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Supplemental Tables

Table S1

List of medications that affect drowsiness and cognition included in the study

Drug category	Drug name
Sedatives	BETA-ADRENERGIC BLOCKING AGENTS – UNSPECIFIED ANXIOLYTICS, SEDATIVES, AND HYPNOTICS – UNSPECIFIED MUSCLE RELAXANTS – UNSPECIFIED ANTIHISTAMINES – UNSPECIFIED ANTIDEPRESSANTS – UNSPECIFIED ANTIPSYCHOTICS – UNSPECIFIED OPHTHALMIC ANTIHISTAMINES AND DECONGESTANTS – UNSPECIFIED ATENOLOL CARBAMAZEPINE VALPROIC ACID METOPROLOL PHENYTOIN DIPHENHYDRAMINE GABAPENTIN DIPHENHYDRAMINE; PSEUDOEPHEDRINE MELATONIN TOPIRAMATE CITALOPRAM ZALEPLON DOXYLAMINE; PYRIDOXINE DIPHENHYDRAMINE; PHENYLEPHRINE DIPHENHYDRAMINE; HYDROCODONE; PHENYLEPHRIN ESZOPICLONE RAMELTEON DEXTROMETHORPHAN; DIPHENHYDRAMINE; PHENYLEPHRINE BROMPHENIRAMINE; DIPHENHYDRAMINE BROMPHENIRAMINE; DIPHENHYDRAMINE; PHENYLEPHRINE SUVOREXANT
Stimulants	ARMODAFINIL FLUOXETINE DEXTROAMPHETAMINE MODAFINIL SERTRALINE FLUOXETINE; OLANZAPINE

METHYLPHENIDATE
PAROXETINE
DIURETICS – UNSPECIFIED
THIAZIDE AND THIAZIDE-LIKE DIURETICS-
UNSPECIFIED

Other drugs

FENTANYL
MORPHINE
OXYCODONE
OXYMORPHONE

Table S2

Number of participants, by joint and marginal categories of eGFR and albuminuria; total study population, 2005-14.

Total population

Categories of eGFR (mL/min/1.73 m ²)	Categories of Albuminuria (mg/g)			Total
	<30	30-300	>300	
≥90	14789	1299	247	16335
60-89	7006	964	236	8206
45-59	1014	299	108	1421
30-44	303	197	89	589
15-29	54	49	60	163
<15	4	7	32	43
Total	23170	2815	772	26757

* CKD prognosis cells: white, low risk; light gray, moderate risk; medium gray, high risk; dark gray, very high risk.¹³

Table S3

Standardized^a prevalence (%) of each sleep problem and sleep-problem index^b, by CKD^c status; total study population, 2005-14

Year	Trouble sleeping (%)			Sleep disorder (%)		
	All	CKD	No CKD	All	CKD	No CKD
2005-2006	24.1	24.2	24.2	7.4	8.8	7.3
2007-2008	24.0	27.2	23.5	7.6	10.3	7.3
2009-2010	25.0	29.9	24.3	7.1	10.5	6.8
2011-2012	26.5	25.9	26.8	8.9	13.5	8.3
2013-2014	27.7	32.1	26.9	10.2	15.0	9.5
P for trend	<0.001	0.005	0.012	<0.001	0.001	<0.001

Year	Inadequate sleep: <7 hours (%)			Excessive sleep: >9 hours (%)		
	All	CKD	No CKD	All	CKD	No CKD
2005-2006	35.9	40.3	35.2	2.6	2.9	2.2
2007-2008	38.3	39.9	38.1	2.3	3.5	1.8
2009-2010	36.6	40.2	36.1	2.2	3.1	1.8
2011-2012	37.0	35.4	37.4	2.2	3.3	1.7
2013-2014	35.4	39.4	34.7	2.8	3.2	2.4
P for trend	0.53	0.68	0.35	0.79	0.72	0.92

Year	Nocturia (%)			Year	Sleep-problem index score>1 (%)		
	All	CKD	No CKD		All	CKD	No CKD
2005-2006	24.2	32.8	22.6	2005-2006	23.0	27.6	22.2
2007-2008	24.3	30.7	23.2	2007-2008	23.8	29.8	22.8
2009-2010	24.0	32.9	22.6	2009-2010	24.2	32.0	23.1
2011-2012	24.1	32.1	22.8	2011-2012	24.8	30.1	24.1
P for trend	0.45	0.65	0.11	2013-2014	25.7	32.9	24.4
				P for trend	0.036	0.068	0.056

^aStandardized for age and sex. Using 2000 US Census population as the standard population.

^bSleep-problem index was created by summing the number of problems (trouble sleeping, sleep disorder, nocturia, inadequate sleep) reported by each subjects.

^cCKD, chronic kidney disease; as reduced kidney function (estimated glomerular filtration rate [eGFR] < 60mL/min/1.73m², calculated with the CKD-EPI equation¹³ and/or the presence of albuminuria (urine albumin-to-creatinine ratio [ACR] ≥30 gm/g, standardized to the 2005-06 cohort.

Table S4

Weighted prevalence (%) and 95% CI^a) of each sleep problem, by category of CKD prognosis; total study population, 2005-14

CKD prognosis	Trouble sleeping	Sleep disorder	Nocturia	Inadequate sleep	Excessive sleep
Low risk	25.2 (24.2, 26.1)	7.9 (7.5, 8.4)	21.9 (19.6, 24.2)	36.7 (35.5, 37.9)	2.0 (1.7, 2.1)
Moderate increased risk	29.1 (25.8, 32.4)	11.4 (9.3, 13.4)	36.5 (31.6, 41.3)	35.9 (33.5, 38.2)	3.8 (3.0, 4.6)
High risk	35.4 (30.2, 40.7)	13.0 (9.3, 16.7)	45.9 (38.4, 53.5)	35.9 (33.1, 38.7)	7.1 (5.4, 8.7)
Very high risk	34.7 (27.2, 42.3)	14.8 (9.9, 19.6)	56.5 (47.7, 65.3)	31.3 (26.7, 35.9)	11.4 (8.5, 14.2)

^aCI, Confidence interval.

Table S5

Crude prevalence (%) and 95% CI) of each sleep problem (a-e), by joint and marginal categories of eGFR and albuminuria; total study population, 2005-14.

a. Ever told a doctor of having trouble sleeping

Categories of eGFR (mL/min/1.73 m ²)	Categories of Albuminuria (mg/g)			Total
	<30	30-300	>300	
≥90	23.0 (21.9, 24.1)	27.3 (23.3, 31.3)	36.0 (23.4, 48.7)	23.5 (22.5, 24.6)
60-89	29.1 (27.6, 30.6)	29.0 (24.5, 33.6)	38.5 (28.8, 48.2)	29.4 (26.7, 32.1)
45-59	31.2 (27.5, 35.0)	35.7 (26.4, 45.0)	37.0 (20.1, 54.0)	31.5 (26.9, 36.2)
30-44	35.9 (30.2, 41.7)	28.6 (19.1, 38.0)	28.2 (15.9, 41.4)	32.6 (27.1, 38.1)
15-29	37.6 (22.1, 53.2)	41.0 (22.8, 59.2)	42.2 (25.8, 58.8)	39.9 (29.5, 50.4)
<15	28.1 (0, 72.1)	75.0 (35.4, 100)	40.5 (20.8, 60.3)	49.94 (25.7, 74.1)
Total	25.5 (24.6, 26.5)	28.5 (25.5, 31.5)	32.7 (27.0, 38.3)	25.9 (25.0, 26.8)

b. Even been told by a doctor of having sleep disorder

Categories of eGFR (mL/min/1.73 m ²)	Categories of Albuminuria (mg/g)			Total
	<30	30-300	>300	
≥90	6.9 (6.4, 7.5)	10.4 (7.7, 13.0)	14.1 (5.8, 22.4)	7.3 (6.8, 7.9)
60-89	8.7 (8.7, 10.6)	14.1 (10.9, 17.3)	13.5 (6.1, 20.8)	10.0 (8.4, 11.7)
45-59	10.3 (7.3, 13.3)	13.5 (7.3, 19.6)	15.6 (1.9, 29.2)	11.0 (7.7, 14.3)
30-44	12.2 (7.6, 16.9)	14.5 (5.9, 23.1)	21.4 (7.8, 35.0)	13.4 (9.4, 17.5)
15-29	20.7 (7.6, 33.8)	15.3 (3.7, 26.8)	13.9 (0.44, 27.4)	15.7 (9.5, 21.9)
<15	28.1 (0, 77.1)	0	13.0 (0, 26.5)	12.1 (2.5, 21.5)
Total	8.0 (7.6, 8.5)	11.7 (9.5, 14.0)	13.8 (9.6, 18.0)	8.5 (8.0, 8.9)

c. Nocturia

Categories of eGFR (mL/min/1.73 m ²)	Categories of Albuminuria (mg/g)			Total
	<30	30-300	>300	
≥90	18.9 (16.6, 21.1)	28.7 (24.4, 33.0)	42.9 (31.8, 53.9)	20.8 (18.0, 22.4)
60-89	25.5 (22.5, 28.4)	43.4 (37.2, 49.5)	47.5 (36.4, 58.7)	27.8 (24.0, 31.6)
45-59	40.7 (35.6, 45.8)	48.1 (39.0, 57.2)	59.6 (43.1, 76.0)	42.7 (37.0, 48.5)
30-44	50.6 (40.8, 60.3)	54.1 (43.9, 64.4)	65.2 (45.0, 85.3)	52.8 (44.1, 61.6)
15-29	50.2 (34.5, 66.0)	64.8 (45.8, 83.8)	66.4 (46.4, 86.3)	61.1 (49.2, 73.0)
<15	55.6 (0, 100)	15.6 (0, 53.4)	77.4 (52.3, 100)	57.3 (30.2, 84.4)
Total	22.5 (20.1, 24.9)	37.4 (32.4, 42.5)	46.0 (37.9, 54.0)	24.3 (21.8, 26.7)

d. Inadequate sleep (<7 hours)

Categories of eGFR (mL/min/1.73 m ²)	Categories of Albuminuria (mg/g)			Total
	<30	30-300	>300	
≥90	38.0 (35.5, 39.4)	42.1 (38.9, 45.3)	43.9 (39.2, 48.7)	38.3 (37.0, 39.7)
60-89	34.2 (32.7, 35.7)	36.2 (31.9, 40.5)	39.4 (33.5, 45.3)	34.5 (33.0, 35.9)
45-59	27.9 (24.1, 31.7)	34.3 (27.1, 41.4)	38.0 (27.6, 48.4)	29.6 (26.1, 33.1)
30-44	27.4 (22.8, 32.0)	25.3 (19.4, 31.2)	46.7 (34.5, 58.9)	29.4 (25.7, 33.1)
15-29	23.7 (13.9, 33.6)	29.0 (18.8, 39.0)	36.5 (25.5, 47.4)	30.0 (23.6, 36.4)
<15	33.8 (21.3, 42.3)	59.9 (34.4, 85.3)	48.0 (33.4, 62.7)	49.6 (33.8, 65.4)
Total	36.2 (35.1, 37.3)	38.2 (36.0, 40.3)	41.9 (38.6, 45.2)	36.5 (35.4, 37.5)

e. Excessive sleep (>9 hours)

Categories of eGFR (mL/min/1.73 m ²)	Categories of Albuminuria (mg/g)			Total
	<30	30-300	>300	
≥90	2.0 (1.7, 2.2)	2.0 (1.0, 2.9)	3.5 (0.7, 6.3)	2.1 (1.8, 2.3)
60-89	1.7 (1.4, 2.0)	5.0 (3.3, 6.7)	6.4 (0.0, 13.3)	2.2 (1.5, 2.8)
45-59	4.4 (2.8, 5.9)	5.9 (3.1, 8.7)	3.9 (0.0, 8.3)	5.1 (3.6, 6.7)
30-44	8.8 (4.6, 13.0)	11.4 (0.5, 22.1)	1.4 (0.0, 3.4)	9.7 (6.7, 12.6)
15-29	10.8 (1.0, 20.5)	11.3 (0.5, 22.1)	21.0 (8.1, 33.9)	14.1 (7.9, 20.3)
<15	44.4 (0, 100)	0	6.2 (0, 18.8)	8.6 (0, 18.9)
Total	2.1 (1.9, 2.3)	4.3 (3.2, 5.3)	7.2 (4.3, 10.1)	2.5 (2.1, 2.6)

*CKD prognosis cells: white, low risk; light gray, moderate risk; medium gray, high risk; dark gray, very high risk.¹³