

Linking EMR with SDOH Data: Insights Across Disease Cohorts

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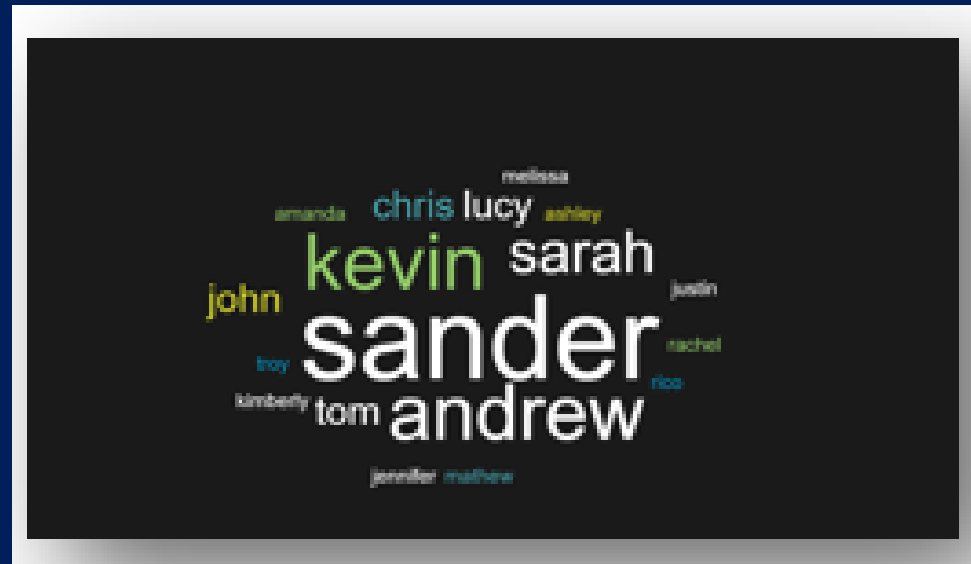
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Interactive Question

Word Cloud

What is the first word that comes to mind when thinking of social determinants of health (SDOH)?

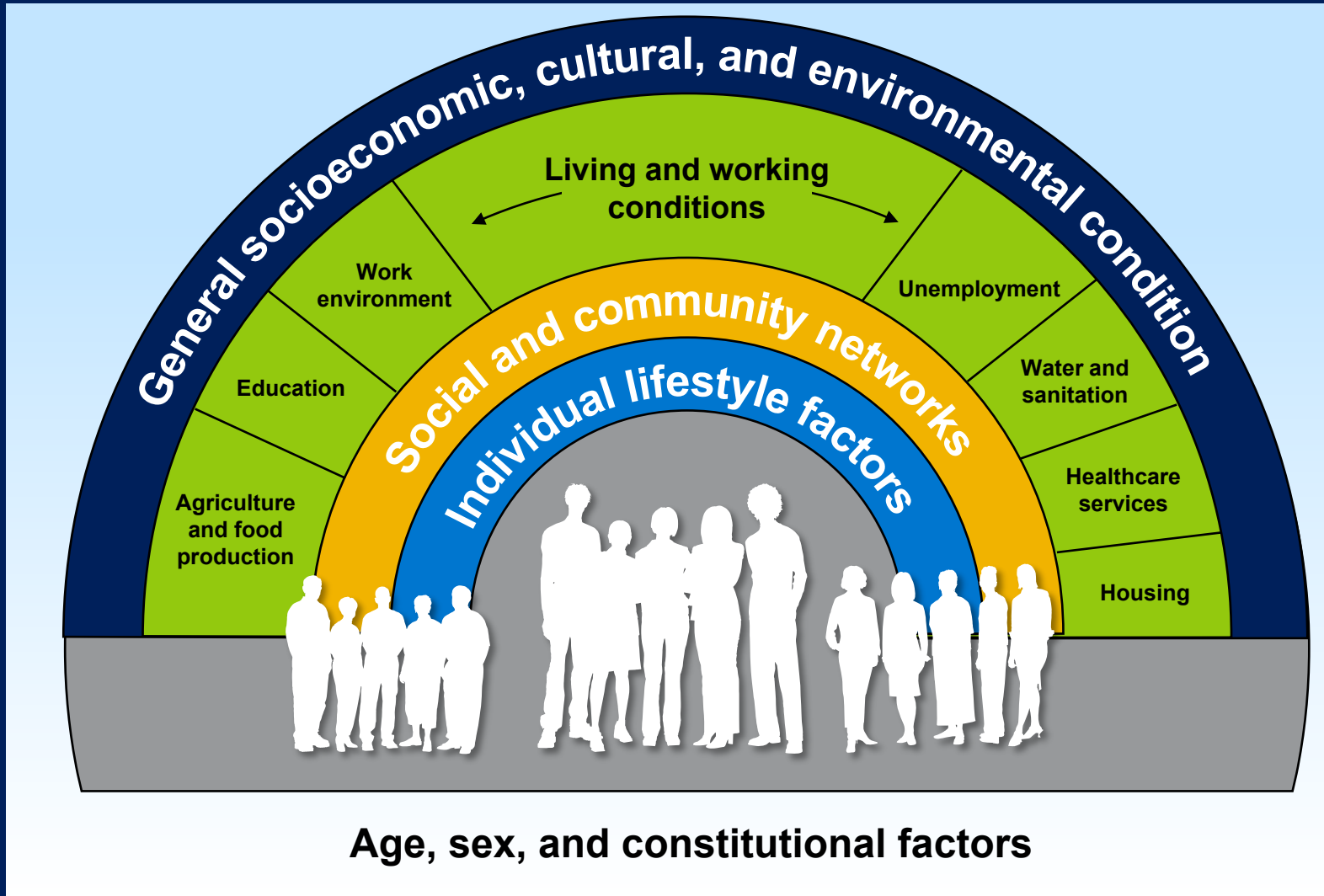


**Please note the word cloud will form as the attendees respond.

Learning Objectives

1. Describe how social determinants of health (SDOH) linked to EMR data provide insights into disease-specific patient cohorts beyond standard demographic data.
2. Understand how composite measures and interactions can be derived to provide deeper insights into SDOH factors that may influence care patterns and outcomes.

Social Determinants of Health



- Conditions in which people are born, live, work, and age
- Estimated to drive up to 80% of health outcomes¹

¹Greer 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

Purpose

- 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

- Utilized two data sources: EMR encounter records and SDOH data from CY 2022
- Identified patients with the disease states of interest from the EMR
 - ICD-10-CM, ICD-9-CM, and SNOMED codes
- Patients in each disease cohort were matched to those in the SDOH database using unique anonymized patient identifiers.
- A patient was classified as having “overlapped”
 - if the patient had a record in SDOH
and
 - a record in the problems table for one of the requisite disease states
 - on or before December 31, 2021.

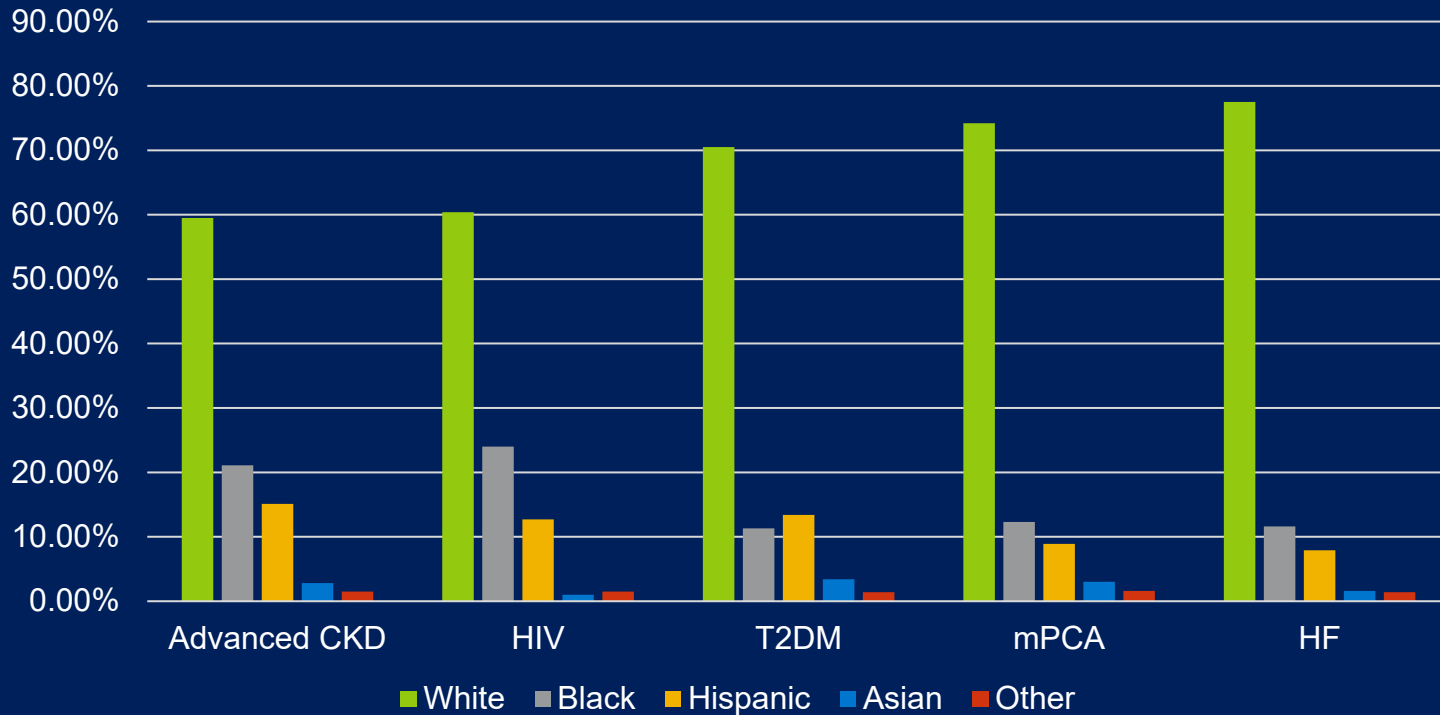
SDOH Overlap: Average 25% EMR

	EMR # Patients	Overlap w/SDOH # Patients	Overlap %
Dx 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%
Diabetes Type 2	6,774,464	1,830,024	27.0%
Heart Failure	2,071,329	432,692	20.9%
HIV	249,960	85,675	34.3%
Met Prostate CA + Exc	4,214	830	19.7%

- Highest overlap among patients living with HIV.
- Lowest overlap among mPCa patients.

Results: Demographics

Race/Ethnicity



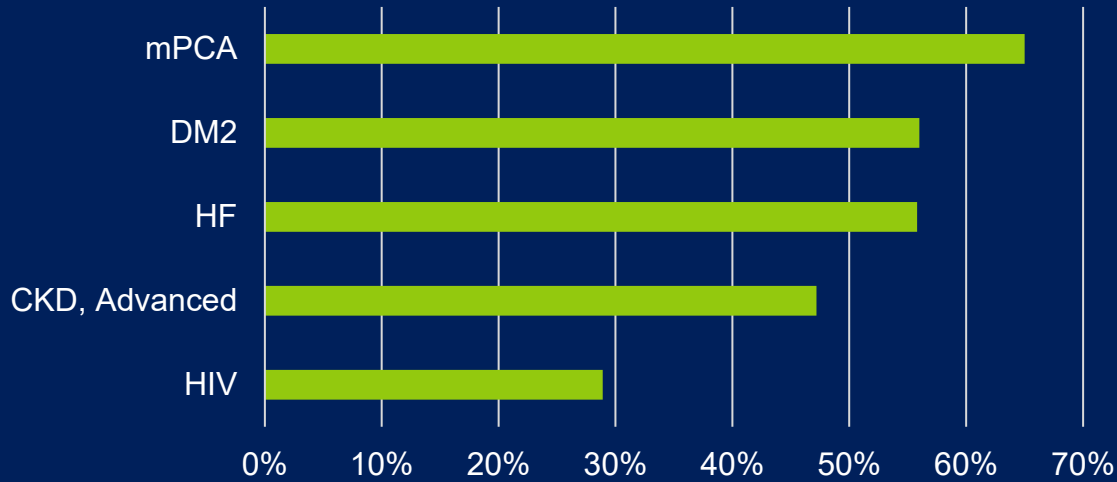
Racial diversity was greatest amongst patients with advanced CKD or HIV and lowest amongst those with mPCA or HF.

Cohort	Age Mean (SD)	% Male
CKD, Advanced	72.3 (13.8)	48.3%
T2DM	64.5 (14.0)	43.6%
HF	72.3 (13.8)	43.7%
HIV	51.2 (14.4)	65.1%
mPCA	75.5 (9.3)	96.6%

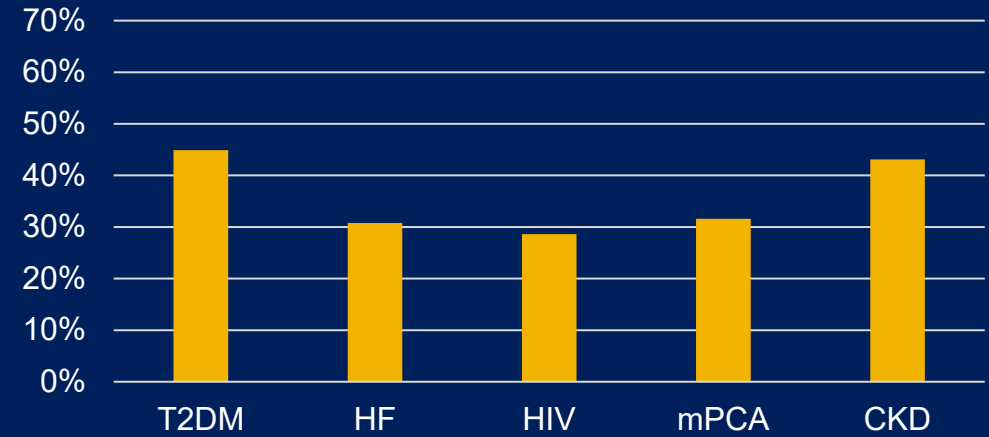
- HIV patients are younger, while mPCA patients are older.
- CKD, T2DM, HF patients were more likely to be female.

Results: Household Characteristics

Marital Status



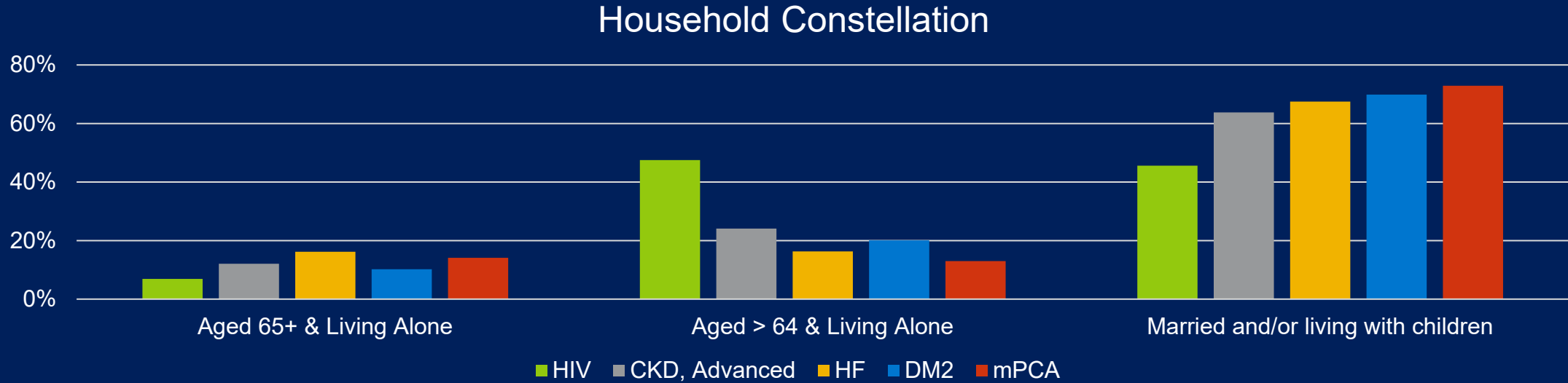
Households with Children Residing in the Home



	Household Size, mean (SD)
T2DM	2.8 (1.3)
CKD	2.7 (1.3)
HF	2.4 (1.2)
HIV	2.0 (1.2)
mPCA	2.5 (1.1)

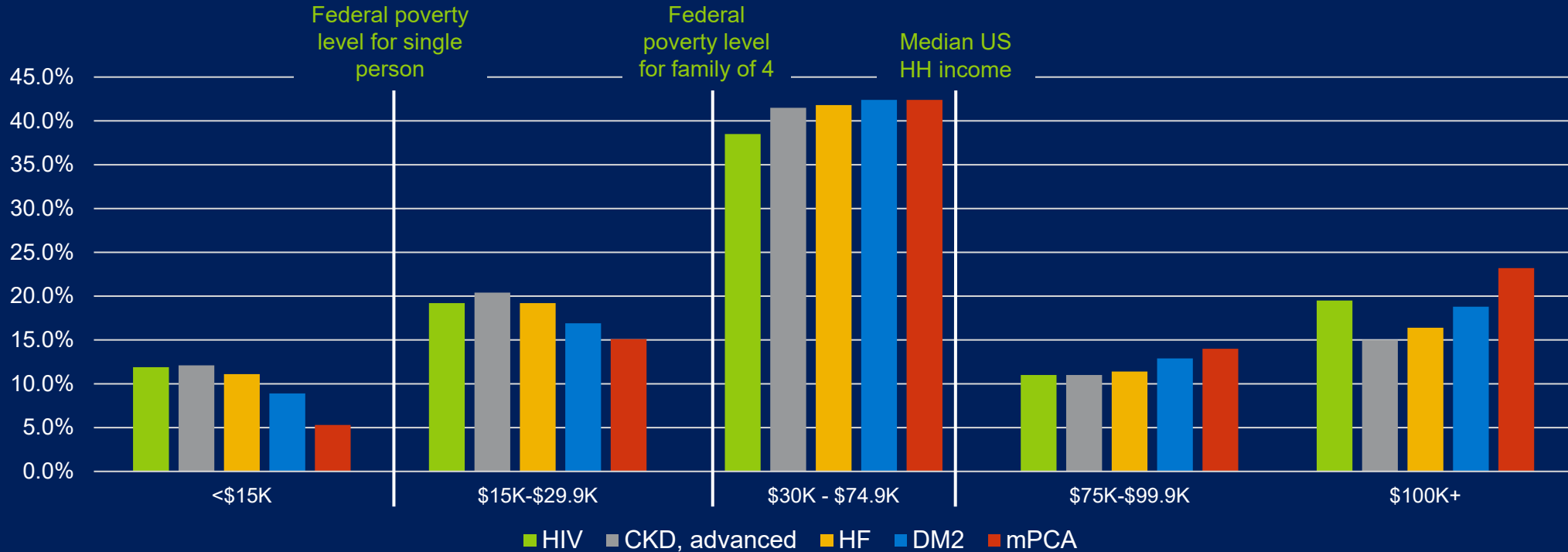
- The majority of mPCA, DM2, HF patients were married.
- T2DM and CKD patients were most likely to have children in the home, and the largest mean household size.

Results: Composite Household Status



- HIV patients are most likely to be single living in a household without children.
- HF and mPCA patients are most likely to be aged 65+ and living alone.
- Composite measure helps identify populations who may be more likely to need additional assistance managing their disease.

Results: Annual Household Income



- Most patients have annual household income at or below the 2022 US median household income (\$74,580)
- mPCA patients were most likely to have an annual household income >\$100k.
- HIV, advanced CKD, HF patients had the lowest annual household income

1 <https://www.census.gov/library/publications/2023/demo/p60-279.html#:~:text=Real%20median%20household%20income%20was,and%20Table%20A%2D1>

2 <https://www.healthcare.gov/glossary/federal-poverty-level-fpl/>

Results: Economic Stability Indicator

ESI	HIV N=84,371	Advanced CKD N=71,591	HF N= 426,527	DM2 N=1,816,799	mPCA N=944
Mean (SD)	17.3 (8.8)	16.7 (8.5)	14.4 (8.4)	14.3 (8.3)	12.0 (8.1)
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%

Economic Stability Indicator (ESI)¹:

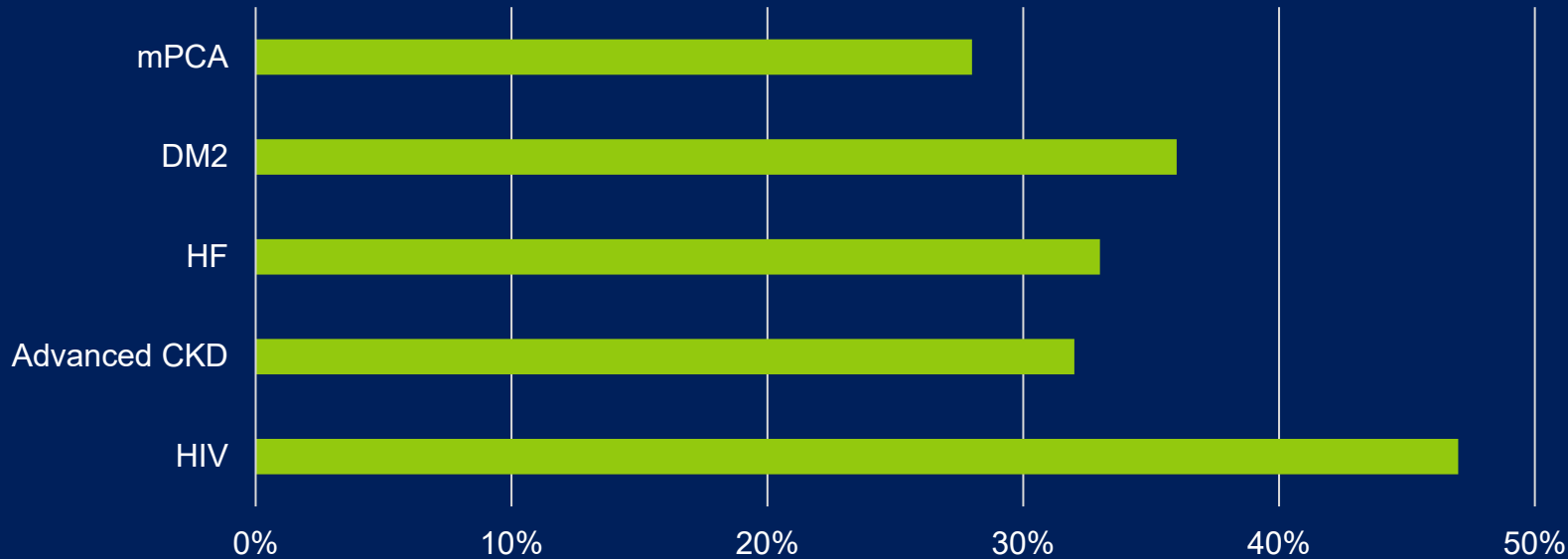
- Created by Membership Marketing Support Services (MMSS) in 2016.
- A model score used to rank-order the likelihood of invitation to apply and receive approvals on direct marketing lists.
- May proxy credit scores but NOT built with credit data.
- Ranges from 1 (most stable) to 30 (least stable), approximating credit scores from 365 to 800, in increments of 15.

HIV and CKD patients have the lowest, while mPCA patients have the highest economic stability.

¹<https://www.economicstabilityindicatormn.org/About>

Results: Interaction of Household Economic Indicators

Subprime ESI Among Those with HH Income > US Median



Like composite measures, interactions can uncover additional insights.

- Income and ESI are highly correlated.
- Despite high levels of income, 28% - 47% of households have low economic stability.

Recommendations: When Considering Linking SDOH Data



Linking EMR data with person-level SDOH data provides new insights into disease-specific cohorts beyond standard demographics.



Composite measures and interactions can be derived to provide deeper understanding of 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, critical to understand the underlying population represented to put findings into the correct context.

Post-test Question

Which of the following statements related to SDOH factors is true.

- a) Composite measures and interaction terms are not useful or insightful.
- b) SDOH factors only include age, race/ethnicity, and gender.
- c) Composite measures and interactions can be derived to provide deeper insights into SDOH factors that may influence care patterns and outcomes.
- d) SDOH factors have very little influence on health outcomes.

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