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RESEARCH ARTICLE

Impact of Copayment Changes on Children's Albuterol Inhaler Use and Costs after the Clean Air Act Chlorofluorocarbon Ban

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Objective. To examine changes in children's albuterol use and out-of-pocket (OOP) costs in response to increased copayments after the Food and Drug Administration banned inhalers with chlorofluorocarbon (CFC) propellants.

Setting. Four health maintenance organizations (HMOs), two that increased copayments for albuterol inhalers that went from generic CFC-containing to branded CFC-free versions, and two that retained generic copayments for CFC-free inhalers (controls). We included children with asthma aged 4–17 years with commercial coverage from 2007 to 2010.

Design. Interrupted time series with comparison series.

Data. We obtained enrollee and plan characteristics from enrollment files, and utilization data from pharmacy and medical claims; OOP expenditures were extracted from pharmacy claims for two HMOs with cost data available.

Findings. There were no significant differences in albuterol use between the group with increased cost-sharing and controls with respect to changes after the policy change. There was a postpolicy increase of \$6.11 OOP per month per child using albuterol among those with increased cost-sharing versus \$0.36 in controls; the difference between groups was significant ($p < .01$).

Conclusions. Increased copayments for brand-name CFC-free albuterol after the CFC ban did not lead to a decrease in children's albuterol use, but it led to a modest increase in OOP costs.

Key Words. Cost-sharing, health insurance, asthma, prescription drugs, health care costs

In response to the Clean Air Act, the U.S. Food and Drug Administration (FDA) banned the use of chlorofluorocarbon (CFC) propellants in albuterol inhalers as of January 1, 2009 (United States Food and Drug Administration 2005). As a result, generic CFC-containing albuterol inhalers were removed from the U.S. market and were replaced by new CFC-free hydrofluoroalkane (HFA) albuterol inhalers that had been brought to market several years prior in anticipation of the ban. Because the HFA inhalers were new, branded drugs, many patients faced higher cost-sharing requirements after albuterol inhalers moved from generic to branded tiers.

Numerous studies suggest that increased cost-sharing is associated with decreased use of health care, including medications for chronic diseases (Newhouse JP and the Insurance Experiment Group 1993; Tamblyn et al. 2001; Gibson, Ozminkowski, and Goetzel 2005; Roblin et al. 2005; Goldman, Joyce, and Zheng 2007; Hartung et al. 2008). Studies in adult populations have shown that greater cost-sharing is associated with reductions in use of asthma medications as well as increases in need for oral steroid bursts, asthma-related ED visits and hospitalizations, and out-of-pocket (OOP) costs (Blais et al. 2003; Goldman et al. 2004; Dormuth et al. 2008, 2009; Campbell et al. 2011). The few studies on medication cost-sharing in pediatric populations suggest similar trends, with higher deductibles and OOP costs associated with reduced use of inhaled steroids and other asthma medications, as well as adverse health outcomes and financially burdensome OOP costs for families (Kozyrskyj et al. 2001; Ungar et al. 2008, 2011; Karaca-Mandic et al. 2012;

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Fung et al. 2014). Data are limited on the impact of cost-sharing on acute medications such as rescue medications for asthma like albuterol, for which patients or parents may have different price elasticities (i.e., the degree to which the quantity used is responsive to changes in price) compared with chronic medications such as controller medications (Piette, Heisler, and Wagner 2004; Landsman et al. 2005). Two studies, including one around the time of the CFC ban, have found that higher OOP costs for bronchodilators were associated with decreased use for adults and children (Ungar et al. 2008; Jena et al. 2015). However, these studies did not include comparison groups that were not exposed to a cost-sharing change or explicitly examine changes before versus after the ban.

Through its indirect impact on cost-sharing for albuterol inhalers, the Clean Air Act has created a unique natural experiment from which to address unanswered questions about the impact of cost-sharing on albuterol use for children with asthma and more broadly on acute medication use. Our study explicitly tests the impact of this natural experiment on children's albuterol use and costs by taking advantage of an existing comparison group for which there was an exogenous health plan decision to retain generic copayments for the branded HFA inhalers. The objectives of this study were to examine if increased copayments for albuterol inhalers after the CFC ban were associated with changes in children's albuterol inhaler use and OOP costs relative to children who did not face cost-sharing changes due to the ban.

METHODS

Design and Setting

We used a population-level interrupted time series design with comparison series during the time period from January 1, 2007 to December 31, 2010 (2 years before and after the date of policy implementation, January 1, 2009). Electronic data on subject demographics, enrollment, medication dispensing, and health care utilization came from the Population-Based Effectiveness in Asthma and Lung Diseases (PEAL) Network, a distributed data network that was created for research on lung diseases (Tse et al. 2013; Fung et al. 2014; Li et al. 2014; Wu et al. 2014, 2015). Four PEAL health maintenance organization (HMO) sites were included in this study: Harvard Pilgrim Health Care (HPHC), HealthPartners Research Foundation (HPRF), Kaiser Permanente Northern California (KPNC), and Kaiser Permanente Northwest (KPNW). The study was approved by the Institutional Review Board (IRB) of each site.

Population

We assembled a rolling cohort of children with asthma aged 4–17 years. To be included in the denominator for a given month during the study period (January 1, 2007 and December 31, 2010), children were required to meet the following criteria during the month in question: (i) continuous enrollment in a commercial insurance plan with drug coverage; and (ii) age ≥ 4 years and < 18 years on the first day of the month. They also must have met the following criteria in the 12 months prior to the first day of the month: (i) continuous enrollment in a commercial insurance plan with drug coverage; and (ii) a diagnosis of asthma, defined as having at least one office visit, emergency department (ED) visit, or hospitalization with an International Classification of Diseases, Ninth Revision (ICD-9) code of 493.xx, or any dispensing of an asthma controller medication (inhaled corticosteroid [ICS], leukotriene antagonist [LTRA], long-acting β_2 -agonist [LABA], or combination ICS and LABA [ICS-LABA]). We excluded children with diagnoses of other serious comorbid pulmonary conditions (cystic fibrosis, immunodeficiency, bronchiectasis, congestive heart failure, pulmonary hypertension, or pulmonary embolism). Children enrolled in plans with deductibles were excluded because the deductible costs for albuterol inhalers were not handled consistently across plans.

Variables

Independent Variables. The primary independent variable of interest was exposure to a cost-sharing increase for albuterol after the policy change. The exposed group consisted of children from HPHC and HPRF who changed from having a generic drug copayment for albuterol inhalers to having a higher branded drug copayment after the policy change. The control group consisted of children from KPNC and KPNW, which chose to retain generic copayments for CFC-free albuterol after the policy change. Fixed covariates included study site and gender. Data on race/ethnicity were incompletely collected by the participating health plans and are categorized as white, non-white (black, Asian/Pacific Islander, Hispanic), and missing. Census block group data were used to measure residence in a low-income area (≥ 20 percent of residents with household incomes below the federal poverty level) and low-education area (≥ 25 percent of the residents aged 25 years and older who have less than a high-school education) (Krieger 1992; Krieger et al. 2003). Time-varying covariates included age at the start of each month and whether the

child had persistent asthma. We defined children with persistent asthma, a subgroup that could be particularly affected by the copayment change, as those having at least one dispensing of a controller medication (ICS, LTRA, LABA, or ICS-LABA) in the 12 months prior to the first day of the month in question. Although we defined the overall study population with asthma using broader criteria that included having an asthma-related ED visit or hospitalization, we did not define persistent asthma using HEDIS criteria such as albuterol use or asthma-related ED visits or hospitalizations because of our hypothesis that these could also be affected by the copayment change.

Dependent Variables. The primary dependent variables for this study were number of albuterol inhalers dispensed and OOP costs for albuterol inhalers. CFC-containing and CFC-free albuterol inhalers were identified using national drug codes in pharmacy dispensing and claims data. We measured the number of albuterol inhalers (CFC-containing or CFC-free) dispensed to eligible children with asthma in each month of the study period, and then determined the number of inhalers dispensed per 1,000 children with asthma in that month. We chose the number of albuterol inhalers dispensed, rather than the percent of children with an albuterol dispensing or number of dispensings per month, because we found that sites differed in the amount of medication dispensed in each dispensing (e.g., some plans dispense only a 30-day supply, while others might dispense a 90-day supply in one dispensing) which could affect OOP costs, and because children may be prescribed more than one inhaler at a time if they need one for home and one for school. To determine the number of albuterol inhalers dispensed, we divided the prescribed amount (number of metric units in the prescription as it was filled) by the package size for one canister of each unique drug based on national drug code. Each canister of both CFC and CFC-free albuterol contained 200 inhalations.

Data on OOP drug costs were available only for two sites: HPHC (exposed) and KPNC (control). For these two sites, we measured OOP costs for albuterol inhalers in each month for each eligible child with asthma using the member responsibility for copayments, coinsurance, or any other member liability from claims data. Costs were adjusted to 2010 dollars using the 2010 Consumer Price Index for All Urban Consumers, annual average for all items (United States Bureau of Labor Statistics 2016). We measured the OOP cost per child with asthma in each month, and the OOP cost per child who was dispensed an albuterol inhaler in each month.

As secondary outcomes, we also measured asthma-related ED visits and controller medication use. For eligible children with asthma in each month of the study period, we measured the number of ED visits with an ICD-9 code of 493.xx as the primary diagnosis or as a nonprimary diagnosis in addition to another respiratory diagnosis (pneumonia, influenza with pneumonia or other respiratory manifestations, bronchitis, acute upper respiratory infection, acute bronchitis and bronchiolitis, pulmonary collapse, respiratory failure, other pulmonary insufficiency, pneumothorax, perinatal chronic respiratory disease, viral infections excluding human papilloma virus, retrovirus, retrovirus NOS, HTLV I, HTLV II, HIV 2, retrovirus NEC) (Tse et al. 2013). We then determined the number of ED visits per 1,000 children with asthma per month. To measure controller medication use, we calculated the percent of days covered (PDC) among children with persistent asthma (defined above) in each month. Within each month, we counted the days the patient was covered by any controller medication (ICS, LTRA, LABA, or ICS-LABA) based on the prescription fill date and days of supply, then divided this by the number of days in the month. The days supply of overlapping prescriptions were added together for medications within the same class, but not those in two different classes. We used the PDC of each medication class to calculate the mean PDC for controller medications per month.

Statistical Analyses

We used an interrupted time series design with comparison group, with a 2-year preperiod prior to implementation of the policy (January 1, 2007–October 1, 2008) and a 2-year postperiod after implementation (January 1, 2009–December 31, 2010) (Wagner et al. 2002). The washout period just prior to implementation of the policy (October 1, 2008–December 31, 2008) was excluded from the analyses because some patients had begun to convert over to CFC-free inhalers, while other patients may have stockpiled the less expensive CFC-containing albuterol in anticipation of the change (Consumer Affairs 2009). We measured descriptive statistics on study site, age, gender, race/ethnicity, census block group education and income, and prevalence of persistent asthma among children in the study population in each month of the study period. Given the differences between the exposed and control groups and changes over time in the prevalence of persistent asthma, data were weighted to reflect the distribution of the study population within subgroups. The weighted distribution was defined by prevalence of persistent asthma as of the first month of the study (January 2007). Analyses were also

adjusted for seasonality within each site. We used segmented linear models with an autoregressive correlation structure to test for statistically significant changes in the level (intercept) or trend over time (slope) after enactment of the policy in January 2009, controlling for the prepolicy level and trend. The level can be thought of as the value of the outcome at the beginning of a given time segment, such that a jump or drop in level after the policy change constitutes an abrupt intervention effect. The trend is the rate of change of the outcome over the course of a time segment, and a change in trend represents an increase or decrease in the slope of the segment after the intervention compared with the preceding time segment (Wagner et al. 2002). We developed models separately for the exposed and control groups, and we also modeled the difference in monthly outcome rates between the exposed and control groups in order to control for underlying secular trends.

RESULTS

The number of children with asthma in our study's rolling cohort each month ranged from 60,778 to 68,605, with a mean of 64,313 children per month (16,854 in the group exposed to the cost-sharing change and 47,459 in the control group). While the exposed and control groups were similar with respect to age and gender, they differed from each other in terms of race/ethnicity (including in the proportion with missing race/ethnicity data), census block group education and income, and prevalence of persistent asthma (Table 1). However, aside from prevalence of persistent asthma, which decreased slightly in the control group but not the exposed group, these characteristics remained stable over the course of the study period within each study group.

Figure 1 shows the adjusted time series of monthly rates of albuterol inhaler use per 1,000 children with asthma and the fitted trend line before and after the policy change for the exposed group, control group, and for the difference between the two. Data from the 3-month washout period just prior to the policy change were not included (indicated in the figure by the gray bar). After the policy change on January 1, 2009, there was a significant change in level (intercept) for the exposed group with an increase of 7.5 inhalers per month per 1,000 children ($p = .04$), and there was a significant downward change in trend (slope) ($p = .01$). There were similar changes in the control group, with an increase in level of 6.9 inhalers per month per 1,000 children after the policy change, although not significant ($p = .12$ for change in level and $p = .11$ for change in trend). For the difference in rates between the

Table 1: Characteristics of Study Population

	<i>Jan-07</i>	<i>Jan-08</i>	<i>Jan-09</i>	<i>Jan-10</i>
Site				
HPHC	11,255	10,569	10,897	10,735
HPRF	6,226	5,426	5,546	6,421
Total exposed*	17,481	15,995	16,443	17,156
KPNC	46,037	41,458	40,000	43,866
KPNW	5,049	5,219	5,225	5,628
Total controls†	51,086	46,677	45,225	49,494
Age				
4–11 years				
Exposed	58%	58%	58%	57%
Control	57%	58%	58%	58%
12–17 years				
Exposed	42%	42%	42%	43%
Control	43%	42%	42%	42%
Male				
Exposed	58%	58%	58%	59%
Control	57%	57%	57%	57%
Race/ethnicity				
White				
Exposed	26%	27%	27%	26%
Control	36%	35%	35%	34%
Non-white				
Exposed	8%	9%	9%	9%
Control	37%	39%	40%	41%
Other/missing				
Exposed	66%	65%	64%	65%
Control	27%	26%	25%	25%
Low-education block group				
Exposed	8%	8%	8%	8%
Control	22%	23%	23%	23%
Low-income block group				
Exposed	4%	5%	5%	5%
Control	7%	7%	7%	7%
Persistent asthma				
Exposed	62%	64%	63%	61%
Control	73%	71%	69%	68%

*Subjects exposed to increased cost-sharing.

†Control subjects without increased cost-sharing.

exposed and control groups, there was no significant change in level ($p = .98$) or trend ($p = .85$) relative to each other.

Figure 2 shows the adjusted time series of monthly OOP costs for albuterol inhalers per month per child dispensed albuterol for the study sites for which cost data were available (HPHC and KPNC). The exposed group

Figure 1: Number of Albuterol Inhalers Dispensed

Notes. The dashed vertical line indicates the policy change, after which CFC-containing albuterol inhalers were prohibited and the exposed group faced increased cost-sharing for branded CFC-free albuterol inhalers. The difference between the rates in the exposed and control groups are shown by the square markers at the bottom of the chart. The gray vertical box indicates the washout period just prior to the policy change.

(HPHC) had a significant postpolicy increase in level of \$6.11 per month per child dispensed albuterol ($p < .01$), while the control group (KPNC) had a small increase in level of \$0.36 ($p < .01$). The trend for the exposed group continued to increase but significantly less steeply than before ($p = .01$), while there was no significant change in the trend for the controls ($p = .49$). For the difference between the groups, there was a significant increase in level after the policy change ($p < .01$), while the postpolicy trend continued to increase but less steeply than before ($p = .049$). Across all children with asthma, the postpolicy increase in mean monthly OOP costs for albuterol inhalers was \$0.66 for those in the exposed group ($p < .001$), compared to \$0.08 in the control group ($p = .037$) (data not shown).

After the policy change, there was no significant change in level after the policy change for adjusted monthly rates of asthma-related ED visits in either the exposed group ($p = .19$) or the control group ($p = .13$), or in the difference in rates between the two groups ($p = .53$) (Figure 3). There also was no significant change in trend for ED visit rates after the policy for the

Figure 2: Out-of-Pocket Cost for Albuterol Inhalers per Child Dispensed Albuterol

Notes. The dashed vertical line indicates the policy change, after which CFC-containing albuterol inhalers were prohibited and the exposed group faced increased cost-sharing for branded CFC-free albuterol inhalers. The difference between the costs in the exposed and control groups are shown in by the square markers. The gray vertical box indicates the washout period just prior to the policy change.

exposed group ($p = .08$), the control group ($p = .87$), or for the difference between them ($p = .07$). For controller medication use, there was no significant change in level after the policy change for mean PDC in either the exposed group ($p = .63$) or control group ($p = .34$), or in the difference between the two ($p = .10$) (Figure 4). There was no significant change after the policy in the downward trend in mean PDC for the exposed group ($p = .86$), but there was a significant change from an upward to a downward trend after the policy change for the control group ($p < .01$). As a result, there was a significant change in the trend for the difference between exposed and control groups from pre- to postpolicy ($p < .01$).

DISCUSSION

Our study found that the cost-sharing change associated with the FDA policy to ban CFC-containing albuterol inhalers in response to the Clean Air Act did

Figure 3: Asthma-Related ED Visits

Notes. The dashed vertical line indicates the policy change, after which CFC-containing albuterol inhalers were prohibited and the exposed group faced increased cost-sharing for branded CFC-free albuterol inhalers. The difference between ED use in the exposed and control groups are shown in by the square markers. The gray vertical box indicates the washout period just prior to the policy change.

not result in the expected decrease in albuterol inhaler use for children with asthma, although OOP costs increased modestly for those exposed to the cost-sharing increase. Our study took advantage of this natural experiment using a rigorous interrupted time series design with a control group that was not exposed to increased cost-sharing for CFC-free albuterol inhalers to address the concern that the higher cost-sharing for branded CFC-free inhalers resulting from the FDA policy would create barriers to use of needed asthma care.

Our finding that there were no differences in albuterol inhaler use between children with and without a cost-sharing increase stands in contrast to other studies that have found a decrease in medication use with increased cost-sharing. There are several potential explanations for this. Most studies that find decreased medication use with increased cost-sharing have focused on chronic medications (Kozyrskyj et al. 2001; Blais et al. 2003; Campbell et al. 2011). The lack of a decrease in albuterol use among children exposed to

Figure 4: Controller Medication Use among Children with Persistent Asthma

Notes. The dashed vertical line indicates the policy change, after which CFC-containing albuterol inhalers were prohibited and the exposed group faced increased cost-sharing for branded CFC-free albuterol inhalers. The difference between the mean PDC in the exposed and control groups are shown in by the square markers. The gray vertical box indicates the washout period just prior to the policy change.

higher cost-sharing may be due to albuterol's role as a medication for relief of acute symptoms, which might make demand for the drug more inelastic (Piette, Heisler, and Wagner 2004; Landsman et al. 2005). Evidence is limited about the effects of cost-sharing on use of acute medications, but data suggest a smaller reduction in use of bronchodilators for children than for other asthma medications (Ungar et al. 2008). Among adult populations, there appears to be a reduction with increased cost-sharing for symptomatic medications such as NSAIDs and antihistamines, especially in situations where an over-the-counter substitute is available (Goldman et al. 2004; Landsman et al. 2005).

Another explanation for the lack of an impact of the cost-sharing increase for albuterol inhalers in our study is that the \$6 increase was relatively modest on top of a relatively small copayment, which just prior to the policy change

was \$10 for CFC-containing albuterol in the exposed children. Other studies have failed to find decreased medication use with modest copayment increases, for example less than \$10 (Johnson et al. 1997; Roblin et al. 2005), while some have found significant reductions in use of asthma controller medications (a decrease of 35–48 days supplied annually) with copayment increases of >\$5 for patients with asthma aged 12–64 years (Campbell et al. 2011).

Differences in the response to cost-sharing for adults versus children may also explain our lack of a cost-sharing effect for acute medications in a pediatric population. While there is evidence that increased cost-sharing reduces care for children as well as adults, the effect may not be as large or may depend on the specific type of health care service or medication (Galbraith et al. 2012; Jena et al. 2015). It may be distressing for parents to see their children struggling with an asthma exacerbation such that they are more willing to spend the extra money on medication to relieve it, and parents may be price inelastic with respect to “necessary” medical goods for their children. Decision makers may be more likely to forgo treatment due to cost for themselves but not for their children or other family members (Karaca-Mandic, Choi Yoo, and Sommers 2013). Additionally, the need for parents to provide albuterol inhalers for their child at daycare, school, or camp may contribute to the lack of change in use associated with the price change.

Our findings differ from a study by Jena et al. (2015) measuring albuterol use and costs in a commercially insured population during the time around enactment of the CFC ban, which found that higher OOP costs for albuterol were associated with a modest decrease in albuterol use for adults and children, with smaller reductions in children than for adults. Our findings may differ because of the added strength of our study from inclusion of a comparison group that did not experience a cost-sharing change due to the policy. Baseline rates of albuterol use appear lower in our study population than in Jena’s, and if our population had less “discretionary” albuterol use at baseline, utilization may have been less sensitive to increases in copayments. Although significant, the percentage point decrease in quarterly albuterol inhaler fills associated with a \$10 increase in OOP costs in the Jena study was only 0.54 from a baseline of 17.2 fills per 100 children per quarter (Jena et al. 2015).

We did not find any significant changes for exposed children in other associated asthma care, such as asthma-related ED visits or controller medication use. This is consistent with findings from the Jena study, in which there were no differences in asthma-related ED use or asthma controller medication use associated with increases in OOP costs for albuterol (Jena et al. 2015). We found that controller medication use in the control group had a significant

change to a downward trend after the policy with no significant change in level, but this is not likely to be related to the changes we found in albuterol use after the policy because we would have expected to see a *decrease* in mean PDC level and an *upward* trend after the policy.

Interestingly, we found an *increase* in use of albuterol inhalers immediately after the change in policy for children with and without increased cost-sharing. We do not believe that the increased albuterol use represents higher rates of poorly controlled asthma, given that rates of asthma-related ED visits did not show a significant increase nor did controller medication use show a significant drop at the same time. One possible explanation is that differences in the mechanism of the new HFA propellants in the CFC-free albuterol inhalers led patients to go through inhalers more frequently. There have been anecdotal reports that patients felt that the new CFC-free inhalers delivered less medication, requiring more puffs, and that the new inhalers were more likely to become clogged and nonfunctional, which would have led to quicker time to refills until patients were able to adjust to using the new inhalers (McGuire 2008; Consumer Affairs 2009). Additionally, if parents were advised to replace their old inhalers with the new CFC-free inhalers around the time of the policy change, this could explain a temporary spike in dispensing. Additional research is warranted to examine how the price increase affected long-term use, for example, after patients adapted to the new inhalers.

While it is reassuring that children do not appear to be forgoing important asthma rescue medications in response to increased cost-sharing for CFC-free albuterol, the increased OOP costs for albuterol due to the policy change may still prove to be a challenge to some families. While the mean monthly increase in costs was only \$6, this could prove burdensome for some families over time if they have children who require frequent albuterol or have lower incomes. Paying a higher proportion of family income for asthma medications has been associated with greater likelihood of asthma exacerbations (Ungar et al. 2011). Families with limited resources must decide where to find extra money for albuterol within fixed family budgets, and they may have problems paying for other necessities or have to borrow to pay for asthma costs (Galbraith et al. 2011; Fung et al. 2014).

Limitations

Although our study design mitigates patient-level selection effects by taking advantage of a change in cost-sharing driven by exogenous FDA and health plan policy changes, our study still could be biased by differences in the

socioeconomic, clinical, and health system characteristics of the health plan populations, which could modify the response to cost-sharing in our study. Although there are substantial amounts of missing race/ethnicity data for some of the health plans studied, we were able to demonstrate that there were no changes over time in the distribution of race/ethnicity (and missingness) between the study groups.

We were able to assess differences across study sites and standardize those that varied over the study period, but with claims data, we were unable to measure other important patient-level socioeconomic and clinical variables that could affect albuterol use and response to cost-sharing such as family income and asthma control. Claims data also present limitations in identifying children with asthma and persistent asthma; for example, our claims-based algorithm may have selected children who do not have asthma but were dispensed LTRA for allergies.

Our study was limited to children with commercial insurance, which may underestimate decreases in medication use due to increased cost-sharing that have been demonstrated in low-income populations (Tamblyn et al. 2001; Chernew et al. 2008). Additionally, the lack of reduction in albuterol use in response to the cost-sharing change may be due to the relatively small copay increase, with a median OOP increase of \$10. The impact of the policy change could be greater among patients with less generous insurance benefits that have larger generic-brand copayment differentials, or those who must pay the full cost of drugs under the deductible, or those without insurance.

CONCLUSIONS

After the enactment of the ban on CFC-containing albuterol inhalers, albuterol inhaler use did not decrease for children with asthma who were exposed to the resulting increase in copayments for the new brand-name CFC-free albuterol inhalers compared to those who did not face a cost-sharing increase. The enactment of the ban led to a modest increase in OOP costs for families in plans that increased cost-sharing to branded drug amounts.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.