Social Determinants of Health Predict Annual Chronic Kidney Disease Screening & Disease Development among Newly Diagnosed Hypertensive & Type-2 Diabetic Patients in a Large Midwestern Health System

Mary Ingle, PhD, MPH[1]; Rasha Khatib, PhD, MPH[1]; Yuxian Du, PhD[2], Vesta Valuckaite, MD, MSc[2], Rakesh Singh, PhD[2], Sheldon Kong, PhD[2], Todd Williamson, PhD[2], Sarang Baman, MD[3]

[1] Advocate Aurora Health Research Institute; [2] Data Generation and Observational Studies, Bayer U.S. Healthcare Pharmaceuticals [3] Enterprise Population Health, Advocate Aurora Health

Background

Clinical guidelines suggest regular chronic kidney disease (CKD) screening after diagnosis of hypertension (HTN) or type 2 diabetes (T2DM), as both are relevant risk factors. Annual monitoring of kidney function allows for early detection of CKD and can improve quality of life. However, social determinants of health (SDOH) can impact access to routine care, including CKD screening. We explore how SDOH factors collected in electronic health records (EHR) predict annual CKD screening & CKD development among newly diagnosed patients with HTN and/or T2DM.

Table 1. Demographic characteristics of Advocate Aurora Health patients (n=235,208) with a new HTN and/or T2DM diagnosis between 2015-2018.

	All [a] (n=235,208)		HTN [b] only (n=154,056, 65%)		T2DM [c] only (n=20,514, 9%)		HTN & T2DM [d] (n=60,638, 26%)	
	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Age	60	(51, 69)	60	(50, 69)	54	(43, 64)	63	(55, 71)
BMI (kg/m²)	31	(27, 36)	30	(27, 35)	31	(27, 36)	33	(28, 38)
	n	%	n	%	n	%	n	%
Female	123,944	53	82,657	54	10,483	51	30,804	51
Ever smoked	86,533	37	57,022	37	7,162	35	22,349	37
Race/Ethnicity								
White	126,502	57	89,899	65	9,539	50	27,064	47
Black	59,953	27	37,251	27	4,272	22	18,430	32
Hispanic/Latino	18,764	8	9,118	6	3,084	16	6,652	11
Asian	9,022	4	4,628	3	1,267	7	3,127	5
Other	9,498	4	6,050	4	952	5	2,496	4
Insurance								
Commercial	192,257	82	126,680	83	18,003	89	47,574	79
Medicare	38,687	17	24,545	16	2,061	10	12,081	20
Uninsured	2,110	1	1,462	1	206	1	442	1
Medicaid	114	<1	79	<1	10	<1	25	<1
Marital status								
Married/Partner	130,771	56	86,450	56	11,256	55	33,065	55
Single	85,025	36	55,298	36	8,312	41	21,415	35
Widowed	19,406	8	12,302	8	946	5	6,158	10
Employment								
Unemployed	143,498	61	90,715	59	12,674	62	40,109	66
Employed	63,866	27	44,331	29	6,305	31	13,230	22
Retired	27,541	12	18,792	12	1,500	7	7,249	12

[a] missing: race/ethnicity: n=11,469, insurance: n=2,040, marital status: n=6, employment: n=303; [b] missing: race/ethnicity: n=7,110, insurance: n=1,290, marital status: n=6, employment: n=218; [c] missing: race/ethnicity: n=1,400, insurance: n=234, employment: n=35; [d] missing: race/ethnicity: n=2,959, insurance: n=516, employment: n=50; Other race: American Indian or Alaskan Native, Native Hawaiian or Other Pacific Islander, and two or more races; Unemployed also includes students

Methods

EHR of patients (n=235,208) with a new HTN and/or T2DM diagnosis between 2015-2018 were abstracted. Patients were followed for three years to assess annual CKD screening (one estimated glomerular filtration rate & one urinary albumin-to-creatine ratio) and CKD development (CKD or end stage renal disease diagnosis). Multivariable logistic regression models adjusted for age, sex, smoking, state, HTN & T2DM were used to evaluate the relationship between SDOH factors with CKD screening and CKD development.

Conclusion

The increase in CKD incidence among Black and retired patients could be due to frequent screenings. However, employment and single status were not a predictor of screening, yet a predictor of CKD. It's possible lifestyle factors unique to this population contributes to CKD development and explored further.
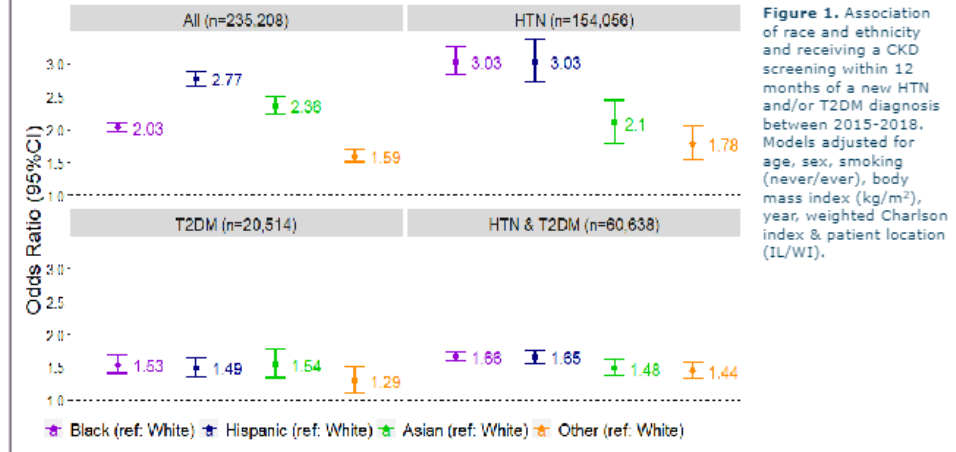

Figure 1. Association of race and ethnicity and receiving a CKD screening within 12 months of a new HTN and/or T2DM diagnosis between 2015-2018. Models adjusted for age, sex, smoking (never/ever), body mass index (kg/m²), year, weighted Charlson index & patient location (IL/WI).
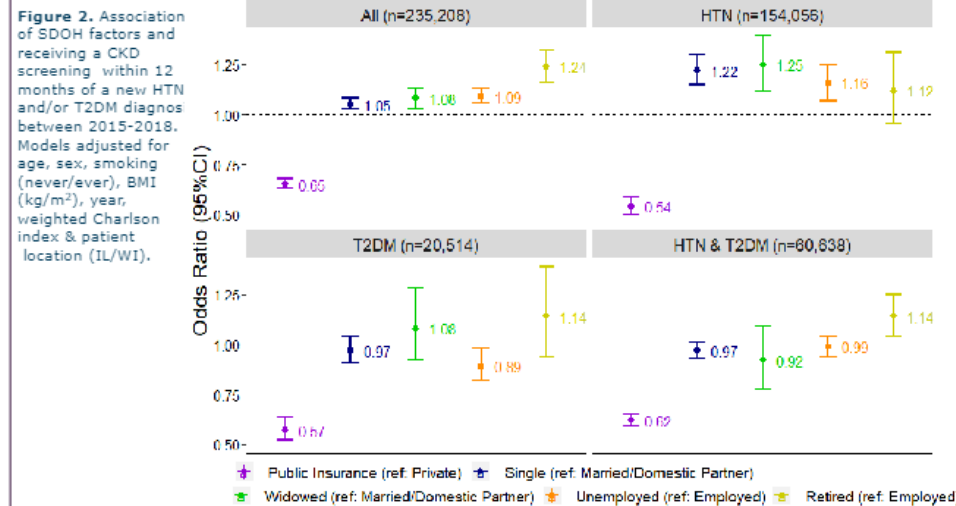

Figure 2. Association of SDOH factors and receiving a CKD screening within 12 months of a new HTN and/or T2DM diagnosis between 2015-2018. Models adjusted for age, sex, smoking (never/ever), BMI (kg/m²), year, weighted Charlson index & patient location (IL/WI).

Results

Most patients were White (57%) females (55%) with solely HTN (65%). Public health insurance patients were 65% less likely to be screened for CKD compared to patients with private insurance (Odds Ratio (OR)=0.65 95% Confidence interval (CI):0.68,0.63). Black (OR=2.03, 95%CI:1.97, 2.09), Hispanic (OR=2.77, 95%CI:2.66, 2.88), Asian (OR=2.36, 95%CI: 2.24, 2.50) patients were more likely to be screened compared to White patients.
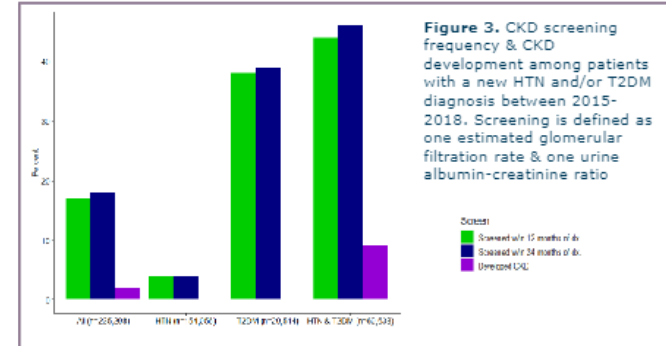

Figure 3. CKD screening frequency & CKD development among patients with a new HTN and/or T2DM diagnosis between 2015-2018. Screening is defined as one estimated glomerular filtration rate & one urine albumin-creatinine ratio

Figure 4. Association of SDOH (A) and race & ethnicity (B) and receiving a CKD diagnosis (CKD or end stage renal disease) after a new HTN and/or T2DM diagnosis between 2015-2018. Logistic regression models adjusted for age, sex, smoking (never/ever), BMI (kg/m²), year, patient location (IL/WI), weighted Charlson index & ≥1 CKD screening within 24 months of diagnosis (yes/no).

Background

Clinical guidelines suggest regular chronic kidney disease (CKD) screening after diagnosis of hypertension (HTN) or type 2 diabetes (T2DM), as both are relevant risk factors. Annual monitoring of kidney function allows for early detection of CKD and can improve quality of life. However, social determinants of health (SDOH) can impact access to routine care, including CKD screening. We explore how SDOH factors collected in electronic health records (EHR) predict annual CKD screening & CKD development among newly diagnosed patients with HTN and/or T2DM.

Table 1. Demographic characteristics of Advocate Aurora Health patients (n=235,208) with a new HTN and/or T2DM diagnosis between 2015-2018.

	All [a] (n=235,208)		HTN [b] only (n=154,056, 65%)		T2DM [c] only (n=20,514, 9%)		HTN & T2DM [d] (n=60,638, 26%)	
	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Age	60	(51, 69)	60	(50, 69)	54	(43, 64)	63	(55, 71)
BMI (kg/m^2)	31	(27, 36)	30	(27, 35)	31	(27, 36)	33	(28, 38)
	n	%	n	%	n	%	n	%
Female	123,944	53	82,657	54	10,483	51	30,804	51
Ever smoked	86,533	37	57,022	37	7,162	35	22,349	37
Race/Ethnicity								
White	126,502	57	89,899	65	9,539	50	27,064	47
Black	59,953	27	37,251	22	4,272	22	18,430	32
Hispanic/Latino	18,764	8	9,118	6	3,084	16	6,652	11
Asian	9,022	4	4,628	3	1,267	7	3,127	5
Other	9,498	4	6,050	4	952	5	2,496	4
Insurance								
Commercial	192,257	82	126,680	83	18,003	89	47,574	79
Medicare	38,687	17	24,545	16	2,061	10	12,081	20
Uninsured	2,110	1	1,462	1	206	1	442	1
Medicaid	114	<1	79	<1	10	<1	25	<1
Marital status								
Married/Partner	130,771	56	86,450	56	11,256	55	33,065	55
Single	85,025	36	55,298	36	8,312	41	21,415	35
Widowed	19,406	8	12,302	8	946	5	6,158	10
Employment								
Unemployed	143,498	61	90,715	59	12,674	62	40,109	66
Employed	63,866	27	44,331	29	6,305	31	13,230	22
Retired	27,541	12	18,792	12	1,500	7	7,249	12

[a] missing: race/ethnicity: n=11,469, insurance: n=2,040, marital status: n=6, employment: n=303; [b] missing: race/ethnicity: n=7,110, insurance: n=1,290, marital status: n=6, employment: n=218; [b] missing: race/ethnicity n=1,400, insurance: n=234, employment: n=35; [d] missing: race/ethnicity n=2,959, insurance: n=516, employment: n=50; Other race: American Indian or Alaskan Native, Native Hawaiian or Other Pacific Islander, and two or more races; Unemployed also includes students

Methods

EHR of patients (n=235,208) with a new HTN and/or T2DM diagnosis between 2015-2018 were abstracted. Patients were followed for three years to assess annual CKD screening (one estimated glomerular filtration rate & one urinary albumin-to-creatine ratio) and CKD development (CKD or end stage renal disease diagnosis). Multivariable logistic regression models adjusted for age, sex, smoking, state, HTN & T2DM were used to evaluate the relationship between SDOH factors with CKD screening and CKD development.

Conclusion

The increase in CKD incidence among Black and retired patients could be due to frequent screenings. However, employment and single status were not a predictor of screening, yet a predictor of CKD. It's possible lifestyle factors unique to this population contributes to CKD development and explored further.
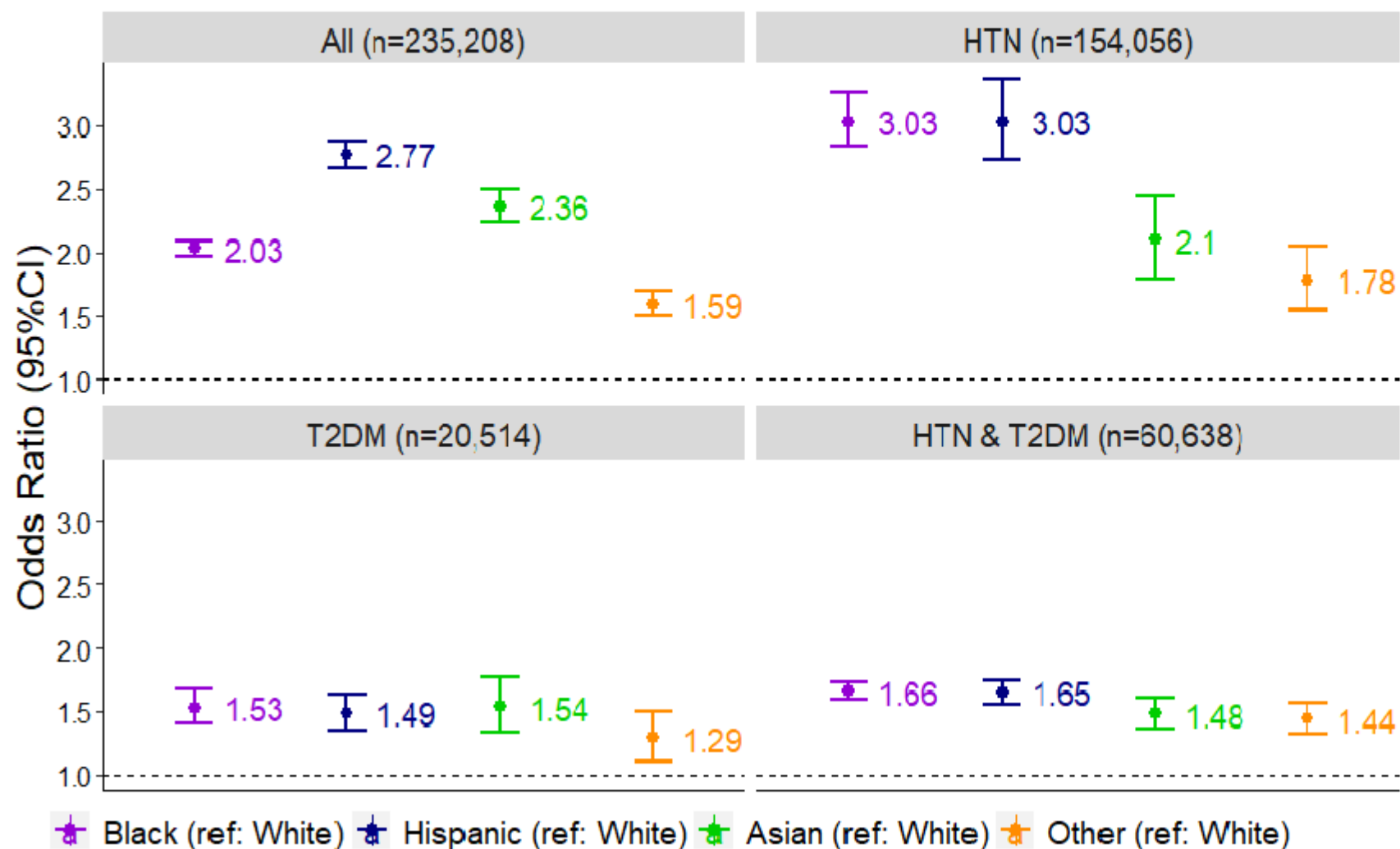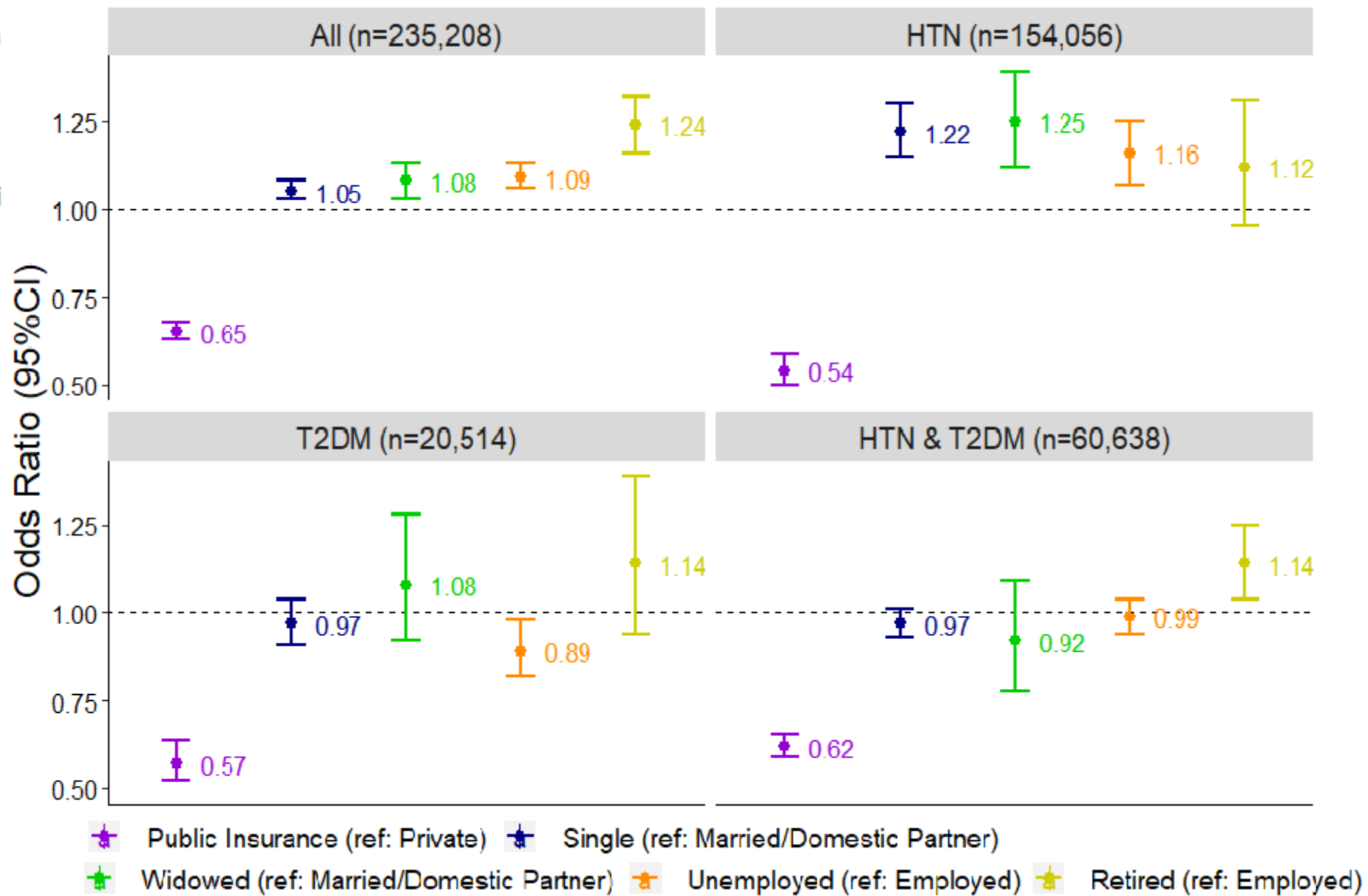

Figure 1. Association of race and ethnicity and receiving a CKD screening within 12 months of a new HTN and/or T2DM diagnosis between 2015-2018. Models adjusted for age, sex, smoking (never/ever), body mass index (kg/m^2), year, weighted Charlson index & patient location (IL/WI).

Figure 2. Association of SDOH factors and receiving a CKD screening within 12 months of a new HTN and/or T2DM diagnosis between 2015-2018. Models adjusted for age, sex, smoking (never/ever), BMI (kg/m^2), year, weighted Charlson index & patient location (IL/WI).

Results

Most patients were White (57%) females (55%) with solely HTN (65%). Public health insurance patients were 65% less likely to be screened for CKD compared to patients with private insurance (Odds Ratio (OR)=0.65 95% Confidence interval (CI):0.68,0.63). Black (OR=2.03, 95%CI:1.97, 2.09), Hispanic (OR=2.77, 95%CI:2.66, 2.88), Asian (OR=2.36, 95%CI: 2.24, 2.50) patients were more likely to be screened compared to White patients.

Figure 3. CKD screening frequency & CKD development among patients with a new HTN and/or T2DM diagnosis between 2015-2018. Screening is defined as one estimated glomerular filtration rate & one urine albumin-creatinine ratio

Screen
- Screened w/in 12 months of dx.
- Screened w/in 24 months of dx.
- Developed CKD

Figure 4. Association of SDOH (**A**) and race & ethnicity (**B**) and receiving a CKD diagnosis (CKD or end stage renal disease) after a new HTN and/or T2DM diagnosis between 2015-2018. Logistic regression models adjusted for age, sex, smoking (never/ever), BMI (kg/m^2), year, patient location (IL/WI), weighted Charlson index & ≥1 CKD screening within 24 months of diagnosis (yes/no).