Linking EMR With SDOH Data: Insights Across Disease Cohorts

Pamela Landsman-Blumberg[1]; Kathy Schulman[2]; Jessica Duchen[1]
[1]Magnolia Market Access; [2]Schulman Consulting

Magnolia market access
a medical knowledge group company

Scan the QR code to learn more about Magnolia Market Access' work with HEOR & SDOH

Introduction

- Social determinants of health (SDOH) are the conditions in which people are born, live, work, and age
- SDOH factors are estimated to drive up to 80% of health outcomes and drive health inequities[1]

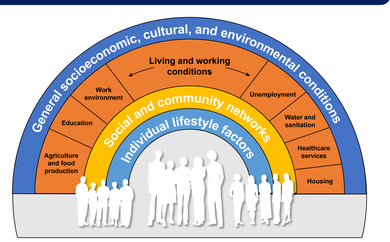


Figure 1. Social Determinants of Health

Objectives

- Link individual and household-level SDOH characteristics to select electronic medical record (EMR) disease cohorts
  - Human immunodeficiency virus (HIV)
  - Chronic kidney disease (CKD)
  - Heart failure (HF)
  - Type 2 diabetes (T2DM)
  - Metastatic prostate cancer (mPCa)
- Identify traditionally unavailable SDOH measures for inclusion in real-world data analysis

Methods

- EMR encounter records from community healthcare providers between 01/01/2016 and 12/31/2021 and SDOH factors for calendar year 2022 including demographics, socioeconomics, and household information were used[2]
- Both data sources are compliant with the Health Insurance Portability and Accountability Act of 1996 and linked by a unique anonymized identifier
- Patients aged 18+ with evidence of HIV, CKD, HF, T2DM, and mPCa were identified using EMR diagnosis codes (International Classification of Diseases 9th [ICD-9-CM] and 10th [ICD-10-CM] Revisions, Systematized Medical Nomenclature for Medicine–Clinical Terminology [SNOMED CT]) before linking to SDOH data
- Descriptive statistics of SDOH measures were evaluated for age, sex, race, custom-defined composite measures for household status (marital status; household size; children in the home), and household economic status (economic stability indicator [ESI], household income)
- ESI ranges from 0 to 30, with higher numbers indicating less economic stability

Results

- Highest overlap among patients living with HIV, lowest among mPCa patients
- HIV patients were the youngest (51.2 [±14.4] years), while mPCa patients were the oldest (75.5 [±9.3] years)
- The majority of CKD, T2DM, and HF patients were female

Table 1. Overlap between EMR and SDOH by Disease Cohort

	EMR # patients	Overlap w/SDOH # patients	Overlap %
Diagnosis prior to 1/1/2022*			
CKD, any	1,977,085	441,012	22.3%
Stage 1 or 2	422,920	112,991	26.7%
Stage 3 or 4	1,430,454	349,022	24.4%
Advanced	316,019	69,122	21.9%
T2DM	6,774,464	1,830,024	27.0%
HF	2,071,329	432,692	20.9%
HIV	249,960	85,675	34.3%
mPCa	4,214	830	19.7%

- mPCa patients were most likely to have an annual household income >$100k, while HIV, advanced CKD, and HF patients had the lowest annual household income
- HIV and CKD patients have the lowest, while mPCa patients have the highest, economic stability
- Despite high levels of income, 28% to 47% of households have low economic stability

Table 2. Economic Stability Indicator by Disease Cohort

ESI	HIV N=84,371	CKD, advanced N=71,591	HF N= 426,527	T2DM N=1,816,799	mPCa N=944
High prime (ESI scores 1-5)	13.9%	13.8%	19.6%	19.5%	29.0%
Near prime (ESI scores 6-9)	10.7%	11.5%	14.4%	15.2%	15.0%
Sub prime (ESI scores 10-30)	75.4%	74.7%	65.9%	65.3%	55.9%

- T2DM and CKD patients are most likely to have children in the home and the largest mean household size
- HIV patients are most likely to be single and living in a household without children
- HF and mPCa patients are most likely to be aged 65+ and living alone

Figure 2. Household Constellation by Disease Cohort

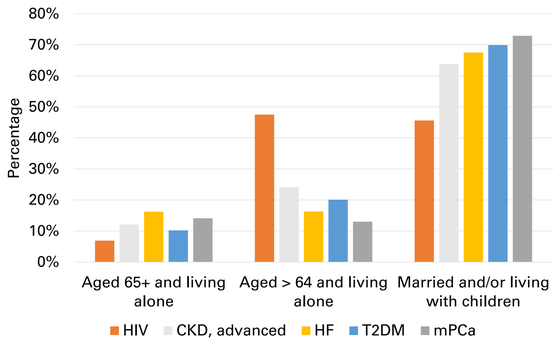


Figure 3. Race/Ethnicity by Disease Cohort.
Racial diversity was greatest among patients with CKD and HF

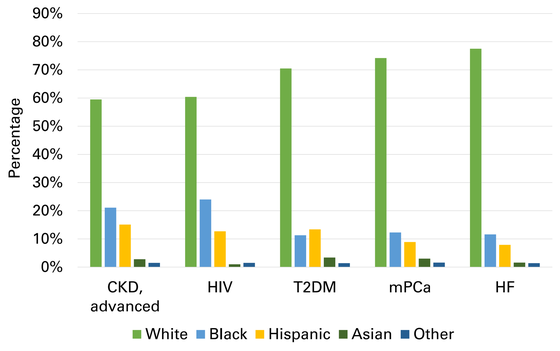
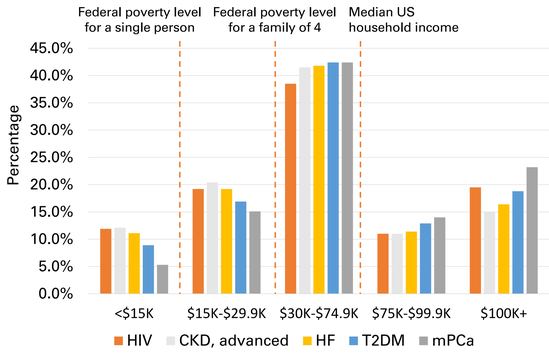


Figure 4. Disease Cohorts by Household Income
The majority of patients have a household income below the median US income, across all disease cohorts



Conclusions

- Linking EMR data with person-level SDOH data provides new insights into disease-specific cohorts beyond standard demographics
- Including patient/household level rather than geographic level, SDOH measures may also remove variability and bias when measuring health outcomes and costs
- Composite measures and interactions can be derived to provide deeper insights into SDOH factors that may influence care patterns and outcomes
- Can be included in propensity score models to remove biases or included as independent variables in analytic models to measure association with measure of interest
- As with analysis of any real-world data source, it is critical to understand the represented underlying population to put findings into the correct context

References

1. Greer ML, Garza MY, Sample S, Bhattacharyya S. Social determinants of health data quality at different levels of geographic detail. *Stud Health Technol Inform*. 2023;302:217-221. doi:10.3233/SHTI230106
2. Sprague C, Simon SE. Ending HIV in the USA: integrating social determinants of health. *Lancet*, 398(10302):742-743. doi:10.1016/S0140-6736(21)01236-8
3. CHRONOS. 2017-2023. Forian, Inc., Newtown, PA. https://forian.com