Methods and Notes

The Agency for Healthcare Research and Quality (AHRQ) released a new group of area-based quality measures in September 2023 called Emergency Department Prevention Quality Indicators (PQEs) [1]. It contains five PQE measures that reflect ED visit rates for potentially preventable emergency department (ED) visits. The PQEs are area-based measures meaning they are evaluated and reported for geographic areas, usually counties. As with the existing group of Prevention Quality Indicators (PQIs), the PQEs are "avoidable use" measures in that they identify conditions that are sensitive to the health status of the population of a county (or other area) and the availability and quality of health care services in the county. PQEs are not used for measuring quality at the hospital level.

This Methods and Notes document serves as a reference for each of four Issue Briefs covering the four evaluable Prevention Quality Indicators (PQEs) listed below. The Kansas Hospital Association (KHA) administrative data does not contain a "visit link" field to identify patients who visit the ED multiple times during the fiscal year. Because this linking field is missing, results cannot be provided for PQE 05, Visits for Back Pain, which requires linked records.

Indicator	Issue Brief
PQE 01	Visits for Non-Traumatic Dental Conditions, Kansas, FY2023
PQE 02	Visits for Chronic Ambulatory Care Sensitive Conditions, Kansas, FY2023
PQE 03	Visits for Acute Ambulatory Care Sensitive Conditions, Kansas, FY2023
PQE 04	Visits for Asthma, Kansas, FY2023
PQE 05	*Not available*

The software version used to generate the results presented in the Issue Briefs was AHRQ ED PQI Version v2024 (using the CloudQI interface) referred to below as EDPQI. The software is provided by AHRQ at no cost and can be downloaded from the AHRQ website. Although the software is provided at no cost, the user must provide row-level administrative discharge data. AHRQ suggests at least three use cases for the PQE data: (1) population health improvement, (2) research and (3) public reporting [2]. KHA and KHC hope that these issue briefs will be useful to hospitals and other organizations engaged in planning population health improvement activities, community health needs assessments, or other health improvement efforts.

Data Source and Preparation

The results provided in the Issue Briefs are based on the fiscal year 2023 administrative data community hospitals in Kansas. Administrative data are collected and processed by participating community hospitals and uploaded to a central data repository according to a standard layout. Although attention is paid to data completeness and quality at various points in this process, the data are subject to potential errors and/or variability in data entry, coding and processing practices at participating hospitals and results should be considered with this caveat in mind.

We prepared an input data file according to AHRQ's software instructions. Note that race and ethnicity are coded according to AHRQ's crosswalk (see Appendix A of the Quality Indicators

Software Instructions). In the Issue Briefs, we used the following abbreviations: "AIAN" for American Indian/Alask Native and "NHOPI" for Native Hawaiian and Other Pacific Islander. The input dataset includes both (1) inpatient records flagged as admitted from the ED and (2) outpatient claims from the ED. Records were excluded if sex or date of birth were missing. No exclusions were made for bill types. The input file required by the EDPQI software is a CSV file with one row per ED visit. Diagnosis codes are included in the input file in 35 columns. Rows with no matching diagnosis codes were included in the input file but the EDPQI software excluded those records during the data loading process.

EDPQI Results

For each indicator, the EDPQI software generates several statistics.

- The observed number of events is the count of ED visits meeting the specified indicator criteria. The age group population is county- or state-level population from the US Census Bureau. [1]
- The observed rate is the raw, or unadjusted rate of observed visits per population living in the county (or state) per year.
- The expected rate is determined based on an aggregate dataset from all states that participate in the Healthcare Cost and Utilization Project (HCUP) referred to as the "reference population." It describes the rate that would be expected for an area with a similar demographic makeup based on the age and sex distributions in the county.
- The O/E ratio is the observed rate divided by the expected rate. If the observed rate for a county is higher than the expected rate for that county, the county is performing worse on average for the indicator as compared to other counties with similar demographics. In this scenario, the O/E ratio for this county would be greater than 1.0. Correspondingly, counties performing better on average for the indicator would have an O/E ratio lower than 1.0 .
- The risk-adjusted rate is an estimate of the rate for a county, adjusted so that it can be compared to another county even if the counties have populations with different age and sex compositions. It is calculated by multiplying the O/E ratio by the rate in the reference population. The software also provides a 95% confidence interval estimate for the risk-adjusted rate. This confidence interval is useful to test whether the difference between a county's risk-adjusted rate and the rate from the reference population is statistically significant. If the reference value falls outside the confidence interval for that county (lower than the lower bound or higher than the higher bound), the difference is statistically significant.
- Finally, the AHRQ software provides a smoothed rate which is a weighted average of the reference population rate and the locally observed rate which will tend to bring rates from counties with a small number of events closer to the reference population rate.

Choropleth Maps

For the Issue Briefs, we chose to create choropleth maps of the county-level smoothed rate which has advantageous statistical properties (described above). The color scheme is a diverging color palette centered on the "National Benchmark," or reference population rate provided by AHRQ. Counties with higher (in red) or lower (in blue) rates have a darker hue, while counties with rates close to the National Benchmark have a neutral hue as indicated in the legend. Following

convention, rates for counties with fewer than five numerator events are not shown to prevent users from drawing inferences for counties with insufficient data to produce stable rate estimates.

Stratified Analyses

To assess potential disparities by age, sex and race/ethnicity, we include stratified rates at the state level. Race and ethnicity were combined into one field according to the file layout required by the AHRQ ED PQI Software. We obtained postcensal Kansas population estimates for 2023 (Vintage 2020-2023) from the Census website [3]. We validated that the census denominators for the overall population match those included in the AHRQ software for the indicators PQE 01, PQE 02 and PQE 04. The population denominator files from Census do not include age-by-month queries, so we were unable to get the exact population denominator for PQE 03 which includes ages 3-months through 64 years. We contacted AHRQ for technical assistance with the PQE 03 denominator and they recommended assuming the proportion of the 0–4-year age group that falls in the <3-month category to be 5%. We made this adjustment by multiplying the 0–4-year age-group by a factor of 0.95 before computing age-specific and age-adjusted rates.

In addition to unadjusted stratified rates, we provide age-adjusted rates for race/ethnicity subgroups. Age-adjustment is a simple method for comparing rates among groups that have differing underlying age distributions. Age-adjusted rates in this report are computed using the direct method based on the Census 2000 standard population [4]. Comparing age-adjusted rates eliminates differences between the rates for groups that could be attributed to those groups having different underlying age compositions. This may be important to understand the differences between groups with different age compositions where the measure rate is also associated with age. Confidence intervals for age-adjusted rates were estimated using the *gamma* interval method [5].

References

[1] AHRQ ED PQI Technical Documentation, Version v2023, Agency for Healthcare Research and Quality, Rockville, MD. https://qualityindicators.ahrq.gov/measures/ed_pqi_resources. Accessed March 6th, 2024.

[2] *AHRQ QI: Quality Indicator Resources*. (n.d.). Retrieved March 6, 2024, from https://qualityindicators.ahrq.gov/measures/how_to_use_ed_pqi_resources.

[3] Annual State Resident Population Estimates for 6 Race Groups (5 Race Alone Groups and Two or More Races) by Age, Sex, and Hispanic Origin: April 1, 2020, to July 1, 2023. Accessed at https://www.census.gov/data/tables/time-series/demo/popest/2020s-state-detail.html on August 15, 2024.

[4] Klein, R. J., & Schoenborn, C. A. (2001). Age adjustment using the 2000 projected U.S. population. Healthy People 2010 Statistical Notes: From the Centers for Disease Control and Prevention/National Center for Health Statistics, 20, 1–10.

[5] Fay, M. P., & Feuer, E. J. (1997). Confidence intervals for directly standardized ratees: A method based on the gamma distribution. *Statistics in Medicine*, *16*(7), 791–801.