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Cost-Benefit Analysis of a Pharmacist's Contribution in Decreasing Asthma-Related Economic and Health Burden with a Focus on the Hispanic Population

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Background

Asthma stands as one of the most prevalent and costly health conditions in the United States. Asthma affects over 27 million people in the U.S., which translates to approximately 1 in 12 individuals [1,2]. The burden of asthma in the United States is significantly higher among individuals with low income, senior adults, and Black, Hispanic, and American Indian/Alaska Native populations, who exhibit the highest rates of asthma-related fatalities, and hospitalizations [3]. This chronic condition, which is most prevalent during childhood but affects individuals of all ages, involves inflammation and swelling of the airways, leading to their constriction, and impeding the flow of air from the nose and mouth to the lungs. Symptoms encompass shortness of breath, wheezing, coughing, and chest tightness or discomfort, with triggers varying among individuals, including allergens like dust and pet dander, certain foods, and exercise [3]. While asthma can be life-threatening, there is no cure; however, appropriate treatment can effectively prevent asthma attacks, ultimately improving the quality of life.

According to the Centers for Disease Control and Prevention (CDC), 6.5% of children in the US have pediatric asthma, and 38.7% of those kids experience exacerbations each year [4]. These incidents put families under stress, especially those with low resources, and raise the likelihood that they will need emergency care. Financial constraints are increased by emergency department (ED) visits and inpatient admissions, which sometimes involve needless chest imaging and antibiotic prescriptions. Furthermore, parents may need to take time off from work to care for their child during an asthma attack and accompany them to medical appointments. This can result in lost wages and, in some cases, the risk of job security if employers are not understanding or accommodating. Missing school can lead to a child falling behind in their studies, which may necessitate additional educational support, tutoring, or even special education services, incurring extra costs.

Asthma has emerged as a significant public health concern within the Hispanic community, where a growing body of research underscores the notable burden of asthmarelated morbidity experienced by this demographic. Notably, among Hispanics, Puerto Ricans exhibit the highest prevalence of asthma in the United States, surpassing even other Hispanic subgroups [4,5]. These asthma disparities observed in Hispanic populations can be attributed to multifaceted factors encompassing socioeconomic, environmental, genetic, diet, and healthcare access dimensions.

Yaghoubi et al. concluded that the comprehensive economic impact of uncontrolled asthma over a 20-year period is staggering, with direct costs (related to treatment or prevention) estimated at $300.6 billion and indirect costs (related to reduced productivity because of such illness or condition) factored in, ballooning the total economic burden to $963.5 billion. This substantial financial strain also translates to a significant loss of quality of life, with American adolescents and adults expected to forfeit an estimated 15.46 million quality-adjusted life years (QALYs) due to uncontrolled asthma [6].

Findings from a real-world observational study demonstrate that pharmacist-led interventions positively impact patient adherence to inhaled corticosteroid (ICS) controller therapy and ultimately enhance asthma control in individuals with challenging-to-treat asthma [7]. These results imply that pharmacist counseling within the community setting has the potential to greatly benefit asthma management at a national scale, advocating for the importance of follow-up consultations, particularly for patients facing difficulties in controlling their asthma. However, it is still unknown whether it's cost effective for the pharmacist to intervene.

Methods

A comprehensive computer-based literature search was meticulously conducted to ascertain the existing body of knowledge regarding the prevalence, treatment modalities, as well as the direct and indirect economic burdens associated with both controlled and noncontrolled asthma. Therefore, integrating the various studies into one comprehensive study of asthma. This analysis places a particular focus on the Hispanic population residing in

the United States. Articles deemed eligible for inclusion in this scoping review adhered to stringent criteria, requiring relevance to asthma, publication in the English language, and an interval of publication spanning from January 2013 to 2023, sourced exclusively from reputable journals. To bolster the reliability of the data, relevant statistics were extracted from esteemed sources such as the Center for Disease Control and Prevention (CDC) and the U.S. Census Bureau. Articles failing to meet these criteria were excluded from consideration in our analysis.

Using the formula: Present Value = Future Value / ((1+ 0.04)(# of years)), the 2018, 2023, and 2043 projected values of excess direct cost, indirect costs and QALYs lost were calculated. Assuming 4% inflation per year and the original 20-year projected values from 2019 to 2038 using 2018 U.S dollars gathered in the Yaghoubi et al. study, the results found in tables 1-3 were extrapolated [6]. Having the 2038 predicted values and using the formula above, it was possible to manually work backwards and estimate the original 2018 numbers. From there, the current 2023-year costs were estimated and from there, the 20-year projection to 2043 was recalculated. Since the 2043 values for the economic burden of uncontrolled asthma are even higher than the ones predicted for 2038, it is evident that this issue needs to be addressed.

Findings

As seen in Table 1, in 2018, the excess direct costs associated with healthcare for individuals aged 15-30 were $38.33 million, increasing to $46.63 million in 2023, $84 million in 2038, and $102.17 million in 2043. For the age group of 30-65, the excess direct costs were $75.25 million in 2018, rising to $91.55 million in 2023, $167.08 million in 2038, and $200.6 million in 2043. Individuals aged over 65 incurred excess direct costs of $22.61 million in 2018, which increased to $27.51 million in 2023, $49.55 million in 2038, and $60.23 million in 2043. The total excess direct costs for all age groups combined were $136.19 million in 2018, $165.69 million in 2023, $300.65 million in 2038, and $363 million in 2043.

Table 1: Excess Direct Costs Estimates for 2018, 2023, 2038 and 2043

Age (Years)	Excess Direct Costs in 2018 (Million $)	Excess Direct Costs in 2023 (Million $)	Excess Direct Costs in 2038 (Million $)	Excess Direct Costs in 2043 (Million $)
15-30	38.33	46.63	84	102.17
30-65	75.25	91.55	167.08	200.6
>65	22.61	27.51	49.55	60.23
TOTAL	136.19	165.69	300.65	363

As seen in Table 2, the excess indirect costs in 2018 associated with healthcare for individuals aged 15-30 amounted to $131.14 million, increasing to $159.55 million in 2023, $287.35 million in 2038, and $349.6 million in 2043. For the age group of 30-65, the excess indirect costs were $189.57 million in 2018, rising to $230.64 million in 2023, $415.37 million in 2038, and $505.36 million in 2043. Individuals aged over 65 incurred excess indirect costs of $19.7 million in 2018, which increased to $23.97 million in 2023, $43.16 million in 2038, and $52.52 million in 2043. The total excess indirect costs for all age groups combined were $302.54 million in 2018, $368.1 million in 2023, $662.91 million in 2038, and $806.53 million in 2043.

Table 2: Excess Indirect Costs Estimates for 2018, 2023, 2038 and 2043

Age (Years)	Excess Indirect Costs in 2018 (Million $)	Excess Indirect Costs in 2023 (Million $)	Excess Indirect Costs in 2038 (Million $)	Excess Indirect Costs in 2043 (Million $)
15-30	131.14	159.55	287.35	349.6
30-65	189.57	230.64	415.37	505.36
>65	19.7	23.97	43.16	52.52
TOTAL	302.54	368.1	662.91	806.53

The information on excess direct and indirect healthcare expenses across age groups that is provided sheds important light on the long-term financial effects of healthcare spending. The increased financial burden of healthcare services above and beyond normal levels is represented by excess direct expenses, which exhibit a significant increase across all age groups from 2018 to 2043. The trend toward increased direct and indirect costs points to a strengthening financial pressure on the healthcare sector. The findings highlight the significance of tackling the causes of rising healthcare costs since they have far-reaching effects on longterm financial planning, resource allocation, and healthcare policy.

Table 3 outlines excess Quality-Adjusted Life Years (QALYs) lost across age groups in 2018, 2023, 2038, and 2043. Individuals aged 15-30 experienced a progression from 1,972 QALYs lost in 2018 to 5,257 in 2043. The age group of 30-65 showed a similar trend, with excess QALYs lost increasing from 3,922 in 2018 to 10,455 in 2043. For those aged greater than 65, the figures rose from 1,162 in 2018 to 3,098 in 2043. Cumulatively, the total excess QALYs lost across all age groups were 7,056 in 2018, 18,810 in 2043. These data underscore the significant healthrelated losses, emphasizing the urgency of targeted interventions to address factors impacting quality-adjusted life years.

Table 3: Excess QALYs Lost Estimates for 2018, 2023, 2038 and 2043

Age (Years)	Excess QALYs Lost in 2018 (Thousands)	Excess QALYs Lost in 2023 (Thousands)	Excess QALYs Lost in 2038 (Thousands)	Excess QALYs Lost in 2043 (Thousands)
15-30	1,972	2,399	4,320	5,257
30-65	3,922	4,772	8,593	10,455
>65	1,162	1,414	2,548	3,098
TOTAL	7,056	8,585	15,462	18,810

According to the U.S Census Bureau, Hispanics made up 19.1% of the U.S population in 2022 and it is estimated that the percentage will reach 26.9% by 2060 [8]. Using the 2023 numbers from Tables 1-3 and assuming that 20% of the U.S population is Hispanic, the excess direct cost, indirect cost, and QALYs lost are $33,138,000, $73,620,000, and 1717 respectively for 2023.

Discussion

Asthma prevalence across Hispanic subgroups has raised questions about potential contributing factors. Among these, dietary patterns have emerged as a key area of interest, as diet is increasingly recognized as a factor that can influence allergic airway inflammation by modulating innate and adaptive immune responses. Han et al. suggests that a proinflammatory diet, characterized by higher intake of saturated and trans fats, might elevate the risk of asthma and asthma symptoms. In contrast, healthy dietary patterns, exemplified by increased intake of fruits, vegetables, and whole grains, may positively influence lung function [9]. The study also tied Puerto Ricans as having lower consumption of fruits and vegetables compared to other Hispanic subgroups, which could explain why asthma rates are higher in this population.

Furthermore, asthma exacerbations, emergency department visits, and hospitalizations are alarmingly frequent occurrences among Hispanic patients, leading to elevated healthcare expenditures [10]. Research indicates that interventions aimed at strengthening medication adherence and improving asthma management among Hispanic patients, while respecting cultural nuances, hold the promise of reducing healthcare utilization, particularly emergency room visits and hospitalizations [10]. This proactive approach not only has the potential to enhance asthma control but also to alleviate the demand for acute care services, thereby advancing health outcomes and promoting cost-effectiveness. However, it is worth acknowledging that the specific outcomes and degree of cost-effectiveness may vary depending on the intervention, patient population, and healthcare system under consideration.

According to Coursera, a retail pharmacist makes $127,820 and a hospital pharmacist makes $130,280, on average, in 2023 [11]. Assuming they work an average of 40 hours per week, we can determine the hourly rate is around $67 for the community pharmacist and $68 for a hospital pharmacist. If we assume that it takes 10 minutes to counsel a patient on inhaler use and asthma management, this translates to $11.17 and $11.33 respectively, per pharmacist interaction which goes a long way for every asthma patient they intervene. It is clearly cost effective to compensate a pharmacist in exchange for the chance of reducing emergency room visits, hospitalizations, and overall healthcare costs.

The burden of uncontrolled asthma translates to a huge number economically speaking and there's a high probability that it can be reduced to a greater extent with a 10-minute consultation from a pharmacist. The clinical or community pharmacist can explain proper inhaler use and techniques, importance of adherence, and answer any question the patient may have. It is crucial to fund training programs for pharmacists to improve their ability to provide advice and education on inhaler use. Providing resources like instructional materials or electronic tools can help make these interventions more successful.

It is also vital to have Spanish-speaking pharmacists and translating services available to non-English speakers to reduce language barriers and have a deeper connection and higher success during the counseling sessions. Being culturally competent is very important while treating Hispanic patients. Healthcare practitioners must recognize and value the great diversity found in Hispanic communities. Being culturally competent enables the establishment of rapport and trust with Latinos, who come from different countries, traditions, and linguistic backgrounds. A stronger bond is created between pharmacists and Hispanic patients when they acknowledge the value of close-knit family relationships, conventional healing methods, and the impact of language on communication. In this situation, providing treatment that is culturally competent means considering the importance of dietary restrictions, religious convictions, and cultural holidays that may have an impact on health decisions. Healthcare professionals may provide individualized, considerate, and efficient care by being aware of these cultural aspects, which will ultimately lead to better health outcomes and a more welcoming healthcare setting.

Pharmacist counseling on inhaler use may come with early expenses, but long-term cost-effectiveness may be enhanced by the potential benefits of better asthma control, lower healthcare utilization, personable interactions, and overall better patient outcomes. Collaboration with healthcare stakeholders and the incorporation of these services into standard practice are essential components to optimize the effectiveness and efficiency of pharmacist counseling and better asthma control.

The systematic review by Mubarak N et al [12]. dives into the influence of collaborative practice between community pharmacists (CPs) and general practitioners (GPs) in asthma management and further supports what is stated above. The study includes 23 different studies, including RCTs, controlled interventions, pre-post investigations, and case-control studies. The findings evaluated many areas of asthma management, such as clinical, humanistic, and economic considerations. Overall, with various impact sizes, 11 out of 14 outcomes supported CP-GP collaborative interventions. Asthma severity, control, symptoms, inhalation technique, hospital visits, adherence, and quality of life were all improved. Although restricted data availability hindered meta-analysis, the collaborative strategy indicated value for money in economic studies. Despite some conflicting findings, the analysis generated a solid evidence basis supporting the beneficial impact of collaborative practices between CPs and GPs in asthma therapy [12].

While it doesn't seem like much, for only around $12, there is a high probability of reducing each patient's future healthcare expenditures since they will know how to properly use their asthma inhalers. This can also positively impact their day-to-day life tremendously, as they will feel healthier and could participate in more physical activities. For example, a parent could enjoy playing soccer with their child whereas if they had uncontrolled asthma, they would likely have an exacerbation shortly after a few minutes of running and would therefore probably avoid playing altogether.

Some limitations of this paper include not considering the child population into the cost of uncontrolled asthma prediction calculations and not accurately factoring undocumented immigrants into the Hispanic population statistics in the U.S. Furthermore, it focused solely on asthma as a disease state. However, it is safe to assume that pharmacists can also make a positive impact through the 10-minute counseling sessions with other chronic lung conditions such as COPD and improve patient outcomes.

Conclusion

Ultimately, this cost-benefit analysis emphasizes the various challenges posed by asthma, emphasizing its incidence, economic impact, and inequities among Hispanics. The paper presents a detailed picture of the rising direct and indirect expenses of asthma, forecasting severe financial burden on the healthcare system through 2043. The findings emphasize the urgency of addressing the core causes of rising healthcare expenses, which necessitates specific initiatives to relieve financial strain on the healthcare system. Real-world observational studies show that pharmacist-led treatments have the potential to improve asthma management, particularly in terms of adherence and control. Calculations that show the relatively low cost of $12 per interaction in proportion to possible reductions in emergency department visits and overall healthcare expenses indicate the cost-effectiveness of pharmacist interventions. Furthermore, the discussion underlines the significance of having a tailored asthma management approach when treating Hispanics. Finally, this analysis calls for investments in pharmacist training programs, cultural competence, and collaborative healthcare models to improve asthma management, reduce economic burdens, and improve the overall well-being of those affected [13,14].

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