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The Impact of Smoke Free Housing on Sick Visits and Hospitalization for Respiratory Illness in Children Ages 0-12

Gail Davis

THE IMPACT OF SMOKE-FREE HOUSING ON SICK VISITS AND HOSPITALIZATION FOR RESPIRATORY ILLNESSES IN CHILDREN AGES 0 - 12

by

Gail M. Davis

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Abstract

This project analyzes the impact of smoke-free family public housing on the respiratory health of children ages 0 – 12. The purpose of this pilot correlational study was to examine the relationship between the initiation of smoke-free policies in family public housing units and health outcomes in children 0 - 12 years. A comprehensive literature review of environmental tobacco health risks and tobacco-free public housing policy is presented. Two theoretical frameworks which guided the project, the Social Ecological Model and the Health Impact Pyramid, are described with an emphasis on health policy as a significant catalyst for positive health outcomes. The methodology, which includes a convenience sample of Neighborhood Health Plan of RI (NHPRI) claims for a cohort of children 0 – 12 years old living in selected smoke-free family public housing units in Providence, RI, was reviewed. Claims data pre and post housing policy change were evaluated to determine whether the implementation of smoking bans in family public housing units in the City of Providence were associated with a decrease in claims of hospitalizations and sick visits for respiratory diseases/illnesses in a cohort of children insured by NHPRI who lived in these units.

Keywords: smoke-free public housing, second hand smoke (SHS), third hand smoke (THS), environmental tobacco smoke (ETS), respiratory illness children.

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Background/Statement of the Problem

The Centers for Disease Control (CDC) defines secondhand smoke (SHS) or environmental tobacco smoke (ETS) exposure as the combination of smoke from the burning end of a cigarette and the smoke breathed out by smokers (CDC, 2015). ETS contains more than 7,000 chemicals. Hundreds are toxic and approximately 70 can cause cancer (Berg, Haardorfer, Windle, Solomon, and Kegler, 2015). The CDC (2015) also warned that older children whose parents smoke are subject to many more health risks as compared with children without this exposure. The lungs of children exposed to environmental tobacco smoke do not develop as well as those of other children who do not breathe secondhand smoke, and they are more susceptible to bronchitis and pneumonia. Wheezing and coughing are more common in children who breathe ETS, and children with asthma who are exposed to secondhand smoke have more severe and more frequent asthma attacks which may put a child's life in danger and impact quality of life. In addition, children living with ETS experience more ear infections and increased frequency of excessive ear fluid (Berg et al., 2015).

The cumulative health risks of ETS result in increased utilization of healthcare services for children exposed including treatment by pediatricians, urgent care settings, and acute care hospitals for such illnesses as asthma, bronchiectasis, bronchitis, bronchiolitis, otitis media, pneumonia, respiratory syncytial virus (RSV), and Sudden Infant Death Syndrome (SIDS) (Berg et al., 2015). In addition to healthcare services,

increased utilization of medications and equipment such as nebulizers, inhalers, and ventilators are also frequently required to treat respiratory illness.

Human costs of tobacco-related acute and chronic illness include physical, social, psychological, and educational losses for the child and loss of the ability to work due to a child's illness for parents. In addition, the financial impact of spending healthcare dollars on preventable ETS-associated disease in children is astronomical. Healthcare costs associated with tobacco use in Rhode Island are estimated to exceed $500 million annually. In the United States, tobacco use causes hundreds of thousands of premature deaths and costs billions of dollars in medical care and productivity losses (RIDOH, 2012).

Historically, attempts have been made to provide health education messages and promotion of cessation programs to parents to reduce health risks for their children with the hope to reduce tobacco exposure in children by providing public health education messages and smoking cessation programs for parents. According to Frieden (2010), education and counseling as a public health intervention represents the least effective intervention option. He stated, "The need to urge behavioral change is symptomatic of failure to establish contexts in which healthy choices are default actions" (Frieden, 2010, 592). Frieden offered a framework for public health action which is accomplished through policy decisions. One such policy has been the national trend to require that public housing for families be smoke-free. In 2009, the Department of Housing and Urban Development (HUD) started to encourage public housing authorities across the United States to enact smoke-free policies. To date, more than 228,000 public housing units across the nation have gone smoke-free, including Boston, Seattle, San Antonio,

and Detroit (Kerr, 2015). Smoke-free housing is part of a larger tobacco-free movement which has occurred on a widespread basis throughout the United States. For example, policies have been enacted for smoke-free public places including military bases, prisons, healthcare facilities, colleges, and universities (Jowers, 2015; Kerr, 2015; Frieden, 2010).

Little is known about the impact of smoke-free policy changes in public housing on the respiratory health of children. The national health plan in the United States, Healthy People 2020, addresses this issue as the objective Tobacco Use (TU), under the category of social and environmental changes. Specifically, the TU 11.1 objective is to "reduce the proportion of children aged 3 to 11 years exposed to secondhand smoke." Healthy People 2020 data demonstrated a 10% improvement from 2005–2008 with reduction over this time from 52.2% to 47%.

Many public housing authorities nationwide are initiating smoke-free policies, and Rhode Island (RI) has followed this trend. Twenty-one of RI's 25 public housing authorities have adopted smoke-free policies (Wendelken, RI DOH, 2013). These local trends have occurred in response to national changes. On November 15, 2015, the US Department of Housing and Urban Development proposed a rule that would ban smoking in public housing nationwide requiring more than 3,100 public housing agencies across the country to make their properties smoke-free. A pilot project to evaluate the relationship between smoke-free public housing policies and the utilization of healthcare services for respiratory illness for children living in public housing will provide useful information about this important health issue for vulnerable children.

Literature Review

A comprehensive literature review was conducted utilizing online databases including: local, state, and federal government websites, PubMed, and CINHAL. Key search words included: *tobacco, smoking, environmental tobacco smoke (ETS), second hand smoke (SHS*), *third hand smoke (THS), smoke-free housing, smoke-free public housing, multiunit housing, impact on infants, toddlers, and children ages 0 – 12, and costs associated with second and third hand smoke.*

Environmental Tobacco Smoke in the Home

Controversy exists regarding the best methods of protecting children from ETS in homes and cars. In an ethical analysis of the issue in the American Journal of Public Health, Jarvie and Malone (2008) concluded that secondhand smoke exposure in private homes and cars was dangerous to nonsmokers, but illustrated their perspective on how a ban would be ethically untenable and unjustifiable. Desapriya, Turcotte, Subzwari, and Pike (2009) responded with a letter to the editor arguing that tobacco smoking should be banned in vehicles in which children are riding. They stated that tobacco has been identified as the second leading risk factor for death of any cause worldwide and cite data from the United States Surgeon General indicating that nearly 22 million children are exposed to risks of environmental tobacco. The authors concluded that while many countries have created laws to ban smoking in workplaces, restaurants, bars and on public transportation, private vehicles remained a place of intense and consistent exposure for children and nonsmoking adults. The authors stated, “Studies demonstrate that the concentration of toxins in a smoke-filled car is 23 times greater than that in a smoky bar” (Desapriya et al., 2009, p. 7).

Goldstein (2015) concurred with the protection of children from the ETS perspective, writing that deliberately and repeatedly exposing children to ETS, which is a known carcinogen, is child abuse. He stated that we as a society believe that we should protect children from all forms of abuse and/or neglect, and when high levels of lead are discovered in a child's home, or children are found to be neglected subsequent to parents' alcohol and/or drug addiction, we as a society intervene to preserve the health of that child. Goldstein argued that the protection should be the same with children who are subjected to prolonged and repeated SHS exposure. He emphatically stated that parents who willfully and consistently expose children to SHS are committing child abuse and that we must intervene to stop that abuse (Goldstein, 2015).

A rebuttal to this perspective by Lindhorst (2015) stated that while children should be protected from the effects of ETS, reporting it as child abuse reinforces a "punishment orientation" towards the addiction that only proves to harm both child and family. Lindhorst (2015) stated:

> Making ETS exposure a form of child abuse is a policy recommendation that will primarily fall on the low income population and will disproportionately affect the children of people of color, reinforcing disparities in both child welfare and health care. She concludes with the statement that until we know that parents have received adequate cessation interventions, we should not move to inflict further sanctions by treating their behavior as a form of child abuse. (Lindhorst, 2015, p. 105-106).

While all parties agreed that exposure to ETS is harmful to children and should be prevented, disagreement continues to exist regarding how to best prevent exposure while protecting privacy and parental rights.

The impact of parental smoke exposure on children with asthma in non-public places including the home was discussed by Butz, et al. (2011). Their study was a home-

based interventional study which utilized Chi-square, ANOVA tests, and multivariate regression models in a sample of 198 children. The authors concluded that over half of the young high-risk children with asthma in their study were exposed to SHS with their caregiver being the primary source of household smoke. Younger children and children with depressed and/or stressed caregivers were at significant risk of SHS exposure, even when a smoking ban in the home was reported. The researchers advocated to include better controls to reduce the exposure of children to SHS in non-public places with an ultimate goal of eliminating all SHS exposure. The homes described were not specified as being in private or public housing (Butz et al, 2011).

Rates of respiratory illness and subsequent hospitalization for children with smoking parents as compared with children with non-smoking parents was described by Pietinalho, Pelkonen, and Rytila (2009). Their population-based case control study involved 521 patients and 932 control subjects. The authors reported that a small child with smoking parents has twice the risk of being hospitalized with a lower respiratory tract infection as compared to children of non-smoking parents. Exposure to ETS increases the number of asthma exacerbations, the degree of difficulty of treatment, the use of asthma medications, emergency room visits, and school absences. This study concluded by stating that smoking is among the most important preventable public health problems, and that small children are the most vulnerable to the toxic effects of ETS because they are exposed to tobacco smoke in their homes where both parents and potentially others smoke. The authors recommended that health care personnel should try to encourage smoking cessation among adults and adolescents to reduce the exposure of children to environmental tobacco smoke (Pietinalho et al., 2009).

The issue of the many children who are exposed to ETS by sharing the same airspace as smokers in public housing is a critical one for the significant number of children living in poverty in the United States. Wilson, et al. (2014) discussed tobacco exposure in children who live in multiunit housing. Their study was a nationally representative dual-frame survey which had 562 respondents. Of the total number of respondents, 29.5% reported smoke incursions in their buildings. Of these, 16% reported incursions in their own unit, 36.2% of which occurred at least weekly. Incursions were defined as smelling tobacco smoke in their building or unit.

The authors showed that blood cotinine levels were significantly higher in children who live in apartment buildings as compared with children who live in single homes even if no one smoked indoors in their own unit. Cotinine is a biomarker of exposure to tobacco smoke for both active smokers and those exposed to ETS, and is evidence of exposure to ETS in the previous few days. This study documented that disseminated tobacco smoke from multiunit apartments may contribute to actual exposure of children. Part of the researchers' conclusion was that this study could prove to impact public opinion and policies about smoke-free multiunit housing for those who live in low-income housing and those who live in privately-owned apartment buildings (Wilson et al., 2014).

Koster, Brink, and Clemmensen (2013) explored exposure to ETS from a multi-unit perspective. The authors described a phenomenon they labeled "neighbor smoke" when describing secondhand smoke that migrates between apartments including common areas and stairways in multi-unit buildings as an "emerging issue for public health and health equity" (Koster, 2013, p.190). The study involved a cohort of 5049 respondents of

which 2183 resided in multiunit buildings in Denmark. In the authors' sampling, 22% of those living in multiunit buildings reported exposure to "neighbor smoke." Their conclusion was that the only way to completely avoid exposure to secondhand "neighbor smoke" was to live in a totally smoke-free multiunit apartment building (Koster et al, 2013).

ETS and multi-unit housing was analyzed by Wilson et al (2011). Of 5002 children in the study, 73% were exposed to secondhand tobacco smoke. Children living in apartments had an increase in cotinine of 45% over those living in detached houses. This increase was 212% for white residents and 46% for black residents, but there was no significant increase for those of other races/ethnicities. At every criteria level of cotinine measured, children in apartments had higher rates of exposure. The authors speculated that since young children's respiratory rates are faster than adults, have a habit of mouthing items and surfaces, and may spend more time indoors, that they are at much higher risk of cognitive deficits and decreased antioxidant levels due to even short exposures to (SHS). The authors concluded that many people living in multiunit dwellings (MUD) were exposed to SHS in their apartments and buildings. They further stated that "partial smoke-free" policies do not seem to protect these residents and appear to increase the occurrence of incursions into the residents' individual apartments (Wilson et al., 2011).

King, Babb, Tynan, and Gerzoff (2013) stated that exposure to SHS from burning tobacco products cause disease and premature death among non-smokers. The authors stated that estimates of multiunit housing residency were determined by using national and state representative data from the 2009 American Community Survey (ACS), an

annual household survey conducted by the U.S. Census Bureau. The sampling frame included all valid residential addresses in the 50 states and the District of Columbia. The ACS is primarily a mail-based survey; however, if no response is received, follow-up is attempted via computer-assisted telephone and in-person interviews. In 2009, 1,917,748 respondents were interviewed (one per household). The overall response rate was 98.0%; state-specific response rates ranged from 94.9% to 99.4%. The authors suggested that multiunit housing residents are particularly susceptible to involuntary SHS exposure in the home, and that environmental studies conducted in these multiunit buildings showed that SHS contaminants can infiltrate smoke-free units and common areas from units where smoking is permitted (King et al., 2012).

Satisfaction by the residents with smoke-free housing policies was explored by Drach, Pizacani, Rohde, and Schubert (2008). With 82% of questionnaires returned, 74% of the tenants reported that they were “happy” with the smoke-free policy. Only 30% of current smokers were “happy” with the policy, as opposed to 85% of former smokers and 92% of people who never smoked. The outcome of this evaluation was that smoke-free policies in subsidized, multiunit housing units are supported by the majority of residents. The authors stated that what was needed for success were messages in line with tenant values, including those of smokers, which may increase acceptability and ultimately, compliance. They further stated that offering tailored cessation resources could further increase the chances of success of the smoke-free policies and should always accompany the implementation of smoke-free policies (Drach et al., 2008).

In an article published in the Rhode Island Medical Journal, five years of weighted data (2011-2015) from the RI Behavioral Risk Factor Surveillance System

(BRFSS) was analyzed (Larson and Santos, 2017). Their findings indicated that in 2004, Rhode Island was the 4th state to pass a comprehensive smoke-free law banning smoking in indoor public places. Most of Rhode Island's Public Housing Authorities (PHAs) voluntarily adopted smoke-free policies before the recent Housing and Urban Development (HUD) rule requiring PHAs to go smoke-free by July 2018. The authors reported that adult smoking declined 23% from 2011-2015, and that 79.4% of Rhode Islanders have voluntary smoke-free homes. These measures resulted in 94.8% of non-smokers reporting no exposure in their homes, and 85.8% reporting no exposure in an indoor public place. However, despite this substantial success, their report showed that progress was not the same for everyone in the state. Their data showed that exposure was higher among adults of low socioeconomic status, racial/ethnic minorities, young adults, and renters (Larson & Santos, 2017).

Also addressing disparities in ETS exposure, Delgado-Rendon et al., (2017) discussed second and third hand smoke exposure of Hispanic residents living in multiunit housing. The authors used a survey method and found that although most of the study participants (97%) banned smoking inside their homes, 80% reported infiltration of second hand smoke (SHS) inside their apartments within the last year. The study found that 85% favored a complete ban on smoking in apartment buildings (Delgado-Rendon, et al., 2017).

Evidence in one study did not support that tobacco control policy reduced exposure in children. A study conducted in China in 2016 demonstrated that when a new tobacco control law was enacted, children's secondhand smoke exposure (SHS) was not lower than before the smoking ban (Zheng et al., 2017). This study surveyed 337 fathers

and 538 mothers. Questions from a subset of key questions from the Global Adult Tobacco Survey (2nd edition) were applied to assess the SHS exposure of children and the prevalence of parental smoking since the smoking ban. A classification tree analysis was used to analyze the factors increasing SHS exposure of children.

> The prevalence of SHS exposure in children at home was 41.3%. The prevalence rates of paternal and maternal smoking were 43.7% and 3.8%, respectively. Compared with data reported by the Health Bureau of Macao SAR in 2011, the prevalence of parental smoking and the prevalence of SHS exposure of children at home have not decreased since the smoking ban. Analysis of the factors increasing the prevalence of SHS exposure of children indicated that fathers with an education level below high school were more likely to contribute to this increase, compared with fathers with a high school education or more (48.2% vs 32.4%, respectively). In addition, fathers represented the majority of smokers at home, accounting for 92.0% of 415 smoking parents. The prevalence of paternal smoking (82.0%) in the group of children with SHS exposure was much higher than that in the unexposed group (16.7%, Chi-squared test = 367.199, P = 0.000). The SHS exposure of children increased consistently with the decrease in paternal education level. This was consistent with the increasing prevalence of paternal smoking as paternal education level decreased. SHS exposure was most common among children whose fathers had an education level below high school and whose mothers were aged ≤29 years (75.0%) (Zheng et al., 2017, p. 55-63).

The authors concluded that the displacement effect of the smoking ban more likely caused the increase of exposure frequency rather than prevalence stating, “This study did not find any decline in the prevalence of parental smoking after the smoking ban. These parents were more likely to smoke at home after the ban, leading to more frequent SHS exposure for their children” (Zheng et al., 2017).

In another international study in Hong Kong, Lee, Wong, and Lau (2017) found that the enactment of smoke-free legislation reduced hospital admissions for childhood lower respiratory tract infections (LRTI). The authors obtained data on 75,870 hospital admissions for LRTI among children ≤18 years of age between January 2004 and December 2012 from all Hospital Authority hospitals. Using a negative binomial

regression model, the impact of smoke-free legislation on admission count was assessed. Hong Kong implemented comprehensive smoke-free legislation in 2007. The authors estimated that the legislation was associated with a reduction of 13,635 admissions in the first 6 years after implementation, and that the immediate reduction was more apparent among school-age rather than preschool children (Lee, Wong, & Lau, 2017).

A study was conducted in Colorado after the enactment of a no-smoking policy in public multiunit residences to evaluate the impact on health outcomes (Young et al., 2016). Three hundred twelve heads of household who resided in one of three multiunit building managed by a Colorado PHA were surveyed before and after the implementation of the no-smoking policy that prohibited smoking in all resident apartments and all indoor common areas. A matched-pairs analysis with initial surveys and 15-month post-policy implementation surveys for 115 respondents was conducted. The results of this study showed decreases in the number and percentage of smokers who smoked every day and the number of cigarettes smoked per day. Eighteen respondents (16%) at T1 were smokers. All of them reported smoking every day. At T2, the number of daily smokers declined to 7 (39%); 5 (28%) smoked rarely to a few times per month, and 6 (33%) had quit smoking (half during the grandfather period and half after the policy was fully implemented). The change in frequency of smoking was significant (*P* = .01).

The number of cigarettes smoked per day declined from T1 to T2, with 6 respondents not smoking any cigarettes at T2, 8 smoking less than half a pack at T1 and 7 at T2, and the number smoking at least half a pack a day decreasing from 9 to 5. The change in the number of cigarettes smoked each day was significant (*P* = .01) (Young et al., 2016).

The authors also reported that 30% of the smokers who responded had quit smoking 15 months after policy implementation. The percentage of residents who reported smelling secondhand smoke indoors also declined significantly. The study found a significant decrease in reported breathing problems after policy implementation. The authors noted that although decreases were found in the incidence of asthma attacks, emphysema/chronic obstructive pulmonary disease, eye irritation, colds, nasal congestion, and ear/sinus infections, these decreases were not significant. They concluded that consistent findings suggest that no-smoking policies reduce resident exposure to secondhand smoke, lower the incidence of secondhand smoke-associated breathing problems, decrease daily smoking and cigarette consumption, encourage smoking cessation, and increase quit attempts. They further concluded that if no-smoking policies were implemented in all multiunit housing, these policies could reduce exposure to secondhand smoke and health problems associated with secondhand smoke, promote smoking cessation, and reduce cigarette consumption (Young et al., 2016).

Third-Hand Smoke and Childhood Risk

Historically, children were exposed to SHS on a regular basis when scientists had not yet discovered the dangerous implications that it has on the respiratory systems of humans, especially children. Adults smoked indoors and in automobiles without regard for the potential impact of the smoke they were exhaling or the others that their smoke was affecting.

The discovery and public awareness of third-hand smoke (THS), which demonstrated that physiological impact occurs on those individuals who are exposed to residual tobacco even when the cigarette is no longer burning, further compounded this

concern. Third-hand smoke is defined as residual tobacco smoke that clings to indoor surfaces and remains after the majority of the airborne components of the smoke have cleared (Bahl, Jacob, Havel, Schick, & Talbot, 2014).

Public opinion regarding childhood exposure to third-hand smoke greatly underestimates the risk of danger. Winickoff et al., (2009) stated that the vast majority of 1,510 smokers and nonsmokers surveyed agreed that second-hand smoke is dangerous (95.4 percent of non-smokers versus 84.1 percent of smokers), but only 65.2 percent of nonsmokers and 43.3 percent of smokers agreed that breathing air in a room where people smoked yesterday (third-hand smoke) can harm the health of infants and children today and in the future. The authors further stated that the most dangerous chemical compounds in cigarette smoke were cyanide, arsenic, and lead. Cyanide interferes with the release of oxygen to tissues because it binds to hemoglobin preventing it from binding with oxygen, and even small quantities of lead exposure have been associated with diminished Intelligence Quotient (IQ) levels. They added that the reason children are more at risk when exposed to second and third-hand smoke is that their developing brain is especially susceptible to low level of toxins. Babies and small children are closer to the surfaces covered by these toxins such as floors, and tend to put everything in their mouths and/or are highly likely to mouth contaminated surfaces (Winickoff et al., 2009).

In July of 2011, Jonathan Winickoff made a compelling statement before the Tobacco Products Scientific Advisory Committee on behalf of the American Academy of Pediatrics. In this statement, he emphasized the importance of eliminating children's exposure to tobacco and secondhand smoke. He also addressed the issue of dissolvable

tobacco products, and the danger of accidental ingestion by children, which would result in serious harm or death from nicotine toxicity.

The means by which ETS, particularly third-hand smoke, is absorbed by children, was described by Bahl et al., (2014). The authors illustrated the mechanics by which third-hand smoke (THS) exposure can occur through the skin, through ingestion and inhalation. Infants and small children could be at greater risk than adults because their skin is thinner, their surface to volume ratio is greater, and because they spend more time in contact with THS-contaminated surfaces and where they can put objects contaminated with THS into their mouths. The authors concluded that the main source of THS exposure to toddlers would be through their mouthing fabrics used in toys, drapes and upholstery that are not frequently laundered and that have long-term accumulation of THS (Bahl et al., 2014).

Increased ETS Risk for Children

The greater risk for children of exposure to tobacco as compared with adults has been discussed by Ballantyne (2009). The author reported that children ingest twice the amount of dust that adults do due to faster respiration and proximity to dusty surfaces, which causes them to experience 20 times the exposure of adults. The author further stated that studies in rats suggest that tobacco toxin exposure is the leading cause of sudden infant death syndrome (SIDS) caused by respiratory depression (Ballantyne, 2009).

Strong negative physiologic reactions, prenatally and in infants and children, have demonstrated as a response to the highly toxic gases dissipated while the cigarette smolders. According to Cohen, Vardavas, Patelarou, Kogevinas, and Katz-Salamon

(2013), only 15% of SHS is actually main stream smoke exhaled by a smoker. The rest is actually highly toxic unfiltered side-stream gases and particles released as the cigarette smolders. The authors stated that while a passive smoker may inhale as little as one one-hundredth of the dose of the smoke inhaled by the active smoker, the risk of disease increases disproportionally by 20 – 50% or more. They described the blood pressure reactions of infants to mild stress for evidence of cardiovascular effects of passive exposure to tobacco smoke during pregnancy and early infancy. The authors observed a 20-fold difference between BPR (% change in BP during head-up tilt) of infants of controls versus passive smokers. The BPR declined linearly as the infant's (but not the mother's) cotinine level rose ($p = 0.04$), indicating abnormal BPR was caused mainly by postnatal smoke exposure. Infants of active smokers differed from those of passive smokers (Cohen et al., 2013).

In this study, systolic blood pressure ranged from 94 for the control group (n=9), 93 for the passive smoker group (n=10), to 100 in the active smoker group (n=6). The diastolic blood pressures for this same cohort ranged from 57 for the control group, 52 for the passive smoker group, and 61 for the active smoker group. The authors concluded that the cardiovascular consequences of early-life passive smoking manifest sooner and far stronger than realized or acknowledged (Cohen et al., 2013).

The authors stated:

> Underlying non-symptomatic circulatory dysfunction in infants born to lifelong abstainers is not just caused by SHS exposure during pregnancy; it worsens dramatically if the newborn is then directly exposed to low-level smoky air even for a few months. Most of this exposure occurs in the home, where the very young spend most of their time, so prevention must begin at home." (Cohen et al., 2013, p. 391).

Exposure to ETS in children is a global phenomenon as well. Globally, indoor air pollution, most of which is caused by ETS, is a major cause of morbidity and mortality in children under five years of age. Bhat, Manjunath, Sanjav, and Dhanya (2012) indicated that acute lower respiratory tract infection was a major problem in developing countries, especially among children under 5 years of age. The authors stated that worldwide, acute respiratory infections contribute to approximately 18% of all deaths before the age of 5 years, and that indoor air pollution was one of the factors prioritized by the World Health Organization (WHO) as a cause of pneumonia. Exposure to adult smoking accounts for most indoor air pollution. Of the 1.5 - 2 million deaths per year worldwide attributable to indoor air pollution, approximately 1 million are caused by acute respiratory infections in children under the age of 5. This is a frightening statistic because it is totally preventable (Bhat et al., 2012).

Lubick (2011) described the global estimate of ETS, stating that it was responsible for the premature deaths of approximately 603,000 people globally in 2004. She gave a historical perspective, stating that it was first proven to cause adverse health effects in the 1980s. Lubick stated:

> Most striking, children under age 5 years bore the brunt of respiratory infections in poorer countries, where malnutrition or inadequate health care also may lead to higher disease and mortality rates in children with other health problems that are exacerbated by SHS exposure. The team calculated that children overall experienced an estimated 61% of the disease burden from SHS (Lubick, 2011, p. A66).

Lubick further cited that one main source of data which discusses exposure among children was the Global Youth Tobacco Survey which was co-sponsored by the U.S. Centers for Disease Control and Prevention in more than 120 countries. The data from this survey showed that the global proportion of people exposed to SHS in various

settings at 40% of all children (which they defined as 0 - 14 years) around the world. These proportions varied by region according to smoking habits, rural versus urban populations, regulations of the country, and many other factors. For example, in Eastern Europe approximately two-thirds of non-smokers in all age and sex groups were estimated to be exposed, but in southern and northeast Africa, only 12% of children and even fewer adults were estimated to be exposed. Lubick found that the burden of morbidity from SHS exposure which is measured by disability adjusted life years (DALYs), also varied by regions with higher estimates for low-income countries in Southeast Asia and the eastern Mediterranean region compared with Europe. While asthma and ischemic heart disease accounted for the most disease among adults, lower respiratory infections were the most common disease entity in children (Lubick, 2011).

Weitzman and Gittleman (2011) described that scientific literature on the negative effects of SHS on children began to emerge only about twenty-five years ago, but that the list of negative health consequences identified in those twenty-five years is quite formidable. The list included prenatal and childhood secondhand smoke exposure as the leading cause of low birth weight and recurrent ear infections in children. They reported that SHS exposure may have subtle but serious effects on children's hearing. Weitzman and Gittleman further found that children exposed to tobacco prenatally and during childhood have substantially higher rates of behavior problems and emotional and neurocognitive impairments such as attention deficit hyperactivity disorder than children who were not exposed (Weitzman and Gittleman, 2011).

Theoretical Framework

Two theoretical frameworks were utilized to guide the research of exploring the impact of smoke-free family public housing on the health status and health utilization of children living in smoke-free housing: the Social-Ecological Model and the Health Equity Pyramid. The first framework described is the Social-Ecological Framework which was developed by Urie Bronfenbrenner in the 1970s as a conceptual model and later formalized as a theory in the 1980s (Bronfenbrenner et al., 2016). Bronfenbrenner continued to review and revise it until his death in 2005.

In his original theory, Bronfenbrenner stated that the entire ecological system in which growth occurs musts be taken into account so that we can understand human development. The framework acknowledges that human beings exist within external systems which impact all aspect of their lives, including their health. These systems or environmental contexts are social, physical, and policy and may be applied to the ETS exposure of children issue. A child who is completely under the social control of a caregiver who smokes is a factor which clearly impacts that child’s health, whether in an automobile, the home, or other exposure settings. The physical environment of a home, including any number of health risks such as smoke, lead, access to drugs, guns, or other safety issues, all impact upon the health of a child. The largest system of policy may impact on all other subsystems within it, either positively if it proactively initiates protective action, or negatively if it does not act or enforces policies which are detrimental to the child’s health. This is represented by public policies impacting on health such as environmental laws, the existence of social and environmental justice within a society, and institutional regulations and policies. The public housing authority’s

smoke-free building policy represents one such policy. The Social-Ecologic Model is displayed in Appendix A.

A second theoretical framework which was used to guide and understand the research project was Frieden's Health Impact Pyramid due to its focus on policy as an intervention to promote health. The pyramid is divided into five tiers representing the lowest to highest parts of the pyramid.

In the Health Impact Pyramid Model, the greatest amount of health impact is achieved at the lower part of the pyramid with the least amount of individual effort required. This first category, the lowest part of the pyramid, which is the largest represents health interventions such as lowering the number of people living in poverty. Frieden noted that reducing poverty improves life expectancy significantly even in the absence of any other interventions (Frieden, 2010). The second tier of the pyramid represents interventions that change the environment to make healthy options the default choice, regardless of level of education, socioeconomic status, or other societal factors. The basis of this tier of intervention is that the environment provides the healthiest choice in contrast with the individual needing to seek out the healthiest choice. In the case of children being exposed to ETS, their health outcome will theoretically be improved by regulating family public housing to be smoke-free regardless of whether their caregivers are aware of tobacco risk or make choices which are in their children's best interest in terms of health. The third tier, long-lasting protective interventions would include immunizations. For example, making human papilloma virus (HPV) vaccines widely utilized in children and normative within a society would lead to prevention of many cancers and reduce associated morbidity and mortality. The forth tier, clinical

interventions includes treatment of the many diseases associated with tobacco exposure such as control of asthma. These are associated with individual access to care and adherence so demonstrate much less commensurate outcomes as compared with interventions at the pyramid base. The last and least effective of the pyramid health interventions is counseling and education. This would include smoking cessation education for parents and counseling about the importance of protecting children from second and third-hand smoke. This has been an intervention strategy for many years which has shown poor yield in term of outcomes, particularly among the most vulnerable children living in poverty for whom ETS remains a significant risk factor for morbidity and mortality (Frieden, 2010). The Health Impact Pyramid Model is shown in Appendix B.

Both the Social-Ecological Framework and the Health Equity Pyramid are based on principles of social and environmental justice. Social justice is a core public health value. Beauchamp stated, "The historic dream of public health…is a dream of social justice" (Beauchamp, 1999, p. 105). This clearly applies to the issue of ETS exposure in public housing since each person has a right to breathe air uncontaminated by tobacco smoke and live an unpolluted life, despite where they may live based on their socioeconomic status. The United States Environmental Protection Agency (EPA) defined environmental justice as follows:

> Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA has this goal for all communities and persons across this Nation. It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work (EPA, 2015, p. 1).

The application of environmental justice implies the equitable distribution of environmental risks and benefits, fair and meaningful participation in environmental decision-making, recognition of community ways of life, local knowledge, and cultural difference, and the capability of communities and individuals to function and flourish in society. ETS exposure in public housing is a serious environmental health issue which affects not only those living in the apartment where the smoking takes place, but all of those living in the public housing unit.

Method

This study was a correlational epidemiological study which used secondary data analysis utilizing claims data. This pilot evaluation project analyzed a convenience sample of Neighborhood Health Plan of RI (NHPRI) claims for a cohort of children 0 – 12 years old who lived in selected smoke-free family public housing units in Providence, Rhode Island. De-identified respiratory illness associated claims data for children 0 – 12 from NHPRI, a nonprofit health insurance company which provides coverage for low income members who qualify for Medical Assistance, were reviewed for 2012 (pre smoke-free housing) and for 2014 – 2016 (post smoke-free housing). Claims were examined pre and post housing policy change to evaluate whether the implementation of smoking bans in family public housing units in the city of Providence impacted claims for hospitalizations and sick visits for respiratory diseases/illnesses in a cohort of children insured and case managed by NHPRI who lived in one of the 20 public housing units in Providence which primarily housed families.

A convenience sample of NHPRI respiratory illness associated claims for children 0 – 12 years old who lived in one of the twenty smoke-free family public housing units in Providence, RI in 2012, 2014, 2015, and 2016 were analyzed pre smoke-free public housing (2012) and post smoke-free public housing (2014 – 2016) policy implementation. Data were reviewed by month and place of service using member count per 100 and visit count per 100. The goal of the analysis was to evaluate the short term impact of smoke-free policy implementation on children living in family public housing. The pilot study was approved by the Rhode Island Institutional Review Board (IRB) and by NHPRI. The letter of agreement with NHPRI is presented in Appendix C.

Results

Claims data for Neighborhood Health Plan of Rhode Island (NHPRI) Medicaid enrolled members ages 0 - 12 who lived in one of the 20 family public housing units in Providence, Rhode Island were analyzed for 2012 prior to implementation of a smoke free housing policy in all public housing in the city. This data was compared with claims data for NHPRI members in 2014, 2015, and 2016 following implementation of the smoke free housing policy in 2013.

Data included two different health outcome variables: the member count and the visit count. The member count was defined as the raw number of children with discrete asthma or respiratory related health encounters taking place at a variety of settings. The visit count was defined as the number of discrete encounters for asthma or respiratory illness. Any child could have more than one encounter for which a claim was filed. Both types of measures were judged important to evaluate since they could provide information regarding the asthma related health status of children.

Data were first analyzed using the member count as a rate per 100 enrolled children. This was defined as the rate of children with a respiratory or asthma claim for all settings per 100 enrolled children living in Providence public family housing, allowing conclusions which are independent of an increase or decrease in the number of enrolled children living in the housing included. For 2012, prior to the implementation of the policy, the rate of children with a respiratory or asthma claim for all settings, or member count, was 61.96/100 children. Following implementation of the policy in 2014, the rate of children with a respiratory or asthma claim for all settings was 60.56. This represents a decrease of 2.26% of children who had an asthma or respiratory claim for the

first year of policy implementation. A larger reduction was seen in the overall findings for 2015 data. The rate of children with a respiratory or asthma claim for all settings in that year was 53.55/100, a reduction of 13.57% from 2012 - 2015 and an 11.57% reduction from 2014 to 2015. The member count increased to 63.64/100 in 2016, an increase of 18.84% from 2015 - 2016 and an increase of 2.71% since 2012.

Data was then analyzed using the visit count which was defined as the rate of visits per 100 enrolled children. For 2012, prior to the implementation of the policy, the visit count was 143.56. Following implementation of the policy, the visit count was 95.07/100 in 2014 and 94.83/100 in 2015. This represents a decrease of 33.78% from 2012 - 2014 and 33.94% from 2012 - 2015. An increase in visit count accompanied the increase in member count for 2016 with member count per 100 increasing to 114.93/100, an increase of 21.2% from 2015 - 2016.

Member counts for which claims were filed for 2012, pre-smoke-free policy implementation, and for 2014 - 2016, post smoke free housing policy implementation, were analyzed for care provided in a variety of settings including: emergency department (ED), inpatient hospital, office visit, outpatient hospital, and urgent care. Low member counts overall were seen in the emergency department (ED) which remained at 14-16 per 100 during 2012 and 2014 - 2016. A slight decrease in ED member count was seen from 2012 - 2014 (0.2%), and a moderate decrease was seen from 2012 - 2015 (8.58%). However, an increase in member count of 25% in the ED was seen from 2015 - 2016 (from 12.9/100 to 16.23/100). Inpatient hospital member counts were less than two for all years. The 2012 pre-smoke-free policy implementation member count was 1.23/100. The

member count dipped to 0 in 2014 and remained at 1.29 and 1.3 for 2015 and 2016 respectively.

The member count for the office visit setting decreased following initiation of the smoke-free policy. In 2012, the member count per 100 for office visits was 35.58. In 2014, the member count for office visits was reduced to 33.8, a 5% decrease. The trend continued in 2015 with the member count lowering to 30.32, a 14.78% reduction from 2012. The 2016 rate increased to 32.47/100 from the 2015 rate of 30.32/100, but was still 8.74% lower than the 2012 pre-smoke- free policy member count of 35.58/100.

Outpatient hospital member counts ranged from 5.63-8.44/100. A reduction was seen from pre policy implementation in 2012 rates of 7.98 in both 2014 and 2015. In 2014, the member count decreased to 5.63 (29.45% reduction). The 2015 rate of 6.45/100 represented a 19.17 reduction from pre policy implementation. The 2016 member rate of 8.44/100 was an increase from both pre policy implementation rates of 7.98 (an increase of 5.76%) and the 2015 rate of 6.45 (a 23.58% increase). The member count for urgent care visits was variable over the time assessed. The claims data showed an increase from 2012 (3.07/100) to 2014 (7.04), a 129% increase. The member count for outpatient hospital dropped in 2015 to 2.58, then increased to 5.19/100 in 2016.

The visit count or rates of children with a claim per 100 enrolled children for 2012, pre-smoke-free policy implementation, and for 2014 - 2016, post smoke free housing policy implementation, was analyzed for care provided in a variety of settings including: emergency department; inpatient hospital, office visit, outpatient hospital, and urgent care. The ED visit count decreased from 2012 - 2014, dropping from 23.93 to 16.2/100, a 32.3% reduction. It increased to 21.3/100 in 2015, a reduction of 10.99%

from pre policy implementation, and 24.03/100 in 2016, an increase of 4.2% from the pre-smoke-free policy baseline. The inpatient hospital visit count was low with 1.23/100 in 2012, 0 in 2014, and 1.29 in 2015. The visit count increased to 3.25 for 2016.

Visit counts in the office visit setting decreased dramatically over the time assessed. The pre smoke free policy implementation visit count for this setting was 85.89 in 2012. This dropped to 52.81 in 2014 and 50.97 in 2015, representing a 40.66% decrease from 2012 - 2015. This measure increased slightly in 2016 to 56.49, but continuing to show a reduction in the visit count for the office visit setting of 34.22%. Visit counts for this population also decreased dramatically for the outpatient hospital setting, from 25.77/100 in 2012 to 14.79/100 in 2014, 11.61/100 in 2015, and to 15.58 in 2016. From 2012 pre smoke free housing implementation to 2015, the visit count decreased by 54%. Even with the slight increase in visit count in this group from 2015-2016, the overall decrease in outpatient visits is still remarkable at 39.38%.

Urgent care visit counts ranged from 6.74/100-15.58/100. In 2012 prior to the smoke free housing initiative, 6.7/100 visits took place in 2012. This increased to 11.26 in 2014, 9.68 in 2015, and 15.58 in 2016, an overall increase in the years assessed of 135.8%. Appendix D depicts member counts and visit counts of NHPRI children living in Providence public family housing with a claim for asthma or respiratory illness by setting for 2012 and 2014 – 2016. Appendix E presents graphs demonstrating children with asthma claims by place of service and asthma rates for this population for 2012 and 2014 – 2016.

Summary and Conclusions

Limitations

Limitations of the study include the type of study, number sampled, duration, and enforcement issues. The project was a correlational study which attempted to evaluate if a reverse relationship between respiratory claims for children living in family public housing and living in smoke-free public housing exists. Expansion to a cohort or experimental study would be required to determine whether the smoke-free housing actually contributed to health outcomes. The pilot evaluated data of 614 children and 693 respiratory healthcare encounters. Larger numbers of children and visits would improve the generalizability of the findings. The limited time period for which the data was examined following the policy change may not have allowed for the health status of the children to be affected. Only short term impact would be shown in this sample. Although the policy is in effect, lack of enforcement may allow ETS to be present and impacting children in spite of the policy implementation which may make it appear that the policy is not impacting health outcome. Other issues impacting respiratory illness in children such as influenza, substitution of tobacco cigarettes for electronic cigarettes or "vaping", lingering impact of tobacco in apartments from prior exposure (3^{rd} hand smoke), and outdoor air quality would not be accounted for by this type of study.

Summary

The purpose of this project was to determine if the enactment of a ban on smoking in all of the family public housing units in the city of Providence passed in December 2012 impacted the incidence of respiratory infections in children ages 0 – 12 who lived in one of these housing units while they were Neighborhood Health Plan of Rhode Island members. Aggregate claims data was obtained for the service years 2012 (prior to

enactment) and 2014 – 2016 (post enactment). The results indicated that the first two years following the ban showed a decrease in respiratory visits from 2012 – 2014 and from 2012 – 2015 in this group of children. A spike in visits in 2016 was noted, but this visit count was still less than prior to the policy implementation.

Conclusions

The results demonstrate that a reverse correlation did exist between the implementation of a smoking ban in family low-income housing units in Providence and respiratory related healthcare encounters in the population of 0 – 12 year old Neighborhood Health Plan of Rhode Island members living in one of these units during the times sampled. Further research studies are needed to examine the long term impact of smoke-free policies on children living in public housing. Collaboration with community stakeholders to provide enforcement and programs to remove third hand smoke toxins which remain as residual in curtains, paint, and furnishings are needed. Further advocacy for safe, healthy housing policy in addition to banning smoking in cars with children is critical.

Recommendations and Implications for Advanced Nursing Practice

The advanced practice nurse can be a catalyst for change in population health including the health of vulnerable children living on public housing. Implications are clear for practice, research, and policy. Advanced practice nurses are charged with collaborating with community stakeholders to assure healthy environments for vulnerable populations. The Robert Wood Johnson Foundation (RWJF) stated, "Nurses must act as essential catalysts for improvement for change, building consensus, and developing cultures of health, lifelong learning, inter-professional collaboration, transparency, and wholeness" (RWJF, 2017). Advanced practice nurses should engage in research of vulnerable populations to promote health equity including research related to low SES children living in public housing. National longitudinal and multisite studies to evaluate the impact of policy implementation are needed to build on this preliminary correlational study. A core role of advanced practice nurses is advocacy for individuals, families, and populations. Advocating for macroscopic intervention at the policy level is the most effective means of promoting the health of populations. Nurses must use population health approaches including providing leadership in state and local public health agencies and collaborating with stakeholder coalitions to provide universal access to tobacco cessation programs, expansion of smoke-free public housing and other ETS exposure minimizing policy, and extension of healthy homes initiatives for all (RWJF, 2017).

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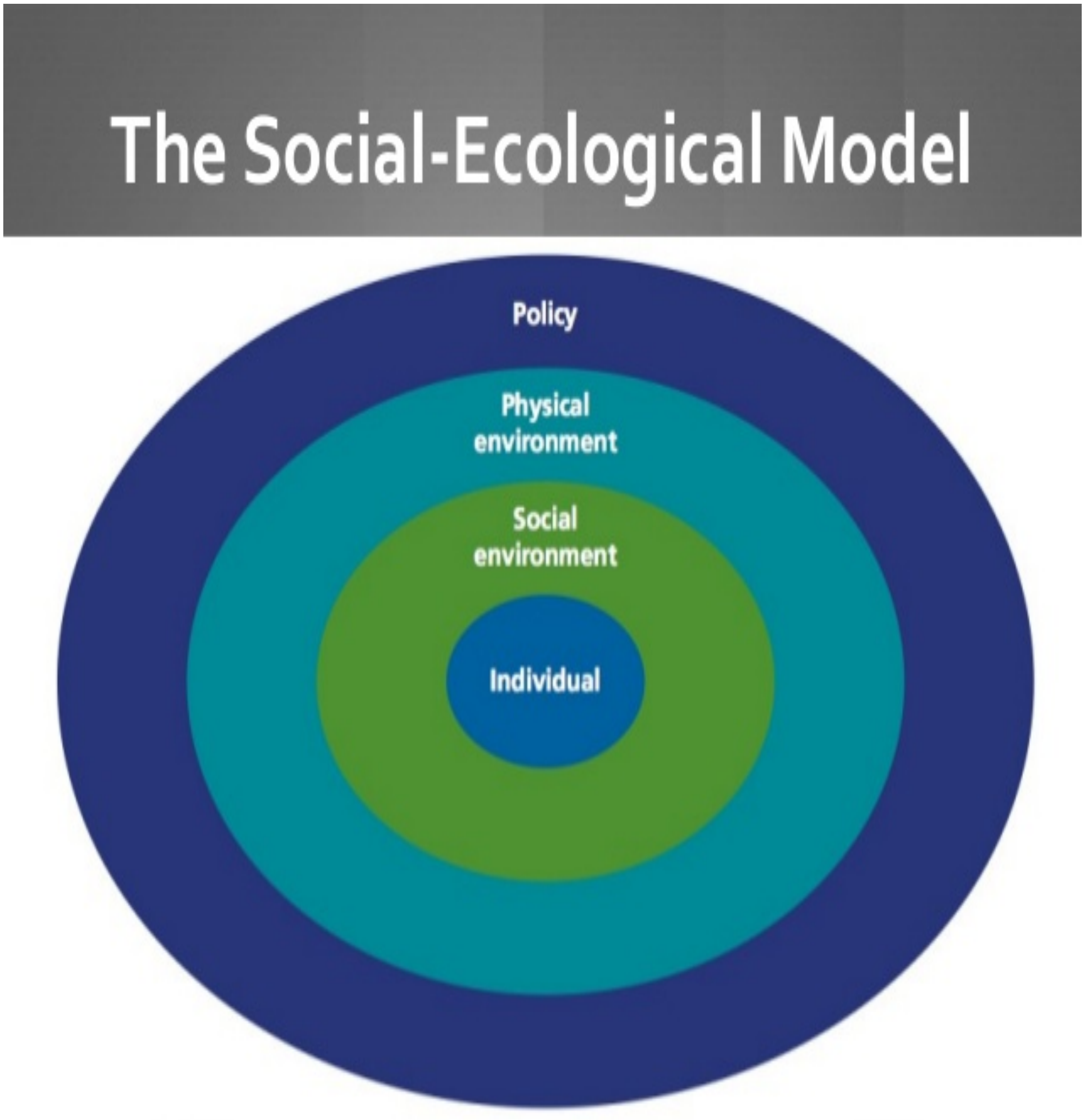
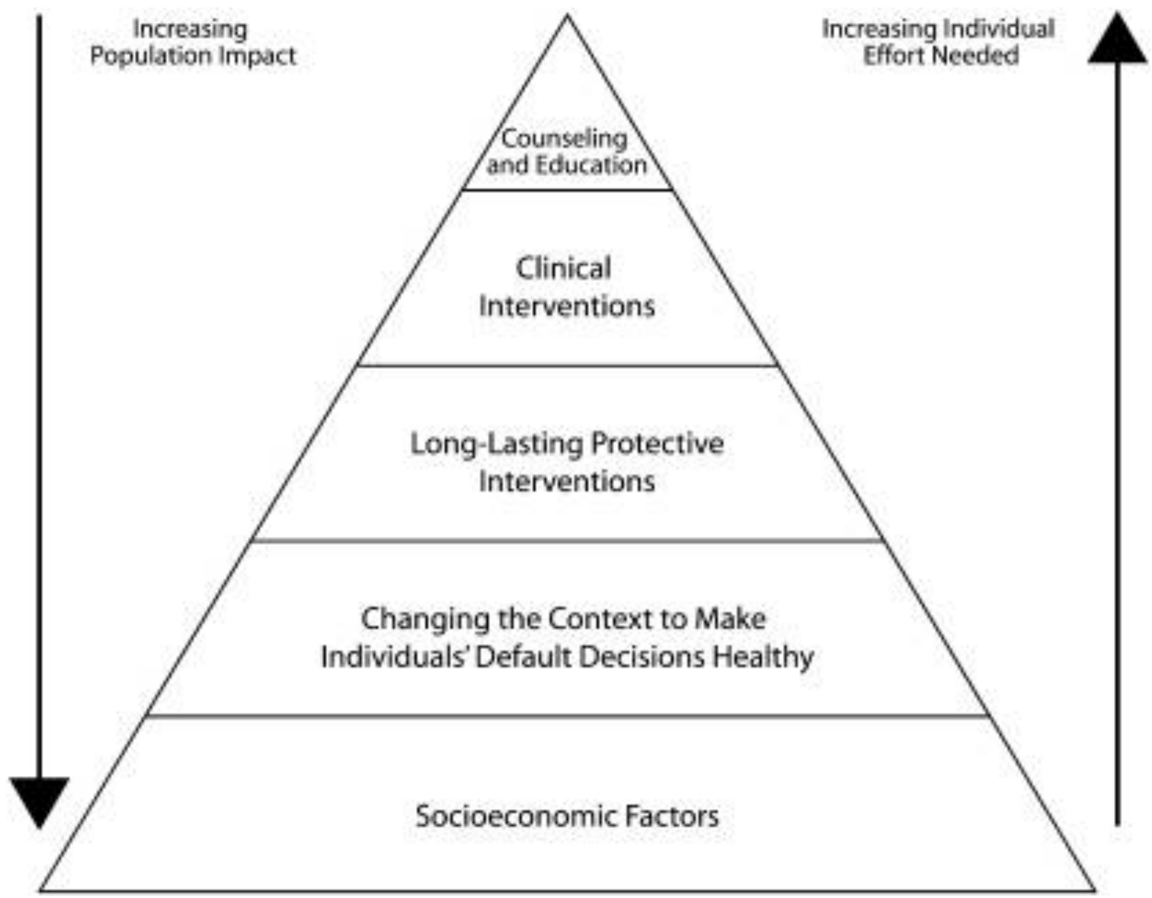
Appendix A



(Bronfenbrenner, 2016)

Appendix B

Health Impact Pyramid Model



(Frieden, 2010).

Appendix C

Neighborhood Health Plan of Rhode Island

Rhode Island College
Institutional Research Board
600 Mount Pleasant Avenue
Providence, RI 02908

September 16, 2015

Dear Rhode Island College Institutional Review Board,

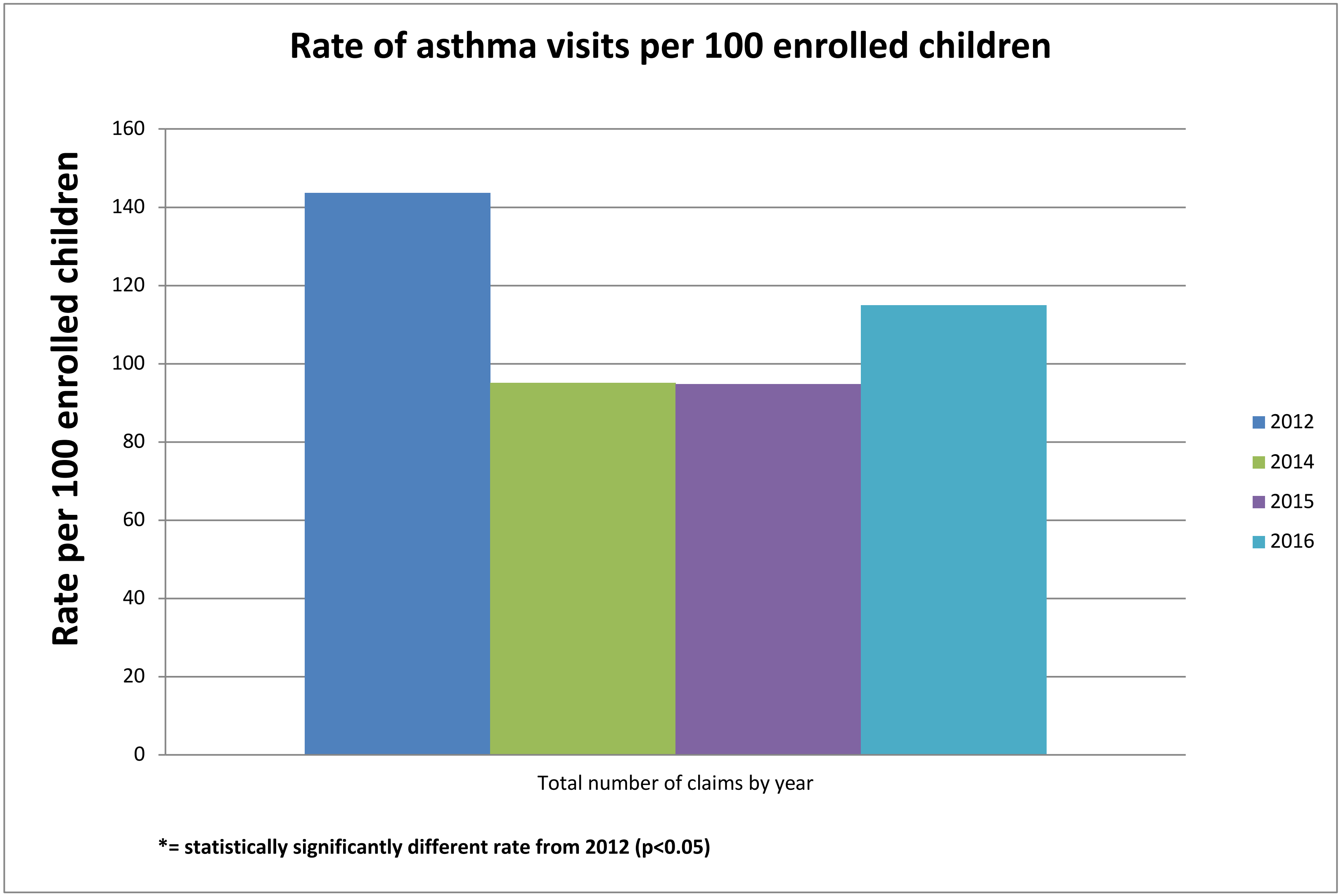
This letter is provided as agreement to serve as a collaborating agency on Gail Davis' Master's project titled "*Impact of a Smoke-Free Policy Intervention on Children 0-12 Years*" which will involve analyzing aggregate data to determine the impact of the enactment of smoke-free public family housing units in the city of Providence on the number of hospital admissions and sick visits for respiratory illnesses in the above population of Neighborhood Health Plan of RI members. The student will be supported to use Neighborhood's aggregate claims data for children 0-12 years living in pre-smoke-free public family housing in the city of Providence as compared with claims data of children 0-12 years living in smoke-free family public housing in Providence. Our organization is completely supportive of this opportunity to support Ms. Davis' work in whatever way we can and look forward to the project outcomes.

Sincerely,

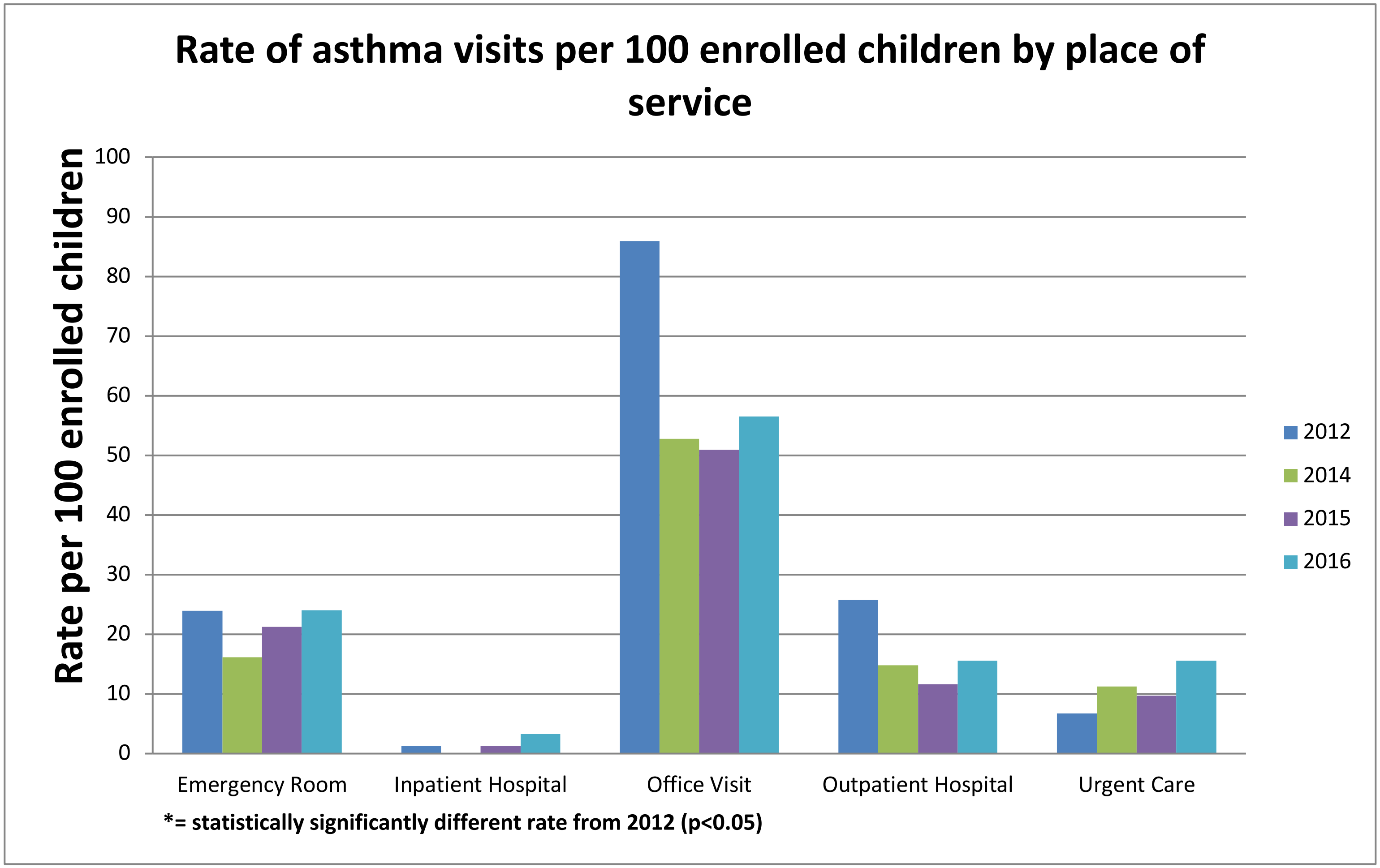
Michelle Lupoli, MS, RN, CCM

Michelle Lupoli, MS, RN, CCM
Vice President of Medical Management
mlupoli@nhpri.org
(401) 459-6035

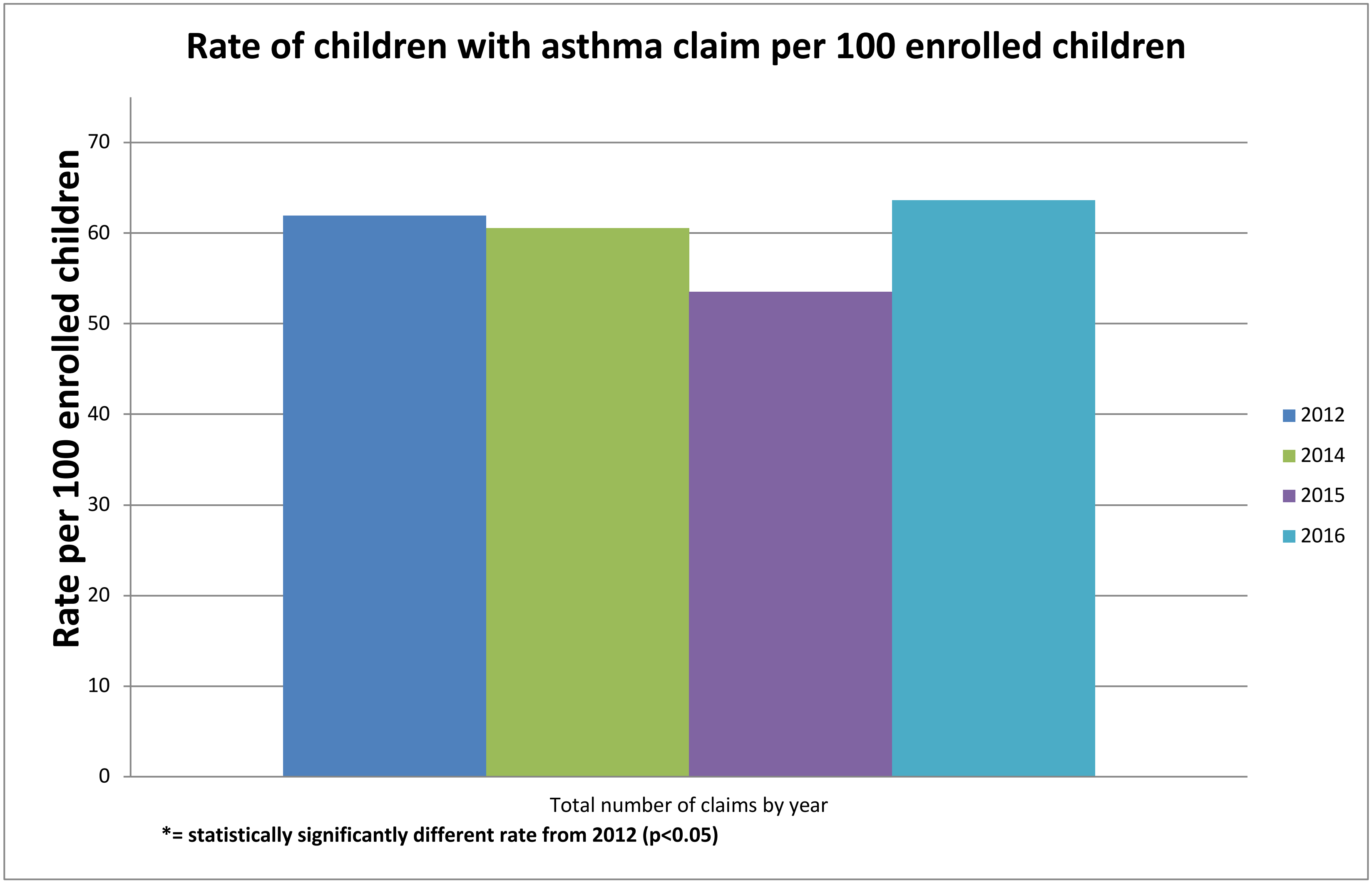
Appendix D


Rate of asthma visits per 100 enrolled children
Rate per 100 enrolled children
160
140
120
100
80
60
40
20
0
Total number of claims by year
2012
2014
2015
2016
*= statistically significantly different rate from 2012 (p<0.05)

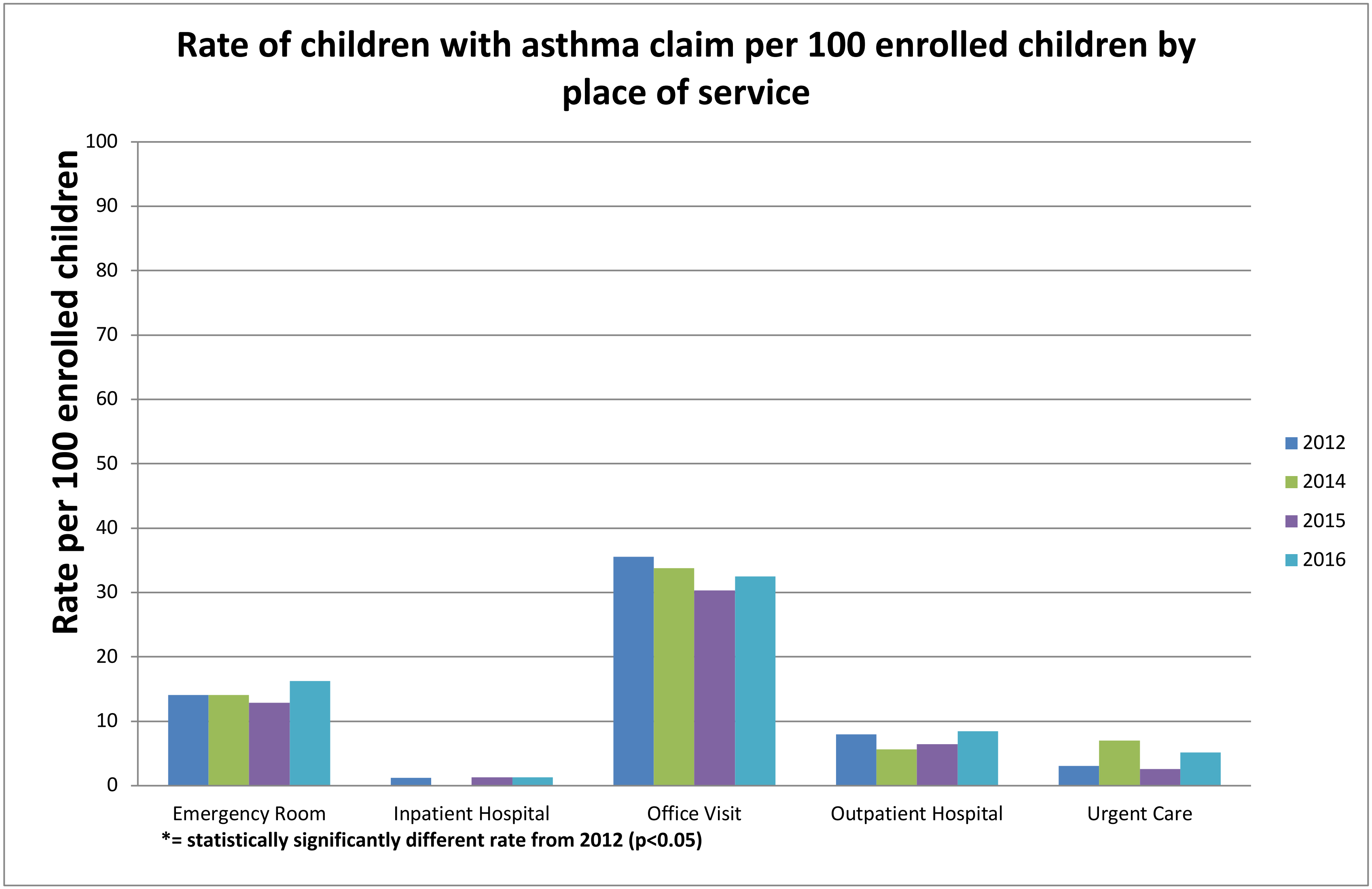
Appendix E


Rate of asthma visits per 100 enrolled children by place of service
Rate per 100 enrolled children
100
90
80
70
60
50
40
30
20
10
0
Emergency Room
Inpatient Hospital
Office Visit
Outpatient Hospital
Urgent Care
2012
2014
2015
2016
*= statistically significantly different rate from 2012 (p<0.05)

Appendix F


Rate of children with asthma claim per 100 enrolled children
Rate per 100 enrolled children
70
60
50
40
30
20
10
0
2012
2014
2015
2016
Total number of claims by year
*= statistically significantly different rate from 2012 (p<0.05)

Appendix G


Rate of children with asthma claim per 100 enrolled children by place of service
Rate per 100 enrolled children
100
90
80
70
60
50
40
30
20
10
0
Emergency Room
Inpatient Hospital
Office Visit
Outpatient Hospital
Urgent Care
2012
2014
2015
2016
*= statistically significantly different rate from 2012 (p<0.05)

Appendix H

2012 Claims Summary Tables

2012 Total Count of Children:	163

2012 Claims Summary by Month

Place of Service	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals:
Emergency Room	4	1	2	7	2	3	1	1	5	1	3	9	**39**
Inpatient Hospital				1								1	**2**
Office Visit	9	9	6	15	21	11	10	6	10	17	10	16	**140**
Outpatient Hospital	3	1	4	4	4	2	1		8	3	3	9	**42**
Urgent Care	1	1	2	1		2	1	1		1	1		**11**
Totals:	**17**	**12**	**14**	**28**	**27**	**18**	**13**	**8**	**23**	**22**	**17**	**35**	**234**

Place of Service	Member Count	Visit Count
Emergency Room	23	39
Inpatient Hospital	2	2
Office Visit	58	140
Outpatient Hospital	13	42
Urgent Care	5	11
Totals:	**101**	**234**

RATES per 100 enrolled children

Place of Service	Member Count	Visit Count
Emergency Room	14.11043	23.92638
Inpatient Hospital	1.226994	1.226994
Office Visit	35.58282	85.88957
Outpatient Hospital	7.97546	25.76687
Urgent Care	3.067485	6.748466
Totals:	**61.96319**	**143.5583**

Appendix I

2014 Claims Summary Tables

2014 Total Count of Children:	142

2014 Claims Summary by Month

Place of Service	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals:
Emergency Room	3	4	3	1	2			3	3	2	1	1	**23**
Inpatient Hospital													**0**
Office Visit	7	4	5	9	7	6	1	4	6	8	7	11	**75**
Outpatient Hospital	2	2	2	2	2	1		2		5		3	**21**
Urgent Care	1	3	1	1	2		2	2			2	2	**16**
Totals:	**13**	**13**	**11**	**13**	**13**	**7**	**3**	**11**	**9**	**15**	**10**	**17**	**135**

Place of Service	Member Count	Visit Count
Emergency Room	20	23
Inpatient Hospital	0	0
Office Visit	48	75
Outpatient Hospital	8	21
Urgent Care	10	16
Totals:	**86**	**135**

RATES per 100 enrolled children

Place of Service	Member Count	Visit Count
Emergency Room	14.08451	16.19718
Inpatient Hospital	0	0
Office Visit	33.80282	52.8169
Outpatient Hospital	5.633803	14.78873
Urgent Care	7.042254	11.26761
Totals:	**60.56338**	**95.07042**

Appendix J

2015 Claims Summary Tables

2015 Total Count of Children:	155

2015 Claims Summary by Month

Place of Service	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals:
Emergency Room	4	3	2	4	4	1	2	3	3	4	1	2	**33**
Inpatient Hospital		1									1		**2**
Office Visit	7	1	8	12	11	5	4	1	4	9	8	9	**79**
Outpatient Hospital	2		3	1	1	2			1	3	2	3	**18**
Urgent Care		2	3	1	1	2			1	1	3	1	**15**
Totals:	**13**	**7**	**16**	**18**	**17**	**10**	**6**	**4**	**9**	**17**	**15**	**15**	**147**

Place of Service	Member Count	Visit Count
Emergency Room	20	33
Inpatient Hospital	2	2
Office Visit	47	79
Outpatient Hospital	10	18
Urgent Care	4	15
Totals:	**83**	**147**

RATES per 100 enrolled children

Place of Service	Member Count	Visit Count
Emergency Room	12.90323	21.29032
Inpatient Hospital	1.290323	1.290323
Office Visit	30.32258	50.96774
Outpatient Hospital	6.451613	11.6129
Urgent Care	2.580645	9.677419
Totals:	**53.54839**	**94.83871**

Appendix K

2016 Claims Summary Tables

2016 Total Count of Children:	154

2016 Claims Summary by Month

Place of Service	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals:
Emergency Room	4	3	3	1	3	2	3	1	5	3	5	4	**37**
Inpatient Hospital	4									1			**5**
Office Visit	7	12	8	1	9	6	3	8	8	8	8	9	**87**
Outpatient Hospital	3		3	1	5	3			2	3	3	1	**24**
Urgent Care	3	4		3	4			4	1	3	2		**24**
Totals:	**21**	**19**	**14**	**6**	**21**	**11**	**6**	**13**	**16**	**18**	**18**	**14**	**177**

Place of Service	Member Count	Visit Count
Emergency Room	25	37
Inpatient Hospital	2	5
Office Visit	50	87
Outpatient Hospital	13	24
Urgent Care	8	24
Totals:	**98**	**177**

RATES per 100 enrolled children

Place of Service	Member Count	Visit Count
Emergency Room	16.233766	24.025974
Inpatient Hospital	1.2987013	3.2467532
Office Visit	32.467532	56.493506
Outpatient Hospital	8.4415584	15.584416
Urgent Care	5.1948052	15.584416
Totals:	**63.636364**	**114.93506**