

## **Material and Methods**

### **Data source**

The Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) 2002-2012 Nationwide Inpatient Sample (NIS) was analyzed. The NIS contains an approximately 20% stratified representative cross-sectional sample of all US hospitalizations each year. Factoring in the sampling design of hospitals, sample weights were created by NIS, which allow for representative estimates of hospital discharges across the US [7]. All data were de-identified, and no attempts were made to identify individuals from the dataset. The HCUP's formal data use agreement was upheld by all parties with access to NIS. The Institutional Review Board at Northwestern University approved the study.

### **Identification of psoriasis, AA, and HS comorbidities**

Psoriasis was identified by a primary and/or secondary occurrence of the previously validated *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* diagnosis code 696.1 [8]. Three different control groups were used: 1. all hospitalizations without a diagnosis of psoriasis yielding a representative cohort of US hospitalizations, 2. all pediatric (age 0-17 years) hospitalizations without a diagnosis of psoriasis yielding a representative cohort of US hospitalizations and 3. all hospitalizations with a diagnosis of either alopecia areata (AA) and hidradenitis suppurativa (HS) (704.01 and 705.83, respectively). AA and HS were chosen because they were previously shown to have significant MH comorbidity [6]. MH comorbidities were determined by NIS Clinical Classification Software codes 650-663 and 670.

## Statistical analysis

All analyses were performed using SURVEY procedures in SAS (version 9.4, SAS Institute, Cary, NC) that accounted for clustering by individual hospitals, discharge trend weights, and sample strata that accounted for hospital's census region or division, ownership/control, location/teaching and number of beds. The weighted frequency and prevalence (95% CI) of either a primary or any (primary/secondary) diagnosis of a MH disorders was determined for inpatients with psoriasis and controls without psoriasis, or with AA or HS. Cost of inpatient care was estimated using the total charge of hospitalization and the cost-to-charge ratio provided by HCUP. All costs were adjusted for inflation to the year 2014 using the Consumer Price Index from the US Bureau of Labor Statistics [9]. Mean length of stay (LOS), inflation-adjusted cost-of-care and 95% CI were determined for psoriasis and controls.

The association between psoriasis and MH disorders was determined using survey logistic regression models. The dependent variable was either any (primary/secondary) or only primary diagnosis of a MH disorder (yes/no). Diagnosis of psoriasis (yes/no) was the independent variable. Multivariable models included age (continuous), sex (male/female), race (white/non-white) and insurance status (yes/no). Crude and adjusted odds ratios (OR) and 95% CI were estimated.

To determine the associations of any MH disorder (binary dependent variable) in inpatients with psoriasis, multivariable logistic regression models were constructed using stepwise selection ( $\alpha=0.05$ ) from the following covariables: age (18-39/40-59/60-79/ $\geq 80$ ), sex (female/male), season of admission (spring/winter/fall/summer), race/ethnicity (white/black/Asian/Hispanic/other or multiracial), median annual income of the hospital ZIP code (quartiles), hospital location (metropolitan /fringe-metropolitan /micropolitan/not metropolitan or micropolitan), insurance coverage (Medicaid/Medicare, private/uninsured), number of chronic conditions (0-1/2-5/6+), hospital region (northeast/midwest/south/west), bed size (small/medium/large), and teaching status (yes/no). Adjusted OR and 95% CI were estimated.

To determine the relationship of MH disorders with hospitalization cost and LOS in psoriasis patients, survey weighted linear regression models were constructed with either log-transformed cost of care or length of stay (LOS) as the dependent variables and any MH disorder as the binary independent variable. Cost of care and LOS were not normally distributed and therefore were log-transformed. Excess LOS and cost of care for a MH disorder indirectly related to psoriasis were estimated by:  $((\text{prevalence of that MH disorder in psoriasis patients}) / (\text{prevalence of that MH disorder in non-psoriasis patients})) * (\text{Total hospitalization annual days or costs for that MH disorder in psoriasis patients})$ . Sensitivity analyses were performed comparing cost of care and LOS in psoriasis to AA and HS. Sensitivity analyses were conducted limited to the pediatric population (ages 0-17 years).

Complete case-analysis was implemented. Two-sided P values less than or equal to 0.05 were considered significant.