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Potentially preventable hospitalizations for acute and chronic conditions in Alaska, 2010–2012☆

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ABSTRACT

Objective. The U.S. Agency for Healthcare Research and Quality's Prevention Quality Indicators comprise acute and chronic conditions for which hospitalization can be potentially prevented by high-quality ambulatory care. The Healthy Alaska 2020 initiative (HA2020) targeted reducing potentially preventable hospitalizations (PPH) for acute and chronic conditions among its health indicators. We estimated the PPH rate for adults aged ≥18 years in Alaska during 2010–2012.

Methods. We conducted a cross-sectional analysis of state-wide hospital discharge data obtained from the Healthcare Cost and Utilization Project and the Indian Health Service. We calculated average annual PPH rates/1000 persons for acute/chronic conditions. Age-adjusted rate ratios (aRRs) were used for evaluating PPH rate disparities between Alaska Native (AN) and non-AN adults.

Results. Among 127,371 total hospitalizations, 4911 and 6721 were for acute and chronic PPH conditions, respectively. The overall crude PPH rate was 7.3 (3.1 for acute and 4.2 for chronic conditions). AN adults had a higher rate than non-AN adults for acute (aRR: 4.7; $p < 0.001$) and chronic (aRR: 2.6; $p < 0.001$) PPH conditions. Adults aged ≥85 years had the highest PPH rate for acute (43.5) and chronic (31.6) conditions. Acute conditions with the highest PPH rate were bacterial pneumonia (1.8) and urinary tract infections (0.8). Chronic conditions with the highest PPH rate were chronic obstructive pulmonary disease (COPD; 1.6) and congestive heart failure (CHF; 1.3).

Conclusion. Efforts to reduce PPHs caused by COPD, CHF, and bacterial pneumonia, especially among AN people and older adults, should yield the greatest benefit in achieving the HA2020 goal.

1. Introduction

The Agency for Healthcare Research and Quality (AHRQ) has developed a set of evidence-based Prevention Quality Indicators (PQIs) that use routinely collected hospitalization data to assess ambulatory/outpatient healthcare quality in a community (Prevention Quality Indicators Overview). The PQIs measure acute and chronic conditions for which good outpatient care can potentially prevent hospitalization, such as complications of diabetes. Hospitalization rates are affected by factors beyond the direct delivery of healthcare services such as patients' socioeconomic status and environmental pollution. Therefore, the PQI data are intended to be a starting point for further evaluation of a community's healthcare quality determinants.

Abbreviations: AHRQ, Agency for Healthcare Research and Quality; AI/AN, American Indian/Alaska Native; AN, Alaska Native; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; HA2020, Healthy Alaskans 2020; HDDS, Hospital Discharge Data Set; IHS, Indian Health Service; NPIRS, National Patient Information Reporting System; PQIs, Prevention Quality Indicators; aRR, age-adjusted rate ratio; RR, age-specific rate ratio; SE, standard error; SID, State Inpatient Database; UTI, urinary tract infection.

☆ Note: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the Agency for Healthcare Research and Quality.

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A coalition of public health groups led by the State of Alaska Department of Health and Social Services and the Alaska Native Tribal Health Consortium are collaborating to improve health and reduce health disparities among Alaskans through the Healthy Alaskans 2020 (HA2020) initiative (Healthy Alaskan 2020: 25 Leading Health Priorities). Reducing potentially preventable hospitalizations, as defined by the AHRQ PQIs, is among the 25 health indicators targeted by HA2020 for improvement. The estimated potentially preventable hospitalization rate/1000 adults aged ≥18 years in 2010 was 7.1 for all Alaskans and 18.8 for Alaska Native (AN) people. The HA2020 goal is to reduce this rate by approximately 6% to 6.7 for all Alaskans and eliminate the disparity in hospitalization rates between AN people and all Alaska residents by 2020.

The potentially preventable hospitalization rate targeted by HA2020 for improvement represents the combined acute/chronic PQIs developed by AHRQ (Prevention Quality Indicators Overview; Healthy Alaskans 2020: 25 Leading Health Priorities). The HA2020 potentially preventable hospitalization rate for 2010 was calculated by using hospital discharge data from the Alaska State Inpatient Database (SID), which is part of the AHRQ Healthcare Cost and Utilization Project (HCUP) family of databases. The 2010 baseline preventable hospitalization rate estimate was incomplete because some AN tribally-operated hospitals did not contribute hospital discharge data to the Alaska SID. For the present study, we created an Alaska statewide database that combined hospital discharge data from the Alaska SID data with data from the other tribally-operated hospitals reported to the Indian Health Service (IHS) (Healthcare Cost and Utilization Project - HCUP, 2014; Indian Health Service, 2013; Anon., 2014b). By using this statewide hospital discharge database, we aimed to determine a more comprehensive potentially preventable hospitalization rate for acute and chronic conditions.

2. Patients and methods

2.1. Hospital discharge data

We obtained Alaska hospital discharge data for adults aged ≥18 years during 2010–2012 from two sources: 1) IHS National Patient Information Reporting System (NPIRS) (Indian Health Service, 2013; Anon., 2014b) and 2) the Alaska SID (Healthcare Cost and Utilization Project - HCUP, 2014). All IHS and tribally-operated hospitals report discharge data to NIPRS. The Alaska SID includes hospital discharge data from non-federal community-based acute care hospitals. One community-based hospital stopped reporting data to the Alaska SID after 2007; it accounted for 6.5% of SID hospitalizations among adults aged ≥18 years in 2007 (Kim Laird, State of Alaska Department of Health and Social Services, personal communication, August 4, 2015). We combined Alaska region direct inpatient data from NIPRS and the Alaska SID to create an Alaska statewide hospital discharge dataset. One tribally-operated hospital reported to both NIPRS and SID; discharge data from that hospital were included only from SID. We excluded hospitalizations without a recorded race (0.7%) from analyses by AN status.

2.2. Alaska state population statistics

Annual population statistics for Alaska during 2010–2012 were obtained from the Alaska Department of Labor and Workforce Development. The population increased from 710,231 in April 2010 to 731,191 in July 2012 (Hunsinger, 2015). The Anchorage, Matanuska-Susitna, Fairbanks, Juneau, and Kenai boroughs are considered more urban and comprised 80% of the state population during 2010–2014 (Hunsinger, 2015). In 2012, approximately 82% of Alaskans were aged ≥18 years and 17% of Alaskans reported American Indian/Alaska Native (AI/AN) race alone or in combination with one or more races (Anon., 2014a). Because the majority of AI/AN people in Alaska are AN, they are often referred to as AN (Anon., 2014a). Active duty military personnel represented 3% of the state population in 2012 (Anon., 2014a).

2.3. Potentially preventable hospitalizations

We examined the potentially preventable hospitalization rate for three acute and nine chronic conditions as defined by the AHRQ PQI technical specifications (Prevention Quality Indicators Technical Specifications-Version 5.0, March 2015.). The three acute conditions were dehydration, bacterial pneumonia, and urinary tract infection (UTI). The nine chronic conditions were diabetes short-term complications, uncontrolled diabetes without complications, diabetes long-term complications, diabetes-related lower-extremity amputations, angina without procedure, congestive heart failure (CHF), hypertension, chronic obstructive pulmonary disease (COPD)/asthma in adults aged ≥40 years (older adults), and asthma in adults aged 18–39 years (younger adults). We searched among the first-listed diagnosis for all potentially preventable conditions, except for diabetes related to lower-extremity amputations where we searched among up to 15 listed diagnoses. We classified hospitalizations as urban or rural based on hospital location. Hospitalizations with a primary pregnancy-related diagnosis, resulting from a transfer from another healthcare facility (e.g., hospital, skilled nursing facility or intermediate care facility), or for persons with missing age/sex were excluded for comparability with the HA2020 baseline preventable hospitalization rate for 2010 (Healthy Laskans 2020: 25 Leading Health Priorities).

2.4. Statistical analysis

The unit of analysis was an adult hospitalization. We determined the proportion of all adult hospitalizations that were for potentially preventable acute and chronic conditions by year, age group, AN status, urban/rural location of hospital, and first-listed expected primary payment source for the hospitalization. Patient's location of residence is not known in the Alaska SID; therefore, analyses by urban/rural geography were based on patients' admitting hospital location. For expected payment source, the same categories (private insurance, Medicare, Medicaid, self-pay, other) are used across all HCUP data sources to maintain comparability of results (Stranges & Stocks, 2010). Proportions were statistically compared using the chi-square test.

Annual and average annual crude and age-specific hospitalization rates were calculated as the number of hospitalizations/1000 adults for acute and chronic conditions. Crude and age-specific hospitalization rates (age groups 18–44, 45–64, 65–84, and ≥85 years) among AN and non-AN people were compared by using Poisson regression analysis; age-specific rate ratios (RR) were also calculated for age groups. Hospitalization rates adjusted for age were calculated by the direct method using the 2000 U.S. population as the standard population for all AN and non-AN adults aged ≥18 years (adjusted rates not presented) and compared by using the z-test; age-adjusted rate ratios [aRR] were also calculated. All comparisons were considered statistically significant at the $p < 0.05$ level.

2.5. Potentially preventable hospitalization rate for United States

For comparison with the rates in Alaska, we obtained the hospitalization rate for potentially preventable conditions in the United States from the AHRQ National Healthcare Quality and Disparities Reports website (National Healthcare Quality & Disparities Reports). A website data query tool allowed us to search for the potentially preventable hospitalization rates for acute/chronic conditions by year, sex, and patient location (rather than hospital location as in our analyses using the Alaska SID data). For patient location, the urban designation corresponds to residence in central counties of metropolitan areas with a population >1 million and the rural designation corresponds to residence in non-metropolitan counties with a population of <10,000.

Table 1
Characteristics of potentially preventable hospitalizations for acute conditions, chronic conditions, and all other hospitalizations among Alaska residents aged ≥18 years, 2010–2012.[a]

Characteristic[b]	Potentially preventable hospitalizations		All non-potentially preventable hospitalizations	All hospitalizations
	Acute conditions	Chronic conditions		
	No. (row %)	No. (row %)	No. (row %)	No. (column %)
Total Alaska	4911 (3.9)	6721 (5.3)	115,739 (90.8)	127,371
2010	1593 (3.8)	2190 (5.2)	38,121 (91.0)	41,904 (32.0)
2011	1675 (3.9)	2255 (5.3)	38,738 (90.8)	42,668 (33.5)
2012	1643 (3.8)	2276 (5.3)	38,880 (90.9)	42,799 (33.6)
Sex				
Female	2843 (3.6)	3330 (4.3)	72,090 (92.1)	78,263 (61.4)
Male	2068 (4.2)	3391 (6.9)	43,649 (88.9)	49,108 (38.6)
Age group (years)				
18–44	727 (1.4)	1024 (1.9)	50,810 (96.7)	52,561 (41.3)
45–64	1508 (3.7)	2458 (6.0)	36,718 (90.3)	40,684 (31.9)
65–84	2012 (6.9)	2756 (9.5)	24,221 (83.6)	28,989 (22.8)
85+	6,64 (12.9)	483 (9.4)	3990 (77.7)	5137 (4.0)
Race[c]				
AN	2294 (5.8)	2084 (5.2)	35,475 (89.0)	39,853 (31.3)
Non-AN	2599 (3.0)	4600 (5.3)	79,384 (91.7)	86,583 (68.0)
Hospital location[d]				
Urban	3277 (3.0)	5343 (5.0)	99,346 (92.0)	107,966 (84.8)
Rural	1634 (8.4)	1378 (7.1)	16,393 (84.5)	19,405 (15.2)
Expected payment source (first listed)				
Private insurance	539 (1.5)	936 (2.7)	33,534 (95.8)	35,009 (27.5)
Medicare	2117 (6.3)	2911 (8.7)	28,617 (85.0)	33,645 (26.4)
Medicaid	412 (1.9)	789 (3.6)	20,519 (94.5)	21,720 (17.1)
Self-pay	303 (3.0)	599 (5.8)	9328 (91.2)	10,230 (8.0)
Other[e]	1492 (5.7)	1431 (5.5)	23,291 (88.8)	26,214 (20.6)

Abbreviation: AN, Alaska Native; No., number.
Data sources: Hospital discharge data obtained from the Healthcare Cost and Utilization Project (HCUP) with permission from, and in collaboration with, the Alaska State Inpatient Database and from the Indian Health Service Inpatient Database, and census data from the Alaska Department of Labor and Workforce Development.
[a] The acute (dehydration, bacterial pneumonia, and urinary tract infection) and chronic (diabetes short-term complications, uncontrolled diabetes without complications, diabetes long-term complications, diabetes-related lower-extremity amputations, angina without procedure, congestive heart failure, hypertension, chronic obstructive pulmonary disease/asthma in older adults, and asthma in younger adults) preventable conditions were defined by the Agency for Healthcare Research and Quality (http://www.qualityindicators.ahrq.gov/modules/PQI_TechSpec.aspx).
[b] Characteristic categories may not add up to total due to missing values.
[c] American Indian/Alaska Native (AI/AN) race either alone or in combination with one or more races; AI/AN people of Alaska referred to as Alaska Native.
[d] Admissions to hospitals located in Anchorage, Mat-Su, Fairbanks, Kenai, and Juneau boroughs were considered urban and admissions to hospitals located in all other boroughs were considered rural.
[e] Other includes worker's compensation, Indian Health Service, CHAMPUS/VA, other miscellaneous, other government. Starting in the 4th quarter of 2011, the state-specific code for Indian Health Service (Other) is infrequently used. Instead these patients are reported as having an expected payer of self-pay to document unreimbursed care to Alaska Natives (http://www.hcup-us.ahrq.gov/db/vars/pay1/nisnote.jsp).

2.6. Study oversight

This study was a collaboration between AHRQ, IHS, the Alaska State Department of Health and Social Services, and the Centers for Disease Control and Prevention. The Institutional Review Boards of all collaborating agencies do not consider use of HCUP/IHS hospital discharge data as human subjects research. Therefore, this study was considered exempt from human subjects review.

3. Results

3.1. Characteristics of potentially preventable hospitalizations

A total of 127,371 hospitalizations were reported in Alaska during 2010–2012 for residents aged ≥18 years (Table 1). Potentially preventable hospitalizations accounted for 9.2% of these hospitalizations (3.9% for acute and 5.3% for chronic potentially preventable conditions). A majority (61.4%) of all hospitalizations (including discharges with a primary pregnancy-related diagnosis) occurred in females. The proportion of all hospitalizations that were for potentially preventable acute/chronic conditions combined (excluding discharges with a primary pregnancy-related diagnosis) was greater for males (11.1%) compared with females (7.9%; $p < 0.05$). Although 73.2% of all hospitalizations occurred in adults aged <65 years, half of hospitalizations for potentially preventable acute/chronic conditions combined occurred in adults aged ≥65 years. In all age groups, except for adults aged ≥85 years, a greater proportion of potentially preventable hospitalizations were for chronic than acute conditions. Almost a third (31.3%) of all hospitalizations occurred in AN people. The proportion of all hospitalizations that were for potentially preventable chronic conditions were similar in AN and non-AN people (5.2% and 5.3%, respectively), whereas potentially preventable acute conditions were greater in AN than non-AN people (5.8% and 3.0%, respectively; $p < 0.05$).

The three leading potentially preventable causes of hospitalizations as a proportion of all hospitalizations among AN people were bacterial pneumonia (32.7%), COPD/asthma in older adults (22.5%), and CHF (14.9%); the three leading causes of potentially preventable hospitalizations among non-AN people were COPD/asthma in older adults (21.1%), bacterial pneumonia (20.1%), and CHF (18.7%; Fig. 1).

3.2. Hospitalization rates for potentially preventable acute and chronic conditions by year, sex, and hospital location

When potentially preventable acute and chronic hospitalizations are considered together, the overall average annual hospitalization rate/1000 adults aged ≥18 years in Alaska was 7.3; the annual rate was 7.2 in 2010, 7.3 in 2011, and 7.2 in 2012 (Table 2). The combined acute and chronic average annual hospitalization rate/1000 adults among AN people was 16.1 and among non-AN people was 5.4; the annual hospitalization rate for each population did not change significantly from 2010 to 2012. The combined acute and chronic average annual age-adjusted hospitalization rate/1000 adults among AN adults in urban hospitals was 6.8 and 9.4 in rural hospitals.

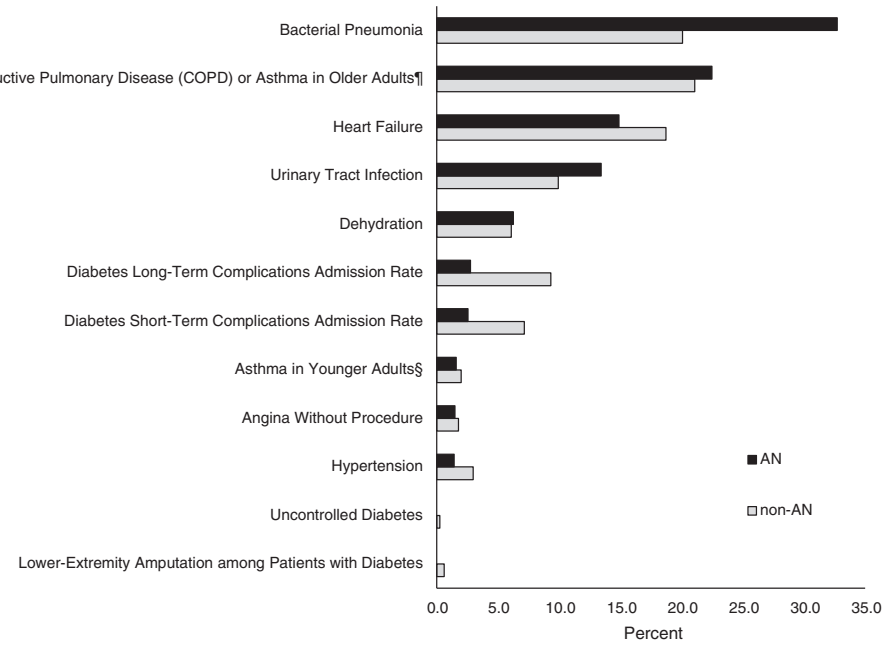

Fig. 1. Proportion of all potentially preventable hospitalizations that are attributable to each preventable quality indicator Alaska residents aged ≥18 years, Alaska, 2010-2012.*† Data sources: Hospital discharge data obtained from the Healthcare Cost and Utilization Project (HCUP) with permission from, and in collaboration with, the Alaska State Inpatient Database and from the Indian Health Service Inpatient Database; census data from the Alaska Department of Labor and Workforce Development. *The preventable conditions are defined by the Agency for Healthcare Research and Quality (http://www.qualityindicators.ahrq.gov/modules/PQI_TechSpec.aspx). Hospitalizations were identified as potentially preventable based on the first-listed discharge diagnosis for all acute and chronic conditions except for the diabetes related conditions, which were identified based on any listed discharge diagnosis. For the diabetes category of chronic conditions, 68 hospitalizations had 2 potentially preventable any-listed diabetes-related discharge diagnosis but were counted once to prevent double counting. †American Indian/Alaska Native (AI/AN) race either alone or in combination with one or more races; AI/AN people of Alaska referred to as Alaska Native. ¶Older adults defined as persons aged ≥40 years. §Younger adults defined as persons aged 18–39 years.

The average annual hospitalization rate for potentially preventable acute conditions was 3.1/1000 adults (Table 2); the aRR comparing AN people with non-AN people was 4.7 ($p < 0.001$). The increased hospitalization risk for potentially preventable acute conditions between AN and non-AN persons was observed for males (aRR: 4.6; $p < 0.001$) and females (aRR: 4.7; $p < 0.001$), and for urban (aRR: 4.7; $p < 0.001$) and rural (aRR: 4.2; $p < 0.001$) hospital locations.

The average annual hospitalization rate for potentially preventable chronic conditions was 4.2/1000 adults (Table 2); the aRR comparing AN people with non-AN people was 2.6 ($p < 0.001$). The rate disparity was observed for both males (aRR: 2.5; $p < 0.001$) and females (aRR: 2.7; $p < 0.001$), and by urban (aRR: 2.9; $p < 0.001$) and rural (aRR: 3.2; $p < 0.001$) hospital locations.

During 2010, 2011, and 2012, the U.S. average potentially preventable hospitalization rate/1000 adults aged ≥18 years for acute conditions was 6.45 (standard error [SE]: 0.13), 6.57 (SE: 0.13), and 6.23 (SE: 0.13), respectively, and for chronic conditions was 10.13 (SE: 0.23), 10.12 (SE: 0.20), and 9.61 (SE: 0.13), respectively (Table 2).

3.3. Potentially preventable hospitalization rates by specific acute and chronic conditions

The average annual age-specific hospitalization rates for potentially preventable acute and chronic conditions were highest among adults aged ≥85 years for AN (126.5 and 60.0/1000 adults, respectively) and non-AN people (30.6 and 27.2/1000 adults, respectively; Table 3). The disparity between AN and non-AN people in potentially preventable hospitalizations for acute conditions was greatest for persons aged 45–64 years (RR: 5.5; $p < 0.001$) and for chronic conditions was for persons aged 65–84 years (RR: 3.2; $p < 0.001$).

Among the three categories of chronic conditions we evaluated, we identified a significant disparity in the average annual potentially preventable hospitalization rate between AN and non-AN people for circulatory diseases (aRR: 2.6; $p < 0.001$) and chronic respiratory diseases (aRR: 3.7; $p < 0.001$) but not for diabetes (Table 3). The crude average annual circulatory disease hospitalization rate/1000 adults for AN people was 2.9 compared with 1.3 for non-AN people. The crude average annual chronic respiratory disease hospitalization rate/1000 adults for AN people was 3.9 compared with 1.3 for non-AN people.

Of the three subgroups of circulatory diseases we analyzed (angina without procedures, CHF, and hypertension), the preventable hospitalization burden was primarily attributable to CHF in AN and non-AN people (crude rate: 2.4 and 1.0/1000 adults, respectively; Table 4). Most of the preventable hospitalizations for CHF in AN and non-AN people (60.1% and 66.5%, respectively; data not shown) occurred in adults aged ≥65 years. Of the two subgroups of chronic respiratory diseases we analyzed (asthma in younger adults and COPD/asthma in older adults), the potentially preventable hospitalization burden was almost entirely attributable to COPD/asthma in AN and non-AN older adults (crude rate: 3.6 and 1.1/1000 adults, respectively). Among the potentially preventable hospitalizations for COPD/asthma in older adults, the majority occurred in adults aged ≥65 years for AN and non-AN people (58.1% and 55.2%, respectively; data not shown).

A disparity was observed between AN and non-AN people in potentially preventable hospitalizations for the three acute conditions (Table 4). The average annual potentially preventable hospitalization rate/1000 adults in AN and non-AN people for UTI was 2.2 and 0.5, respectively (aRR: 3.9; $p < 0.001$), for bacterial pneumonia was 5.3 and 1.1, respectively (aRR: 5.5; $p < 0.001$), and for dehydration was 1.0 and 0.3, respectively (aRR: 3.5; $p < 0.001$). Adults aged ≥65 years accounted for the majority of potentially preventable hospitalizations for UTI (55.0%) and bacterial pneumonia (56.5%; data not shown).

4. Discussion

Our results indicate that the potentially preventable hospitalization rate/1000 adults aged ≥18 years for acute/chronic conditions during 2010 was similar to the HA2020 baseline estimate of 7.1 for all Alaskans

Table 2
Annual and average annual hospitalization rates for potentially preventable acute and chronic conditions among Alaska Native (AN) and non-AN Alaska residents aged ≥18 years, 2010–2012.[a]

	Alaska								United States
	Overall hospitalizations		AN Hospitalizations		Non-AN hospitalizations		AN versus non-AN[b]		
	No.	Crude rate	No.	Crude rate	No.	Crude rate	Age-adjusted rate ratio	*p*-Value	Hospitalization rate (SE)
Potentially preventable acute conditions									
Total	4911	3.1	2294	8.4	2599	2.0	4.7	<0.001	
2010	1593	3.0	768	8.6	818	1.9	4.9	<0.001	6.45 (0.13)
2011	1675	3.1	776	8.5	890	2.0	4.5	<0.001	6.57 (0.13)
2012	1643	3.0	750	8.2	891	2.0	4.7	<0.001	6.23 (0.13)
Sex									
Female	2843	3.7	1362	9.9	1473	2.3	4.7	<0.001	6.67 (0.14)[c]
Male	2068	2.5	932	6.9	1126	1.6	4.6	<0.001	5.75 (0.12)[c]
Location[d]									
Urban	3277	2.6	1051	7.7	2209	1.9	4.7	<0.001	5.42 (0.42)[c]
Rural	1634	5.1	1243	9.2	390	2.1	4.2	<0.001	9.05 (0.43)[c]
Potentially preventable chronic conditions									
Total	6721	4.2	2084	7.7	4600	3.5	2.6	<0.001	
2010	2190	4.2	685	7.7	1487	3.4	2.7	<0.001	10.13 (0.23)
2011	2255	4.2	689	7.6	1555	3.5	2.5	<0.001	10.12 (0.20)
2012	2276	4.2	710	7.8	1558	3.5	2.7	<0.001	9.61 (0.13)
Sex									
Female	3330	4.3	1102	8.0	2208	3.5	2.7	<0.001	9.29 (0.23)[c]
Male	3391	4.1	982	7.3	2392	3.4	2.5	<0.001	10.09 (0.24)[c]
Location[d]									
Urban	5343	4.2	1136	8.3	4172	3.7	2.9	<0.001	10.01 (0.84)[c]
Rural	1378	4.3	948	7.0	428	2.3	3.2	<0.001	10.75 (0.59)[c]

Abbreviation: No., number; SE, standard error.
Data sources: Hospital discharge data obtained from the Healthcare Cost and Utilization Project (HCUP) with permission from, and in collaboration with, the Alaska State Inpatient Database and from the Indian Health Service Inpatient Database; census data from the Alaska Department of Labor and Workforce Development. The United States hospitalization rates are provided as a benchmark for comparison and were obtained from the National Healthcare Quality and Disparities Report (http://nhqrnet.ahrq.gov/inhqrdr/data/submit).
[a] The acute (dehydration, bacterial pneumonia, and urinary tract infection) and chronic (diabetes short-term complications, uncontrolled diabetes without complications, diabetes long-term complications, diabetes-related lower-extremity amputations, angina without procedure, congestive heart failure, hypertension, chronic obstructive pulmonary disease/asthma in older adults, and asthma in younger adults) preventable conditions were defined by the Agency for Healthcare Research and Quality (http://www.qualityindicators.ahrq.gov/modules/PQI_TechSpec.aspx). American Indian/Alaska Native (AI/AN) race either alone or in combination with one or more races; AI/AN people of Alaska referred to as Alaska Native. Rates are expressed as the number of hospitalizations/1000 persons.
[b] Hospitalization rates age-adjusted by direct method using the 2000 U.S. population as the standard (age-adjusted rates not shown); *p*-value calculated by the z-test comparing age-adjusted rates.
[c] The U.S. hospitalization rates for sex and location are reported only for 2012; the location for U.S. hospitalizations corresponds to location of patient's residence rather than the location of the admitting hospital.
[d] For Alaska, admissions to hospitals located in the Anchorage, Mat-Su, Fairbanks, Kenai, and Juneau boroughs were considered urban and admissions to hospitals located in all other boroughs were considered rural; for the United States, the urban location corresponds to patient residence in central counties of metropolitan areas with a population >1 million and rural location corresponds to patient residence in non-metropolitan counties with a population of <10,000.

but was 13% lower than the 18.8 estimate for AN people (Healthy Alaskans 2020: 25 Leading Health Priorities). Therefore, the HA2020 initiative potentially preventable hospitalization rate target for all Alaskans remains 6.7 based on the goal of a 6% reduction from the 2010 baseline (Healthy Alaskans 2020: 25 Leading Health Priorities). Efforts targeted towards reducing preventable hospitalizations for COPD/asthma, CHF, UTI, and bacterial pneumonia, especially among adults aged ≥65 years, could yield the greatest benefit in reducing preventable hospitalizations among Alaskan adults.

The discrepancies in the potentially preventable hospitalization rates for AN people between the baseline HA2020 analysis and the present study can be explained by the differences in methods/assumptions. First, the present analysis used more comprehensive statewide hospital discharge data for the numerator of rate calculations than was available for the baseline HA2020 analysis. During 2001–2010, data for the HA2020 were obtained from the Alaska Hospital Discharge Data Set (HDDS) (Healthy Alaskans 2020: 25 Leading Health Priorities). The HDDS contained the same data that was submitted to the Alaska SID starting in 2010 (Healthcare Cost and Utilization Project - HCUP, 2014).The present study also included hospital discharge data from all IHS-reported tribally-operated hospitals in Alaska. In addition, the population denominator used to calculate the hospitalization rates was different for the baseline HA2020 analysis and the present study. The baseline HA2020 analysis excluded from the population denominator six census areas served by rural tribally-operated hospitals and half of the census area served by the one community hospital that did not contribute data to the HDDS. The present study did not exclude any census areas from the population denominator. Despite the discrepancies, our findings confirm a disparity in potentially preventable hospitalization for acute/chronic conditions between AN and non-AN people.

An optimal preventable hospitalization rate has not been established for most acute and chronic conditions. Therefore, we presented the national hospitalization rate for potentially preventable conditions as a benchmark for comparison (National Healthcare Quality & Disparities Reports). The annual average potentially preventable hospitalization rate for acute conditions in Alaska residents was less than half the rate in the U.S. population. There was a significant racial disparity in the potentially preventable hospitalization rate for acute conditions; that rate was approximately a third higher than the U.S. rate among AN people but less than a third of the U.S. rate among non-AN people. The annual potentially preventable hospitalization rate for chronic conditions in Alaska was less than half the rate observed in the United States. However, the average annual potentially preventable hospitalization rate for chronic conditions among AN people exceeded the rate observed in the U.S. population in each year, whereas that rate among non-AN people was less than half the rate in the U.S. population. Thus, meeting the HA2020 potentially preventable hospitalization rate target in Alaska should prioritize strategies/interventions that reduce disparities in hospitalizations for acute preventable conditions between AN and non-AN people.

Table 3
Average annual overall crude and age-specific hospitalization rates among Alaska residents aged ≥18 years for categories of potentially preventable conditions by Alaska Native (AN) race, 2010–2012.[a]

Potentially preventable conditions by age group (years)[b]	Overall hospitalizations		AN hospitalizations		Non-AN hospitalizations		AN versus non-AN		
	No.	Rate	No.	Rate	No.	Rate	aRR[c]	RR[d]	*p*-Value
Acute conditions	4911	3.1	2294	8.4	2599	2.0	4.7		<0.001
18–44	727	0.9	415	2.6	306	0.5		5.2	<0.001
45–64	1508	2.5	719	8.2	784	1.5		5.5	<0.001
65–84	2012	12.4	903	37.3	1103	8.0		4.7	<0.001
85+	664	43.5	257	126.5	406	30.6		4.1	<0.001
Chronic conditions	6721	4.2	2084	7.7	4600	3.5	2.6		<0.001
18–44	1024	1.2	302	1.9	709	1.1		1.7	<0.001
45–64	2458	4.1	682	7.8	1759	3.4		2.3	<0.001
65–84	2756	17.0	978	40.4	1772	12.8		3.2	<0.001
85+	483	31.6	122	60.0	360	27.2		2.2	<0.001
Diabetes	1505	0.9	251	0.9	1248	0.9	1.1		0.19
18–44	537	0.7	93	0.6	441	0.7		0.9	0.28
45–64	639	1.1	91	1.0	545	1.1		0.9	0.85
65–84	295	1.8	58	2.4	237	1.7		1.4	0.02
85+	34	2.2	–	–	–	1.9		–	–
Circulatory diseases	2486	1.6	779	2.9	1691	1.3	2.6		<0.001
18–44	194	0.2	108	0.7	85	0.1		7.0	<0.001
45–64	792	1.3	210	2.4	573	1.1		2.2	<0.001
65–84	1179	7.3	384	15.9	790	5.7		2.8	<0.001
85+	321	21.0	77	37.9	243	18.3		2.1	<0.001
Chronic respiratory diseases	2730	1.7	1054	3.9	1661	1.3	3.7		<0.001
18–44	293	0.4	101	0.6	183	0.3		2.0	<0.001
45–64	1027	1.7	381	4.4	641	1.3		3.4	<0.001
65–84	1282	7.9	536	22.1	745	5.4		4.1	<0.001
85+	128	8.4	36	17.7	92	6.9		2.6	<0.001
All potentially preventable conditions	11,632	7.3	4378	16.1	7199	5.4	3.4		<0.001
18–44	1751	2.1	717	4.5	1015	1.5		3.0	<0.001
45–64	3966	6.6	1401	16.1	2543	5.0		3.2	<0.001
65–84	4768	29.4	1881	77.7	2875	20.8		3.7	<0.001
85+	1147	75.1	379	186.5	766	57.8		3.2	<0.001

Abbreviations: No., number; RR, age-specific rate ratio; aRR, age-adjusted rate ratio.
Data sources: Hospital discharge data obtained from the Healthcare Cost and Utilization Project (HCUP) with permission from, and in collaboration with, the Alaska State Inpatient Database and from the Indian Health Service Inpatient Database; census data from the Alaska Department of Labor and Workforce Development.

[a] Diseases included in each category of preventable conditions are defined by the Agency for Healthcare Research and Quality (http://www.qualityindicators.ahrq.gov/modules/PQI_TechSpec.aspx). American Indian/Alaska Native (AI/AN) race either alone or in combination with one or more races; AI/AN people of Alaska referred to as Alaska Native. Rates are expressed as the number of hospitalizations/1000 persons; rates not presented for categories with ≤10 hospitalizations (indicated by –).

[b] Hospitalizations for potentially preventable acute conditions (dehydration, bacterial pneumonia, and urinary tract infection), circulatory disease (angina without procedure, congestive heart failure, hypertension), and chronic respiratory disease (chronic obstructive pulmonary disease/asthma in older adults, and asthma in younger adults) were identified based on first-listed discharge diagnosis. Hospitalizations for diabetes-related conditions (diabetes short-term complications, uncontrolled diabetes without complications, diabetes long-term complications, diabetes-related lower-extremity amputations) were identified based on any-listed discharge diagnosis. For diabetes-related conditions, discharges with >1 potentially preventable diabetes-related diagnosis were only counted once to prevent double counting.

[c] Hospitalization rates age-adjusted by direct method using the 2000 U.S. population as the standard (age-adjusted rates not shown) and aRRs were calculated; *p*-value calculated by the z-test comparing age-adjusted rates.

[d] Age-specific rates for each age group within each potentially preventable condition category were compared by using Poisson regression.

Although the reasons for the disparity in potentially preventable hospitalizations between AN and non-AN people are unknown, the geographic isolation of many rural AN communities might be a contributing cause. Among adults aged ≥18 years, approximately half of AN people live in rural Alaska compared with 14% of non-AN people. Many rural Alaskan communities are inaccessible by road and reaching a hospital requires transportation by air (McMahon et al., 2000). Because of geographic barriers, rural Alaskans (who are predominantly AN race) might delay seeking evaluation for illnesses where early treatment could have prevented hospitalization. Furthermore, the threshold for hospital admission might be lower when rural Alaskans present for healthcare because close outpatient monitoring of less severe illness might not be possible.

Our results indicate that most potentially preventable hospitalizations resulting from acute conditions are attributable to UTI and bacterial pneumonia and from chronic conditions are attributable to CHF and COPD. Although a comprehensive review of strategies for managing patients with UTI, bacterial pneumonia, CHF and COPD is beyond the scope of the present analysis, we can evaluate the potential for strategies proposed by the HA2020 initiative to reduce preventable hospitalizations for those conditions. For example, 47% and 27% of the variation in preventable hospitalizations for CHF and COPD, respectively, could be explained by access to healthcare (Bindman et al., 1995). Hence, successful implementation of the HA2020 strategy to increase access to primary care would be expected to reduce the preventable hospitalization rate for chronic conditions (Healthy Alaskans 2020: 25 Leading Health Priorities). Another strategy of the HA2020 initiative is to strengthen public health interventions to reduce disease (Healthy Alaskans 2020: 25 Leading Health Priorities). In 2009, 20.6% of Alaskan adults reported current cigarette smoking (Anon., 2010). Cigarette smoking is an important risk factor for COPD exacerbations that require hospitalization (Au et al., 2009). Respiratory infections, in particular *Streptococcus pneumoniae* and influenza, are also frequent causes of COPD exacerbations (Seemungal et al., 2001; Soler et al., 1998; Nseir et al., 2008). Therefore, programs to encourage smoking cessation and increase pneumococcal/influenza vaccination rates might be examples of public health interventions that should reduce the number of potentially preventable hospitalizations in Alaska.

Previous studies have demonstrated high infectious disease (ID) hospitalization rates among AN people (Holman et al.,2001, 2011, 2013). During 2007–2009, the three ID categories with the highest average annual age-adjusted hospitalization rate/100,000 persons were lower respiratory tract infections (812.9), skin and soft tissue infections (354.0), and kidney, urinary tract, and bladder infections (148.7)

(Holman et al., 2013). The high ID hospitalization rates among AN people have been linked to environmental risk factors such as household crowding and lack of in-home piped water (Hennessy et al., 2008; Wenger et al., 2011). Our study suggests an additional reason for the high ID hospitalization rates in AN people. We demonstrated high rates of potentially preventable hospitalizations for UTIs and bacterial pneumonia, both of which are acute PQIs. The acute PQIs are conditions for which timely outpatient care could potentially prevent hospitalization by mitigating the severity or preventing complications of illness (Anon., 2001). Thus, improving timely access to healthcare could reduce ID hospitalizations in AN people, especially for those living in rural Alaska.

Table 4
Average annual overall crude and age-specific hospitalization rates among Alaska residents aged ≥18 years for specific potentially preventable conditions by Alaska Native (AN) race, 2010–2012.[a]

Specific potentially preventable conditions by age group (years)[b]	Hospitalization rate			AN versus non-AN[c]		
	Overall	AN	Non-AN	aRR[c]	RR[d]	*p*-Value
Chronic conditions						
Diabetes						
Diabetes short-term complications	0.4	0.4	0.4	1.0		0.88
18–44	0.5	0.4	0.5		0.8	0.11
45–64	0.3	0.4	0.3		1.3	0.01
65–84	0.2	–	0.2		–	–
≥85	–	–	–		–	–
Uncontrolled diabetes without complications	0.02	–	0.01	–		–
18–44	–	–	–		–	–
45–64	0.02	–	–		–	–
65–84	–	–	–		–	–
≥85	–	–	–		–	–
Long-term diabetes complications	0.5	0.4	0.5	1.2		0.34
18–44	0.1	0.1	0.1		1.0	0.73
45–64	0.7	0.5	0.7		0.7	0.05
65–84	1.5	1.9	1.4		1.4	0.08
≥85	1.8	–	1.6		–	–
Diabetes-related lower extremity amputations	0.08	0.06	0.08	–		–
18–44	–	–	–		–	–
45–64	0.03	–	0.04		–	–
65–84	0.2	–	0.1		–	–
≥85	–	–	–		–	–
Circulatory disease						
Angina without procedure	0.1	0.2	0.1	3.0		<0.001
18–44	0.02	–	0.02		–	–
45–64	0.1	0.3	0.1		3.0	<0.001
65–84	0.5	1.3	0.4		3.3	<0.001
≥85	–	–	–		–	–
Congestive heart failure	1.3	2.4	1.0	2.6		<0.001
18–44	0.2	0.6	0.1		6.0	<0.001
45–64	1.0	1.9	0.8		2.4	<0.001
65–84	6.2	13.4	4.9		2.7	<0.001
≥85	18.9	33.5	16.7		2.0	<0.001
Hypertension	0.2	0.2	0.2	2.0		<0.001
18–44	0.04	–	0.04		–	–
45–64	0.2	0.2	0.2		1.0	0.84
65–84	0.6	1.2	0.4		3.0	<0.001
≥85	1.6	–	1.2		–	–
Chronic respiratory disease						
Asthma in younger adults[e]	0.1	0.3	0.1	3.0		<0.001
18–44	0.3	0.4	0.2		2.0	<0.001
Chronic obstructive pulmonary disease/asthma in older adults[f]	1.6	3.6	1.1	3.8		<0.001
18–44	0.1	0.2	0.1		2.0	<0.001
45–64	1.7	4.4	1.3		3.4	<0.001
65–84	7.9	22.1	5.4		4.1	<0.001
≥85	8.4	17.7	6.9		2.6	<0.001
Acute conditions						
Bacterial pneumonia	1.8	5.3	1.1	5.5		<0.001
18–44	0.4	1.0	0.2		5.0	<0.001
45–64	1.6	5.5	0.9		6.1	<0.001
65–84	7.6	25.5	4.5		5.7	<0.001
≥85	25.5	85.6	16.3		5.3	<0.001
Dehydration	0.4	1.0	0.3	3.5		<0.001
18–44	0.1	0.3	0.1		3.0	<0.001
45–64	0.4	1.2	0.3		4.0	<0.001
65–84	1.6	4.0	1.2		3.3	<0.001
≥85	4.5	10.8	3.4		3.2	<0.001
Urinary tract infection	0.8	2.2	0.5	3.9		<0.001
18–44	0.4	1.3	0.1		13.0	<0.001
45–64	0.5	1.5	0.3		5.0	<0.001
65–84	3.2	7.8	2.3		3.4	<0.001
≥85	13.5	30.0	10.9		2.8	<0.001

This study has limitations. First, the potentially preventable hospitalization rate disparity between AN and non-AN people could be attributable to differences in the prevalence of risk factors for the preventable conditions (e.g., prevalence of hypertension or hyperlipidemia among persons with circulatory disease or differences in socioeconomic status). In general, however, AN people tend to experience a disproportionate burden of illnesses compared with the general U.S. population (Anon., 2014b). Therefore, we would expect the lack of risk adjustment in our analysis to underestimate the preventable hospitalization rate disparity. In addition, military hospitals did not provide data to the Alaska SID. Not including hospitalizations occurring at military hospitals but including predominantly non-AN military personnel in the population denominator might slightly underestimate of the potentially preventable hospitalization rate for non-AN people. Finally, the hospitalization rates might be affected by factors unrelated to the provision of healthcare such as diagnostic miscoding or incomplete coding. However, we do not suspect differential diagnostic coding by hospitals between AN and non-AN people, so the relative rate disparities that we observed would be unaffected.

5. Conclusions

In this study, we estimated the potentially preventable hospitalization rate for acute and chronic conditions in Alaska during 2010–2012. We identified that AN people and adults aged ≥85 were at highest risk for potentially preventable hospitalizations. Although we measured potentially preventable hospitalization rates, it is important to highlight that those acute and chronic conditions were intended to reflect the quality of health services provided outside the hospital. Furthermore, the indicators were developed using administrative data and cannot provide a direct measurement of the quality of care (Prevention Quality Indicators Overview). Therefore, the results of our analysis are intended to provide a starting point for further evaluation of a community's potential health needs and to identify priorities for intervention.

Notes to Table 4:
Abbreviations: RR, age-specific rate ratio; aRR, age-adjusted rate ratio.
Data sources: Hospital discharge data obtained from the Healthcare Cost and Utilization Project (HCUP) with permission from, and in collaboration with, the Alaska State Inpatient Database and from the Indian Health Service Inpatient Database; census data from the Alaska Department of Labor and Workforce Development.

[a] The preventable conditions are defined by the Agency for Healthcare Research and Quality (http://www.qualityindicators.ahrq.gov/modules/PQI_TechSpec.aspx); American Indian/Alaska Native (AI/AN) race either alone or in combination with one or more races; AI/AN people of Alaska referred to as Alaska Native. Rates are expressed as the number of hospitalizations/1000 persons; rates not presented for categories with ≤10 hospitalizations (indicated by –). Age-adjusted rate ratios are not calculated for categories with <20 hospitalizations.

[b] Hospitalizations for all acute conditions and circulatory/chronic respiratory disease conditions were classified based on first-listed discharge diagnosis and diabetes-related conditions were classified based on any-listed discharge diagnosis. For the diabetes category of chronic conditions, 68 hospitalizations had 2 potentially preventable any-listed diabetes-related discharge diagnosis and were double counted.

[c] Hospitalization rates age-adjusted by direct method using the 2000 U.S. population as the standard (age-adjusted rates not shown) and aRRs were calculated; *p*-value calculated by the z-test comparing age-adjusted rates.

[d] Age-specific rates for each age group within each potentially preventable condition category were compared by using Poisson regression.

[e] Younger adults defined as persons aged 18–39 years.

[f] Older adults defined as persons aged ≥40 years.

Conflict of interest

None of the authors have any conflicts of interest to declare.

Transparency Document

The Transparency document associated with this article can be found, in the online version.

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