RUSH

2018 Health Equity Report Technical Notes

All data for this report were from calendar year 2017. Inclusion criteria and specific data elements for each patient population are described below. Data were obtained from the Rush University Medical Center (RUMC) data warehouse by Chandrea Brown, Information Services Project Leader, unless otherwise noted. The RUMC Institutional Review Board approved this project.

Patient Population Inclusion Criteria by Setting

- **Inpatient:** All patients hospitalized at RUMC or Rush Oak Park Hospital (ROPH) who were discharged between 1/1/17 and 12/31/17. This excluded patients who were at the hospital for observation but were not admitted as an inpatient.

- **Emergency Department:** All patients who were seen in the RUMC or ROPH emergency departments and departed between 1/1/17 and 12/31/17.

- **Primary Care (Rush University Medical Group):** All patients who completed at least one office visit in a primary care Rush University Medical Group (RUMG) department between 1/1/17 and 12/31/17. List of departments are available upon request.

- **Specialty Care (Rush University Medical Group):** All patients who completed at least one office visit in a specialty care RUMG department between 1/1/17 and 12/31/17. List of departments are available upon request.

Data Elements Collected by Setting

Common data elements for patients from all settings included age, race/ethnicity, gender, preferred language, city, state, and zip code. Additional elements for patients from specific settings are described below.

- **Inpatient:** To broadly examine reasons why patients were hospitalized, the diagnostic billing groups (MS-DRGs) assigned to each hospitalization were collected. The calendar month of the hospitalization, and number of hospitalizations within each month were also collected to account for the fact that some patients were hospitalized multiple times in a calendar year. An indicator variable was created for readmission within 30 days after the index hospitalization.

- **Emergency Department:** The primary discharge diagnoses (ICD-10) related to each ED visit was collected to broadly examine reasons why patients were seen in the ED. The Clinical Classification Software (CCS) label corresponding to each discharge diagnosis was assigned for analysis purposes in order to group related diagnoses. CCS was created by the Healthcare Cost and Utilization Project (HCUP) of the Agency for Healthcare Research and Quality (AHRQ). The SAS code file can be found on https://www.hcup-us.ahrq.gov/toolssoftware/ccs10/ccs10.jsp[1]. Similar to the data extraction for the inpatient population, the calendar month of each ED visit and number of ED visits within each month were also collected.

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- **Primary Care (Rush University Medical Group):** Ambulatory quality metric information were also collected for patients who were seen in calendar year 2017 in a RUMG primary care practice. Metrics included in the report were breast cancer screening, high blood pressure control, diabetes control, and colorectal cancer screening.

- **Specialty Care (Rush University Medical Group):** No additional data elements were collected.

Additional Data from Sources outside the Rush System

- **Geographic Data:** Patient zip codes were used to determine the Chicago region, Cook county suburb, county neighboring Cook, or other county that the patient resides in. Chicago city regions were assigned to Chicago patients by approximating the zip code and region using two maps found in http://chicago-zone.blogspot.com/2014/03/chicago-zip-code-map-locate-chicago.html[2] and http://www.thechicago77.com/chicago-neighborhoods/[3]. Zip codes that fell into suburban cook county were created based on the list found in https://www.zip-codes.com/county/il-cook.asp[4]. Counties neighboring Cook (Dupage, Will, Lake, Kane, McHenry, Kendall, and Kankakee) were classified by zip codes using the same zip-codes.com website. Patients who resided in a zip code not in Cook County or the neighboring counties were categorized as living in "Other Counties." Poverty level by zip code was attained from https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_17_5YR_S1701&prodType=table[5] and was also merged with patient data.

- **Patient Experience:** The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) provided patient experience data. Patient experience data consisted of "top box" scores. The top box is the most positive response of the HCAHPS Survey items. The most positive response is "Always" for five HCAHPS composites (Communication with Nurses, Communication with Doctors, Responsiveness of Hospital Staff, Pain Management, and Communication about Medicines) and two individual items (Cleanliness of Hospital Environment and Quietness of Hospital Environment), "Yes" for the Discharge Information composite, "'9' or '10' (high)" for the Overall Hospital Rating item, "Definitely yes" for the Recommend the Hospital item, and "Strongly agree" for the Care Transition composite.

- **Public Health Statistics:** We compared our data to Chicago and U.S. public health trends to determine if trends that we saw among our patient populations were reflective of overall public health trends in the city and nationwide. U.S. statistics for maternal health were attained from the Centers for Disease Control and Prevention (CDC) at https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-mortality-surveillance-system.htm?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Freproductivehealth%2Fmaternalinfanthealth%2Fpmss.html[6]. U.S. trends on asthma prevalence were also procured from CDC, at https://www.cdc.gov/asthma/asthmadata.htm[7]. We obtained asthma prevalence in Chicago from the Chicago Health Atlas found at https://www.chicagohealthatlas.org/indicators/asthma[8]. CDC and Chicago Health Atlas provided hypertension statistics, from

https://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_bloodpressure.htm[9] and https://www.chicagohealthatlas.org/indicators/hypertension[10], respectively.

Data Structure and Aggregation

- To simplify data analyses and aggregation, different datasets were created for each setting. The data structure for each dataset varied slightly, depending on the information that was needed. We used SQL server to extract all Rush patient data from Epic Systems and Statistical Analysis Software version 9.3 (SAS) for all management and analysis of Rush and outside data.

- **Inpatient:** This dataset was in "long" format, with one row per encounter. In order to analyze demographics and readmission status, we created a dataset with one row per unique patient be selecting the last hospitalization for each patient.
- **ED:** Like the inpatient dataset, this dataset was in "long" format, with one row per encounter. We also created a dataset with one row per unique patient by selecting the latest ED visit for each patient in order to analyze demographics.
- **Primary Care:** The data was provided as one row per unique patient.
- **Specialty Care:** The data was provided as one row per unique patient.

Data Cleaning

- Race and ethnicity are captured separately in our electronic medical record system, and we used both fields to create a combined race/ethnicity variable for analysis, which consisted of the following categories: non-Hispanic White, non-Hispanic Black, Hispanic, and others/unknown race/ethnicity.
- Language was aggregated to include English, Spanish, and other/unknown language.
- ICD-10 codes from ED encounters were grouped using CCS, which provided 3 group levels of classification. We used the CCS Level 2 groups for analyses as this categorization provided appropriate specificity for our analyses.

Creating the Race/Ethnicity Variable

```
*Recoding Race variable;
length Race2 $8.;
if patient_first_race='AMERICAN INDIAN OR ALASKA NATIVE' then Race2 ='OTHER';
else if patient_first_race='ASIAN' then Race2 = 'OTHER';
else if patient_first_race='BLACK OR AFRICAN AMERICAN' then Race2 ='AA';
else if patient_first_race='DID NOT ENCOUNTER' then Race2 ='UNKNOWN';
else if patient_first_race='NATIVE HAWAIIAN OR OTHER PACIFIC ISLANDER' then
Race2 ='OTHER';
else if patient_first_race='NOT HISPANIC OR LATINO' then Race2='OTHER';
else if patient_first_race='OTHER' then Race2 ='OTHER';
else if patient_first_race='REFUSAL' then Race2 ='UNKNOWN';
else if patient_first_race='UNKNOWN' then Race2='UNKNOWN';
else if patient_first_race='WHITE' then Race2 ='WHITE';

*Recode Ethnicity variable;
length Hispanic $8.;
if patient_ethnicity in ('DID NOT ENCOUNTER', 'REFUSAL') then
Hispanic='UNKNOWN';
else if patient_ethnicity='HISPANIC OR LATINO' then Hispanic='YES';
```

```
else if patient_ethnicity='NOT HISPANIC OR LATINO' then Hispanic='NO';

*Creating a Race/Ethnicity Variable from Race and Ethnicity;
length Race_Breakdown $8.;
if Race2='WHITE' and Hispanic in ('NO', 'UNKNOWN') then
Race_Breakdown='WHITE-NH';
else if Race2='AA' and Hispanic in ('NO', 'UNKNOWN', '') then
Race_Breakdown='BLACK-NH';
else if Race2='AA' and Hispanic='YES' then Race_Breakdown='HISPANIC';
else if Race2='WHITE' and Hispanic='YES' then Race_Breakdown='HISPANIC';
else if Race2 in ('OTHER','UNKNOWN', '') and Hispanic='YES' then
Race_Breakdown='HISPANIC';
else if Race2='OTHER' and Hispanic in ('NO','UNKNOWN') then
Race_Breakdown='OTHER';
else if Race2 in ('UNKNOWN', '') and Hispanic in ('NO', 'UNKNOWN') then
Race_Breakdown='UNKNOWN';
else if Race2='' and Hispanic='' then Race_Breakdown='UNKNOWN';

*recode patient language variable;
if patient_language='ENGLISH' then Language_Breakdown='ENGLISH';
else if patient_language in ('SPANISH', 'BILINGUAL/SPANISH') then
Language_Breakdown='SPANISH';
else if patient_language in ('ALBANIAN', 'AMERICAN SIGN LANGUAGE', 'AMHARIC',
'ARABIC', 'ARMENIAN', 'ASSYRIAN', 'BILINGUAL/OTHER', 'BOSNIAN', 'BULGARIAN',
'CANTONESE', 'CHINESE', 'CROATIAN', 'CZECH', 'ESTONIAN', 'FARSI', 'FRENCH',
'GREEK', 'GUJARATI', 'HINDI', 'ITALIAN', 'JAPANESE', 'KHMER', 'KOREAN',
'LITHUANIAN', 'MACEDONIAN', 'MALAYALAM', 'MANDARIN', 'MONGOLIAN', 'NEPALI',
'NORWEGIAN', 'POLISH', 'PORTUGUESE', 'ROMANIAN', 'RUSSIAN', 'SERBIAN',
'SICILIAN', 'SIGN LANGUAGE', 'SOMALI', 'SWAHILI', 'TAGALOG', 'TAMIL', 'THAI',
'TIGRINYA', 'TOISHANESE', 'UKRAINIAN', 'URDU', 'VIETNAMESE', 'YORUBA',
'AKLAN', 'BENGALI', 'CERTIFIED DEAF INTERPRETER', 'DANISH', 'DUTCH',
'FLEMISH', 'GERMAN', 'HAITIANCREOL', 'HUNGARIAN', 'IGBO', 'KURDISH',
'NAVAJO', 'PAHTO', 'SINHALESE', 'SWEDISH', 'TACTILE SIGN LANGUAGE', 'TELUGU',
'TRADITIONAL CHINESE', 'TURKISH', 'WOLOF') then Language_Breakdown='OTHER';
else if patient_language in ('', 'DID NOT ENCOUNTER') then
Language_Breakdown='UNKNOWN';
```

Statistical Analyses

- Analyses were largely descriptive in nature, describing patient populations by which setting they were seen in at Rush, the top conditions that patients were seen for, and where they came from.
- Quality metric outcomes, readmission status, reasons of ED visits, and reasons of hospitalizations were analyzed by age, gender, and race/ethnicity groups to determine if there were differences.
    - Chi-square tests were used for preliminary analyses to assess the relationship between the outcomes and demographic variables.
    - Multivariate logistic regression models were used to further analyze quality metric screening completion and readmission status while controlling for age, gender, and race/ethnicity. Models examining readmission status were also controlled for zip code level poverty (as a proxy for socioeconomic status), and whether the hospitalization was for psychosis, heart failure, or renal failure, as readmissions

are more common among hospitalizations for these conditions versus some others.

- Choropleth maps, which display shaded, color patterns associated with the value of the desired variable on a map, were created to show patient counts by zip code for inpatient, ED, primary care, and outpatient specialty care populations. Zip codes with less than 25 patients were not shown to protect privacy. These maps were developed in Tableau version 9.0.
- The health topics were created based on the statistics of the MS-DRG codes and ICD-10 CCS Level 2 groups that had the highest counts across all racial/ethnic groups. Maternal health consisted of ED pregnancy-related complications and inpatient vaginal delivery and cesarean section complications. Child Respiratory Health consisted of ED asthma and respiratory infections, and inpatient bronchitis/asthma. Adult Cardiovascular Health consisted of ED heart disease and inpatient heart failure. Each of the health outcomes were analyzed by race/ethnicity, adjusting for age and gender in logistic regression.

Data Aggregation and Analysis by Health Topic

Maternal Health

- ED Pregnancy Complications
  - CCS Level 2 Label: Complications mainly related to pregnancy
  - Numerator: Women with complications mainly related to pregnancy who are 13-45 years old
  - Denominator: Women 13-45 years old
- Inpatient Vaginal Delivery with Complications
  - MS-DRG 774: Vaginal delivery with Complicating Diagnoses
  - MS-DRG 775: Vaginal delivery without Complicating Diagnoses
  - Numerator: Women with MS-DRG 774
  - Denominator: Women with either MS-DRG 774 or 775
- Inpatient Cesarean Section with Complications
  - MS-DRG 765: Cesarean section with CC (complications or comorbidities)/MCC (major complication or comorbidity when used as a secondary diagnosis)
  - MS-DRG 766: Cesarean section without CC/MCC
  - Numerator: Women with MS-DRG 765
  - Denominator: Women with either MS-DRG 765 or 766

Childhood Respiratory Health

- ED Childhood Asthma
  - CCS Level 2 Label: Asthma
  - Numerator: Children who visited the ED for Asthma
  - Denominator: Children who visited the ED
- ED Childhood Respiratory
  - CCS Level 2 Label: Respiratory Infections
  - Numerator: Children who visited the ED for respiratory infection
  - Denominator: Children who visited the ED
- Inpatient Childhood Bronchitis and Asthma
  - MS-DRG 202: Bronchitis and asthma with CC/MCC
  - MS-DRG 203: Bronchitis and asthma without CC/MCC

  - Numerator: Children who were hospitalized with bronchitis and asthma with or without CC/MCC
  - Denominator: Children who were hospitalized.

Adult Cardiovascular Health

- ED Adult Heart Disease
  - CCS Level 2 Label: Diseases of the heart
  - Numerator: Adults who visited the ED for diseases of the heart
  - Denominator: Adults who visited the ED
- Inpatient Adult Heart Failure
  - MS-DRG 291: Heart failure and shock with MCC or peripheral extracorporeal membrane oxygenation (ECMO)
  - MS-DRG 292: Heart failure and shock with CC
  - MS-DRG 293: Heart failure and shock without CC/MCC
  - Numerator: Adults who were hospitalized with heart failure and shock with MCC or peripheral ECMO, heart failure and shock with CC, or heart failure and shock without CC/MCC
  - Denominator: Adults who were hospitalized

References

[1]Beta Clinical Classifications Software (CCS) for ICD-10-CM/PCS. Healthcare Cost and Utilization Project (HCUP). October 2018. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/toolssoftware/ccs10/ccs10.jsp.

[2]Agrawal, Umesh. 2013. http://chicago-zone.blogspot.com/2014/03/chicago-zip-code-map-locate-chicago.html

[3]The Chicago 77. 2019. http://www.thechicago77.com/chicago-neighborhoods/.

[4]Datasheer, L.L.C. 2018. https://www.zip-codes.com/county/il-cook.asp.

[5]U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_17_5YR_S1701&prodType=table.

[6]CDC 2018. https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-mortality-surveillance-system.htm?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Freproductivehealth%2Fmaternalinfanthealth%2Fpmss.html

[7]CDC 2014. https://www.cdc.gov/asthma/asthmadata.htm

[8]Chicago Health Atlas. 2016. https://www.chicagohealthatlas.org/indicators/asthma

[9]CDC 2016. https://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_bloodpressure.htm

[10]Chicago Health Atlas. 2016. https://www.chicagohealthatlas.org/indicators/hypertension