Association Between Prescription-Taking Status and Total Direct Health Care Cost Among Patients With Asthma

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BACKGROUND

- Asthma is one of the most common chronic diseases in the United States, characterized by recurring periods of wheezing, chest tightness, shortness of breath, and coughing.[1]
- There are two types of medications—relievers such as short-acting inhaled beta 2-agonists for quick relief of asthma and preventers such as inhaled corticosteroids and immunomodulators for long-term control and prevention.
- In 2015, asthma-related health care utilization included 14.2 million physician office visits, 479,000 hospitalizations, 1.8 million emergency department visits, and an average stay of 3.6 days in the hospital.[2]
- Limited recent published data exist that evaluate the association between prescription-taking status and total direct health care costs among patients with asthma.

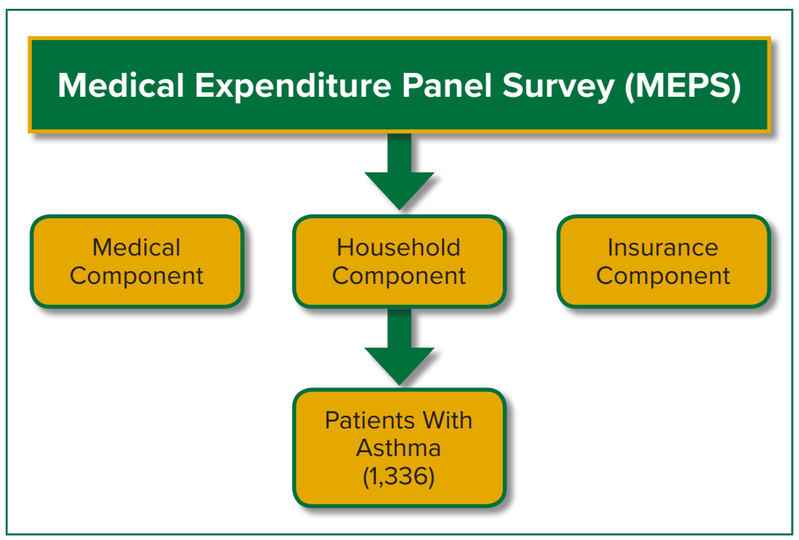
OBJECTIVES

- To compare health care costs among patients with asthma who took daily asthma medications versus those who did not.
- To evaluate whether the direct health care costs differed by age or race/ethnicity.

METHODS

- This was a retrospective, cross-sectional study.
- The total health care costs of patients with asthma aged 18 and above were analyzed based on their prescription-taking status using the Medical Expenditure Panel Survey (MEPS) 2012-2013.[3]
- Total direct medical expenditures were the outcome variable and included expenditures for medications, emergency department visits, office-based visits, inpatient visits, outpatient visits, and other medical equipment and services as reported by participants on the Household Component of MEPS.

Data Source



Study Participants

Study participants inclusion and exclusion criteria

Total participants in MEPS: 75,914 (Year 2012: 38,974; Year 2013: 36,940)

	Number of patients excluded
Patients without asthma	50,739
Patients with asthma under 18 years of age	21,778
No information on prescription-taking status	2,035
No information on health care cost	0
Patients with asthma with non-positive weights	26

Total population for the study = 1,336

Conceptual Model

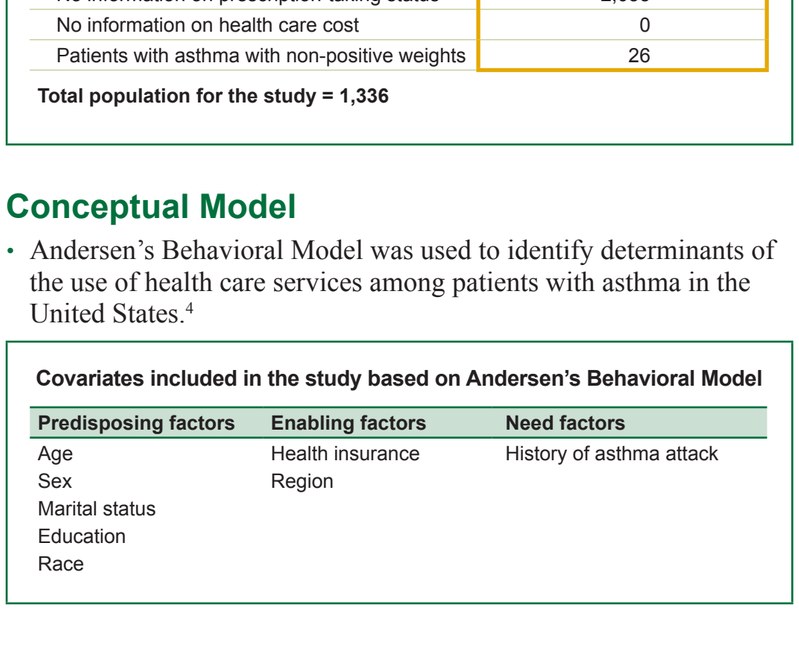
- Andersen's Behavioral Model was used to identify determinants of the use of health care services among patients with asthma in the United States.[4]

Covariates included in the study based on Andersen's Behavioral Model

Predisposing factors	Enabling factors	Need factors
Age	Health insurance	History of asthma attack
Sex	Region	
Marital status		
Education		
Race		

Data Analysis

- Summary statistics were calculated to describe the study population.
- A two-part linear regression model utilizing a smearing technique was conducted for the multivariate analysis.[5]
- The multivariate analysis was subsequently conducted separately for each racial/ethnic and age category to assess if total direct medical expenditures varied by race/ethnicity or age.
- All analyses were conducted using complex sampling procedures in SAS 9.4 to account for the sampling design employed by MEPS.



RESULTS

- Among the study population, 60% of participants were taking asthma maintenance medication daily or almost daily (Table 1).
  - Approximately half of the sample was aged 41 to 64 years (48.4%) and were non-Hispanic white (49.1%).
  - The majority of study participants were female (71.7%) and had a high school diploma or GED (59.6%).
  - More than 85% of the study population had at least one comorbidity, and 61% had an asthma attack in the last 12 months.
- The study participants who did not take daily asthma maintenance medication had statistically significantly lower total direct medical costs compared with participants who took daily asthma medication ($7,485 vs. $15,149; $p < 0.001$; Table 2).
- Race/ethnicity and age were found to be effect modifiers of the relationship between asthma prescription-taking status and total health care costs (Table 3).

Table 1. Demographic Information of Study Participants, 2012-2013 MEPS

	All Patients	Participants Who Take Their Preventive Medication		Participants Who Do Not Take Their Preventive Medication	
	Total Unweighted	Unweighted	Weighted	Unweighted	Weighted
Characteristics	N (%)	N	%	N	%
Total participants	**1,336 (100%)**	**822**	**60.2%**	**514**	**39.7%**
Age					
18-24 years	138 (10.4%)	52	7.0%	86	16.3%
25-40 years	313 (23.4%)	143	15.3%	170	36.6%
41-64 years	647 (48.4%)	432	51.1%	215	38.4%
65 and older	238 (17.8%)	195	26.5%	43	8.5%
Race/ethnicity					
Non-Hispanic white	656 (49.1%)	404	71.2%	252	68.7%
Non-Hispanic black	380 (28.4%)	239	14.6%	141	15.1%
Hispanic	207 (15.5%)	123	7.4%	84	9.6%
Others	93 (7.0%)	56	6.6%	37	6.4%
Region					
Northeast	275 (20.6%)	183	21.2%	92	18.5%
Midwest	299 (22.4%)	194	24.8%	105	23.2%
South	443 (33.2%)	278	34.8%	165	30.9%
West	319 (23.8%)	167	19.0%	152	27.2%
Sex					
Male	378 (28.3%)	237	30.4%	141	28.3%
Female	958 (71.7%)	585	69.5%	373	71.6%
Income	**1,336 (100%)**				
≤ $10,000	204 (15.3%)	129	10.3%	75	11.8%
$10,001-$25,000	289 (21.6%)	188	17.8%	101	15.9%
$25,001-$50,000	319 (23.9%)	187	24.1%	132	24.4%
≥ $50,001	524 (39.2%)	318	47.7%	206	47.8%
Insurance	**1336 (100%)**				
Private	760 (56.9%)	454	66.6%	306	67.8%
Public	451 (33.7%)	312	27.3%	139	20.0%
No insurance	125 (9.4%)	56	5.9%	69	12.1%
Marital status	**1336 (100%)**				
Single	376 (28.1%)	203	20.4%	173	29.8%
Married	554 (41.5%)	343	46.7%	211	45.4%
Divorced/separated/ widowed	406 (30.4%)	276	32.8%	130	24.6%
Education	**1336 (100%)**				
Less than high school	246 (18.4%)	158	13.0%	88	12.2%
High school graduate/GED	796 (59.6%)	502	63.6%	294	54.8%
More than high school	294 (22.0%)	162	23.4%	132	32.9%
Charlson Comorbidity	**1,336 (100%)**				
Zero comorbidities	200 (14.9%)	47	4.2%	153	31.3%
One comorbidity	778 (58.2%)	507	63.9%	271	53.0%
Two comorbidities	238 (17.8%)	174	19.1%	64	11.8%
Three or more comorbidities	120 (9.1%)	94	12.6%	26	3.6%
Asthma attack in last 12 months	**1,336 (100%)**				
Yes	822 (61.5%)	321	39.0%	501	61.0%
No	514 (38.5%)	176	34.3%	338	65.7%

Table 2. Multivariate Linear Regression for Total Direct Medical Expenditures[a]

Variable	Coefficient	95% CI	Standard Error	Expenditure	*P* Value
Patients taking medication	Reference			$15,149	
Patients not taking medication	0.789	-1.02 to -0.555	0.11	$7,485	< 0.001

CI = confidence interval.

[a]Model adjusted for sex, age, insurance status, Charlson Comorbidity Index, race, and having an asthma attack in past 12 months.

Table 3. Effect Modification Between Taking Asthma Medications Daily and Direct Medical Expenditures

	Patients Who Are Taking Medications	Patients Who Are Not Taking Medications	
	Expenditures		*P* Value
Age categories			
18-24 years	$10,774	$3,381	< 0.001
25-40 years	$13,079	$5,369	< 0.001
41-64 years	$16,139	$10,009	< 0.001
65 years and above	$12,845	$9,541	0.19
Race			
Non-Hispanic whites	$13,228	$6,425	< 0.001
Non-Hispanic blacks	$20,480	$9,803	0.005
Hispanics	$24,388	$6,871	< 0.001
Others	$24,452	$9,628	0.17

LIMITATIONS

- Prescription-taking status and the total health care cost were self-reported and were not validated by medical or insurance records; nondifferential misclassification is possible.
- People who agreed to participate in the study may differ from people who did not participate, as extremely ill patients with asthma may have declined to participate. If participation was related to both the exposure and outcome, an over- or underestimate of the true association may occur.
- No information is available in the MEPS database to evaluate adherence to medication.

CONCLUSIONS

- The current study's findings indicate that health care costs are higher among patients with asthma taking daily prescription medication versus those who do not take it. Costs are also high among racial/ethnic minority groups and older patients.
- The high health care cost for patients taking daily medication could be due to their asthma being worse than those who are not taking daily asthma medication. The reasons for racial disparities could be due to socioeconomic status differences among minority groups in the United States.[6]
- Additional studies are needed to investigate possible factors associated with these higher costs among asthma medication users. Specifically, future studies should further evaluate the racial/ethnic and age disparities seen in this study.
- This information could assist medical and public health practitioners in better understanding some of the issues responsible for high health care costs and helping them to plan strategies to minimize these costs among patients with asthma.

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