

11 Adegunsoye A, Oldham JM, Fernández Pérez ER, Hamblin M, Patel N, Tener M, *et al.* Outcomes of immunosuppressive therapy in chronic hypersensitivity pneumonitis. *ERJ Open Res* 2017;3:00016-2017.

12 Lennard L. Implementation of TPMT testing. *Br J Clin Pharmacol* 2014; 77:704–714.

Copyright © 2022 by the American Thoracic Society



## Impact of Insurance Instability and Racial/Ethnic Disparities in Hospitalizations for Patients with Asthma

To the Editor:

More than 1.8 million potentially avoidable hospitalizations with asthma occur in the United States annually (1–3). Asthma has racial/ethnic disparities impacted by insurance (4–8). Insurance status is not static, can be gained or lost or changed, and may adversely impact asthma outcomes (9–12). Massachusetts' health insurance reform extended insurance coverage to 98% of its residents, intending to reduce health disparities (13). We hypothesized that stable insurance would be associated with decreased hospitalizations among patients with asthma, most benefiting the historically disadvantaged populations based on race/ethnicity.

### Methods

We used data from two academic medical centers and six community healthcare centers in Boston providing disproportionate care to those with Medicaid and uninsured. We used electronic medical records to identify patients aged 21–64 years with a diagnosis of asthma and primary care visits between 2005 and 2013. We excluded patients >65 years of age and those missing race/ethnicity (12.8%). Racial/ethnic groups included non-Hispanic White (White), Hispanic, non-Hispanic Black/African American (Black), and Asian/Pacific Islander (Asian). Billing data ensured capture of insurance type for each point of care.

We divided each individual's longitudinal care record into 6-month intervals (January to June; July to December). We grouped insurance coverage into four categories during each 6-month interval: stable private (employer-based, individual coverage), stable public (Medicaid, Medicare, Commonwealth care), switches (any insurance category switch [e.g., uninsured to insured; switch between insurance; insured to uninsured]), and always uninsured. Changes of insurance from one private to another private was not considered an insurance switch. We reviewed all encounters within a 6-month period and assigned patient intervals to a specific category hierarchically. We coded the patient interval insurance as follows: insurance gain at any point (and no loss) as gaining insurance; insurance loss at any point as losing insurance; insurance switch (without loss or gain) as a

switch with neither loss nor gain; and no switches during the interval as always private, always public, or always uninsured. Individuals were included for analysis only during those 6-month intervals when they had a primary care visit.

The outcome was hospitalization within the 6-month interval as the insurance assessment. We included all hospitalizations (except childbirth), as our data did not indicate the primary discharge diagnosis, and under the hypothesis that many hospitalizations might be avoided for other causes if asthma is well controlled (14).

The patient 6-month interval was treated as the unit of analysis. We examined unadjusted hospitalization rates by insurance stability status stratified by racial/ethnic groups. We compared the odds of hospitalization among the insurance stability categories, using generalized estimating equations with logit link, adjusted for the covariates, including income and education by census tract to adjust for neighborhood factors (Table 1) (15, 16). Generalized estimating equations accounts for the correlation of multiple 6-month intervals within a patient. The model included race/ethnicity, insurance instability, and the interaction between the two to estimate odds ratios and test whether they varied by race/ethnicity. Tufts Health Sciences Campus Institutional Review Board approved the study.

### Results

We included a diverse group of patients by race/ethnicity and insurance coverage (Table 1). White patients had a higher rate of stable private insurance coverage than other groups, whereas Hispanic and Black patients had the highest rates of public insurance, switches, and uninsured. Overall, 7.2% of the 6-month intervals had a hospitalization (Table 2). The overall rate of hospitalization was higher among Black and Hispanic patients and lower for Asian patients. Within each of the racial/ethnic groups, those with stable public insurance had higher hospitalization rates than those with stable private insurance, insurance switches, and always uninsured. For each racial/ethnic group, having stable public insurance was associated with significantly higher hospitalization odds than having stable private insurance (reference group) (Table 3). Having insurance switches was also associated with significantly higher odds of hospitalization for the total population compared with those with stable private insurance, except Asian patients. Among the always uninsured, White patients were the only group with significantly higher hospitalization odds than those with stable private insurance. We did not find a statistically significant interaction between insurance stability and race/ethnicity ( $P = 0.08$ ).

### Discussion

We found that stable private insurance was associated with lower hospitalization rates than those with stable public or unstable insurance.

Supported by the National Institute on Minority Health and Health Disparities and the National Center for Advancing Translational Sciences, National Institutes of Health (R01MD007735 and UL1TR002544, respectively)

*Author Contributions:* Concept and design: A.M.L., N.T., N.K., A.H., and K.M.F. Acquisition of data: S.K., A.M.L., L.L.P., J.S., and K.M.F. Analysis and interpretation: A.M.L., L.L.P., N.T., N.K., A.H., and K.M.F. Drafting the manuscript for important intellectual content and final approval of the version submitted for publication: S.K., A.M.L., L.L.P., N.T., N.K., A.H., J.S., and K.M.F.

**Table 1.** Demographic characteristics and insurance categories by race/ethnicity of the sample of patients with asthma from two Massachusetts urban safety net hospital systems, 2005–2013

Variable	Total Patient Sample	Non-Hispanic White	Hispanic	Black/African American	Asian/Asian Pacific Islander
Total sample, <i>n</i> *	15,815	6,099	1,049	7,851	816
Age, yr, mean (SD)	38.3 (12.5)	38.5 (12.3)	37.3 (11.9)	38.2 (12.6)	39.8 (12.9)
Sex, female	10,427 (65.9)	3,813 (62.5)	634 (60.6)	5,443 (69.3)	537 (65.8)
Charlson Comorbidity Index (weighted) <sup>†‡</sup>					
1	13,171 (83.3)	5,232 (85.8)	840 (80.1)	6,372 (81.2)	737 (89.2)
2+	2,636 (16.7)	867 (14.2)	208 (19.9)	1,473 (18.8)	88 (10.8)
Percentage in census tract high school graduate or higher, mean (SD) <sup>§</sup>	82.9 (10.6)	87.7 (9.9)	79.4 (11.0)	79.5 (9.5)	83.6 (11.1)
Median census tract income (2014 dollars), mean (SD) <sup>§</sup>	58,694.8 (26,996.0)	71,683.7 (28,749.7)	51,166.8 (22,155.1)	49,105.9 (21,154.9)	63,723.3 (27,784.6)
English as primary language	14,302 (90.4)	5,849 (95.9)	717 (68.4)	7,268 (92.6)	468 (57.4)
Location					
Academic center 1	7,469 (47.2)	2,388 (39.1)	501 (47.8)	4,355 (55.5)	225 (27.6)
Health centers	4,797 (30.3)	1,523 (25.0)	298 (28.4)	2,705 (34.4)	271 (33.2)
Academic center 2	3,549 (22.4)	2,188 (35.89)	250 (23.8)	791 (10.1)	320 (39.2)
Insurance instability by race/ethnicity (interval level) <sup>  </sup>					
Stable private insurance, % <sup>  </sup>	6,093 (38.5)	3,541 (58.1)	275 (26.2)	1,896 (24.2)	381 (46.7)
Stable public insurance, % <sup>  </sup>	6,064 (38.3)	1,701 (27.9)	493 (47.0)	3,579 (45.6)	291 (35.7)
Insurance switches, % <sup>  </sup>	1,865 (11.8)	496 (8.2)	132 (12.5)	1,192 (15.2)	45 (5.6)
Switch without losing, % <sup>  </sup>	751 (4.8)	247 (4.1)	55 (5.2)	429 (5.5)	20 (2.5)
Switch to insured, % <sup>  </sup>	631 (4.0)	139 (2.3)	39 (3.7)	439 (5.6)	14 (1.7)
Switch to uninsured, % <sup>  </sup>	483 (3.1)	110 (1.8)	38 (3.6)	324 (4.1)	11 (1.4)
Uninsured, % <sup>  </sup>	1,793 (11.3)	361 (5.9)	149 (14.2)	1,184 (15.1)	99 (12.1)

Definition of abbreviations: ICD9 = International Classification of Diseases, Ninth Revision; SD = standard deviation.

Results are frequency (%) unless otherwise indicated. The research data has been presented previously in an abstract form (poster) at Academy Health conference in 2020. See Reference 27.

Asthma diagnosis based on ICD9: 493.

\*Data presented at the patient level.

<sup>†</sup>Variable based on data from first date of medical records.

<sup>‡</sup>Index containing 17 categories of comorbidity and predicts the 10-year mortality for a patient who may have a range of comorbid conditions.

<sup>§</sup>U.S. census tract-level sociodemographic data used to estimate patients' education level and income by geographic area.

<sup>||</sup>Insurance category data are interval-level data. Note that the first interval for each patient is used. Insurance stability status was determined by comparing each primary care visit to the previous primary care visit. Note: 6,820 out of 15,815 (43%) patients have at least one missed 6-month interval. Of the patients with at least one set of adjacent skipped intervals, 53% did not skip more than one interval before having another visit.

**Table 2.** Hospitalization in the total sample of patients with asthma and by race/ethnicity and insurance instability category from two Massachusetts urban safety net hospital systems, 2005–2013

Instability (Four-Category)	<i>n</i> *	Total Intervals (N = 109,384) (%) <sup>*</sup>	Non-Hispanic White (n = 39,906) (%) <sup>*</sup>	Hispanic (n = 5,717) (%) <sup>*</sup>	Black/African American (n = 57,908) (%) <sup>*</sup>	Asian/Asian Pacific Islander (n = 5,853) (%) <sup>*</sup>
Hospitalization						
Overall	109,384	7.2	5.9	8.5	8.3	2.8
Stable private insurance <sup>†</sup>	42,107	4.3	3.9	5.5	5.2	2.2
Stable public insurance <sup>‡</sup>	47,805	9.7	9.1	10.5	10.4	3.3
Any insurance switches <sup>§</sup>	13,110	8.3	7.5	8.7	8.8	2.8
Always uninsured	6,362	4.6	5.2	6.0	4.4	2.3

\*Six-month intervals.

<sup>†</sup>Stable private insurance: typically employer-based or individual coverage without subsidies. Note: The nature of the analytic database did not allow identification of changes from one private to another private insurance, and these were not considered an insurance switch.

<sup>‡</sup>Stable public insurance: Medicaid, Medicare, or Commonwealth care, which was the subsidized insurance option during this time period.

<sup>§</sup>Any insurance switches: any switch in coverage between private, public, and no insurance such as uninsured to insured; switch between insurance categories; or insured to uninsured.

**Table 3.** Adjusted odds ratio of hospitalization by insurance stability within a 6-month interval for patients from two Massachusetts open safety net hospital systems

Concurrent Insurance Stability Group*	n (6-mo Intervals)	Adjusted <sup>†</sup> OR (95% CI)				
		Total Patient Sample	Non-Hispanic White	Hispanic	Black/African American	Asian/Asian Pacific Islander
Hospitalized						
Stable private insurance <sup>‡</sup>	42,107	Reference	Reference	Reference	Reference	Reference
Stable public insurance <sup>§</sup>	47,805	<b>2.12 (1.95–2.31)</b>	<b>2.41 (2.11–2.74)</b>	<b>1.71 (1.20–2.43)</b>	<b>1.98 (1.77–2.22)</b>	<b>1.74 (1.15–2.62)</b>
Any switch <sup>  </sup>	13,110	<b>2.02 (1.83–2.23)</b>	<b>2.37 (2.01–2.80)</b>	<b>1.74 (1.15–2.63)</b>	<b>1.86 (1.64–2.11)</b>	1.43 (0.70–2.92)
Always uninsured <sup>¶</sup>	6,362	1.03 (0.89–1.20)	<b>1.52 (1.13–2.05)</b>	1.02 (0.60–1.75)	0.87 (0.73–1.05)	1.10 (0.48–2.51)
Interaction race <sup>†</sup> insurance stability <i>P</i> value = 0.08						

Definition of abbreviations: CI = confidence interval; OR = odds ratio.

Bolded ORs are significant.

A total of 15,797 patients (6,089 White, 1,046 Hispanic, 7,847 Black, and 815 Asian) were included in the analysis.

\*Data presented based on the 6-month interval; note that some patients may be moving in and out of insurance categories throughout the study period.

<sup>†</sup>Adjusted for time, age, sex, comorbidities, site of care, education, income, and race.

<sup>‡</sup>Stable private: always privately insured.

<sup>§</sup>Stable public: always publicly insured (Medicare, Medicaid, and/or subsidized).

<sup>||</sup>Insurance switch: includes gain (uninsured to insured), switch but not loss or gain (switch between private, Medicare, Medicaid, and subsidized categories), and insurance loss (insured to uninsured).

<sup>¶</sup>Always uninsured: no insurance at any point within the 6-month interval.

Although one goal of insurance reform was to eliminate disparities, we did not see a differential effect of insurance stability on disparities. Stable public coverage did not reduce the odds of hospitalizations for any racial/ethnic group.

We explore why our results conflict with our hypothesis. Expanded health insurance is not equivalent to healthcare access (17). Barriers such as decreased use of preventive care, limited referrals to asthma specialists, or costs may be present (17–19). Clinician-level (workforce diversity, cultural sensitivity, evidence-based care use, and bias), environmental (indoor and outdoor pollution and stress), and individual (health beliefs/literacy and adherence) factors contribute to asthma care disparities (8, 18, 20–22). Some of these factors adversely impact hospitalizations in asthma (18). These factors can also interact to affect the continuum of care, leading to differential outcomes in asthma control and healthcare use. Many of these factors are more relevant in Medicaid expansion enrollees (19, 23). Although those with insurance switches, including gaining insurance, had higher odds of hospitalizations, it may not translate to a poor outcome. Instead, it may reflect coverage to address their medical problem (24). The always uninsured did not have higher hospitalizations, conflicting with prior data (25).

Limitations include lack of generalizability to rural and suburban groups, overrepresentation of Black patients, and inability to address other racial/ethnic subpopulations (26). We may have underestimated insurance changes (if patients did not seek care during periods with a coverage gap), hospitalizations (limited to two academic medical centers), and uninsured visits (uninsured may be reluctant to seek health care). The data did not allow analysis of the temporal relationship between hospitalizations and primary care visits, nor could we analyze changes within each category (e.g., one private to another private insurance).

## Conclusions

For patients with asthma, regardless of race or ethnicity, those with stable public insurance or insurance instability had increased odds of hospitalization compared with those with stable private insurance. Insurance stability alone through Medicaid may be insufficient to prevent hospitalizations in patients with asthma; other social factors likely need to be addressed. ■

**Author disclosures** are available with the text of this letter at [www.atsjournals.org](http://www.atsjournals.org).

Sucharita Kher, M.D.\*  
Amy M. LeClair, Ph.D.  
Lori Lyn Price, M.A.S., M.L.A.  
Norma Terrin, Ph.D.  
Tufts Medical Center  
Boston, Massachusetts  
and  
Tufts University School of Medicine  
Boston, Massachusetts

Nancy Kressin, Ph.D.  
Boston University School of Medicine  
Boston, Massachusetts

Amresh Hanchate, Ph.D.  
Wake Forest School of Medicine  
Winston-Salem, North Carolina

Jillian Suzukida, M.D.  
Karen M. Freund, M.D., M.P.H.  
Tufts Medical Center  
Boston, Massachusetts  
and  
Tufts University School of Medicine  
Boston, Massachusetts

ORCID ID: 0000-0002-3051-6441 (S.K.).

\*Corresponding author (e-mail: [skher@tuftsmedicalcenter.org](mailto:skher@tuftsmedicalcenter.org)).

## References

- AHRQ. HCUPnet. Healthcare Cost and Utilization Project. Rockville, MD: Agency for Healthcare Research and Quality; 2020 [accessed 2021 Dec 21]. Available from: <https://hcupnet.ahrq.gov/#setup>.
- Hodgson K, Deeny SR, Steventon A. Ambulatory care-sensitive conditions: their potential uses and limitations. *BMJ Qual Saf* 2019;28:429–433.
- CDC. AsthmaStats. Atlanta, GA: Centers for Disease Control and Prevention; 2021 [accessed 2021 Dec 21]. Available from [https://www.cdc.gov/asthma/asthma\\_stats/default.htm](https://www.cdc.gov/asthma/asthma_stats/default.htm).
- Forno E, Celedón JC. Health disparities in asthma. *Am J Respir Crit Care Med* 2012;185:1033–1035.
- Hasegawa K, Cydulka RK, Sullivan AF, Langdorf MI, Nonas SA, Nowak RM, et al. Improved management of acute asthma among pregnant women presenting to the ED. *Chest* 2015;147:406–414.
- Rosser FJ, Forno E, Cooper PJ, Celedón JC. Asthma in Hispanics. An 8-year update. *Am J Respir Crit Care Med* 2014;189:1316–1327.
- Peters AT, Klemens JC, Haselkorn T, Weiss ST, Grammer LC, Lee JH, et al. Insurance status and asthma-related health care utilization in patients with severe asthma. *Ann Allergy Asthma Immunol* 2008;100:301–307.
- Wells K, Pladevall M, Peterson EL, Campbell J, Wang M, Lanfear DE, et al. Race-ethnic differences in factors associated with inhaled steroid adherence among adults with asthma. *Am J Respir Crit Care Med* 2008;178:1194–1201.
- Freund KM, Isabelle AP, Hanchate AD, Kalish RL, Kapoor A, Bak S, et al. The impact of health insurance reform on insurance instability. *J Health Care Poor Underserved* 2014;25(1, Suppl):95–108.
- Schoen C, DesRoches C. Uninsured and unstably insured: the importance of continuous insurance coverage. *Health Serv Res* 2000;35:187–206.
- Banerjee R, Ziegenfuss JY, Shah ND. Impact of discontinuity in health insurance on resource utilization. *BMC Health Serv Res* 2010;10:195.
- Fields BE, Bell JF, Moyce S, Bigbee JL. The impact of insurance instability on health service utilization: does non-metropolitan residence make a difference? *J Rural Health* 2015;31:27–34.
- Long SK, Skopec L, Shelto A, Nordahl K, Walsh KK. Massachusetts health reform at ten years: great progress, but coverage gaps remain. *Health Aff (Millwood)* 2016;35:1633–1637.
- AHRQ. HCUP. Hospital stays related to asthma for adults, 2005. Rockville, MD: U.S. Agency for Healthcare Research and Quality; 2021 [accessed 2021 Dec 21]. Available from: <https://www.hcup-us.ahrq.gov/reports/statbriefs/sb54.pdf>.
- Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *J Clin Epidemiol* 1992;45:613–619.
- Butler DC, Petterson S, Phillips RL, Bazemore AW. Measures of social deprivation that predict health care access and need within a rational area of primary care service delivery. *Health Serv Res* 2013;48:539–559.
- McCormick D, Sayah A, Lokko H, Woolhandler S, Nardin R. Access to care after Massachusetts' health care reform: a safety net hospital patient survey. *J Gen Intern Med* 2012;27:1548–1554.
- Canino G, McQuaid EL, Rand CS. Addressing asthma health disparities: a multilevel challenge. *J Allergy Clin Immunol* 2009;123:1209–1217, quiz 1218–1219.
- Hsu J, Qin X, Mirabelli MC, Dana Flanders W. Medicaid expansion, health insurance coverage, and cost barriers to care among low-income adults with asthma: the Adult Asthma Call-Back Survey. *J Asthma* 2020;58:1478–1487.
- Apter AJ, Boston RC, George M, Norfleet AL, Tenhave T, Coyne JC, et al. Modifiable barriers to adherence to inhaled steroids among adults with asthma: it's not just black and white. *J Allergy Clin Immunol* 2003;111:1219–1226.
- Riekert KA, Butz AM, Eggleston PA, Huss K, Winkelstein M, Rand CS. Caregiver-physician medication concordance and undertreatment of asthma among inner-city children. *Pediatrics* 2003;111:e214–e220.
- National Asthma Education and Prevention Program. Expert Panel Report 3 (EPR-3): Guidelines for the Diagnosis and Management of Asthma-Summary Report 2007. *J Allergy Clin Immunol* 2007;120(5, Suppl):S94–S138.
- Yue D, Rasmussen PW, Ponce NA. Racial/ethnic differential effects of medicaid expansion on health care access. *Health Serv Res* 2018;53:3640–3656.
- Shafer PR, Dusetzina SB, Sabik LM, Platts-Mills TF, Stearns SC, Trogon JG. Insurance instability and use of emergency and office-based care after gaining coverage: an observational cohort study. *PLoS One* 2020;15:e0238100.
- Smulowitz P, Landon BE, Burke L, Baugh C, Gunn H, Lipton R. Emergency department use by the uninsured after health care reform in Massachusetts. *Intern Emerg Med* 2009;4:501–506.
- Massachusetts Department of Public Health. A profile of health among Massachusetts adults, 2015. Boston, MA: Massachusetts Department of Public Health; 2016 [accessed 2021 Dec 21]. Available from: <https://www.mass.gov/doc/a-profile-of-health-among-massachusetts-adults-2015/download>.
- Kher S, Kressin N, Terrin N, Price LL, LeClair A, Hanchate A, et al. Impact of insurance instability on racial/ethnic disparities in hospitalizations for asthma. Presented at the AcademyHealth Annual Research Meeting. July 28, 2020, Virtual online. Abstract 301.

Copyright © 2022 by the American Thoracic Society



## Antimicrobial Prophylaxis in Extracorporeal Membrane Oxygenation: Is the Debate Still Open?

To the Editor:

Extracorporeal membrane oxygenation (ECMO) is increasingly used in intensive care units, even in the context of the pandemic we are experiencing (1). There is evidence that nosocomial

infections in ECMO-treated patients are associated with significantly increased morbidity and mortality (2), and most centers use antimicrobial prophylaxis, although there is no evidence supporting this practice.

Prevalence of nosocomial infections in ECMO-treated adult patients has been reported to be one in five patients, with the highest incidence of infections in the cardiac ECMO population; bloodstream and surgical site infections are the most common (3). No evidence of reduced risk of infections in patients given an antimicrobial prophylaxis regimen has been observed in any of the papers analyzed (2). Another retrospective study (3) found that antimicrobial prophylaxis did not reduce the risk of new sterile site infection, as by

This article is open access and distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives License 4.0. For commercial usage and reprints, please e-mail Diane Gern ([dgern@thoracic.org](mailto:dgern@thoracic.org)).