Kidney Medicine

Health and Dental Insurance and Health Care Utilization Among Children, Adolescents, and Young Adults With CKD: Findings From the CKiD Cohort Study

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Rationale & Objective: To understand the association between health and dental insurance status and health and dental care utilization, and their relationship with disease severity in a population with childhood-onset chronic kidney disease (CKD).

Study Design: Observational cohort study.

Settings & Participants: Nine hundred fifty-three participants contributing 4,369 person-visits (unit of analysis) in the United States enrolled in the Chronic Kidney Disease in Children (CKiD) Study from 2005 to 2019.

Exposures: Health insurance (private vs public vs none) and dental insurance (presence vs absence) self-reported at annual visits.

Outcomes: Self-reported suboptimal health care utilization in the past year, defined separately as not visiting a private physician, visiting the emergency room, visiting the emergency room at least twice, being hospitalized, and self-reported suboptimal dental care utilization over the past year, defined as not receiving dental care.

Analytical Approach: Repeated measures Poisson regression models were fit to estimate and compare utilization by insurance type and disease severity at the prior visit. Additional unadjusted and adjusted models were fit, as well as models including interactions between insurance and Black race, maternal education, and income.

Results: Those with public health insurance were more likely to report suboptimal health care utilization across the CKD severity spectrum, and lack of dental insurance was strongly associated with lack of dental care. These relationships varied depending on strata of socioeconomic status and race but the effect measure modification was not significant.

Limitations: Details of insurance coverage were unavailable; reasons for emergency care or type of private physician visited were unknown.

Conclusions: Pediatric nephrology programs may consider interventions to help direct supportive resources to families with public insurance who are at higher risk for suboptimal utilization of care. Insurance providers should identify areas to expand access for families of children with CKD.

Visual Abstract included

Complete author and article information provided before references.

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Health insurance coverage in the United States is associated with better preventive care, access to a regular health care provider and quality treatment options, and overall improved health,[1–5] while lack of coverage has been linked to all-cause mortality.[6,7] In the United States, 2 tiers of health insurance, public and private, primarily govern patient interactions with the health care system. Public insurance (eg, Medicaid) among children with additional health care needs is associated with more emergency department visits and an increased need for mental health services.[8] Typically, private-based insurance plans offer more accessible care and are associated with easier access to specialty care and shorter appointment wait times compared to public insurance.[9,10] Notably, major changes in accessibility occurred after 2010 when the Affordable Care Act (ACA) was passed.[10]

Differences in health care utilization are pronounced in populations with chronic diseases, including diabetes and chronic kidney disease (CKD).[11,12] Those with childhood-onset CKD use health care services more frequently and with longer durations compared to healthy peers.[13] In addition, dental care is considered part of comprehensive health care but is often overlooked among children with chronic diseases.[14–17] To our knowledge, there is no thorough description of dental care utilization among children with CKD in the context of dental insurance.

The contrast between private- and public-based health insurance in terms of health care and dental care utilization has not been adequately studied in children and young adults with CKD, even though disease management and access to clinical care are critical in improving outcomes.[18,19] The aim of this study was to investigate secular trends in health insurance status between 2005 and 2019 and describe health care and dental care utilization by insurance status and potential modifiers in the Chronic Kidney Disease in Children (CKiD) Study.

METHODS

Study Design and Population

The CKiD Study is an ongoing cohort of children, adolescents, and young adults with a diagnosis of CKD in the United States and Canada with participants enrolled

PLAIN-LANGUAGE SUMMARY

Patterns of health and dental care utilization and factors related to access are not well described in children with chronic kidney disease (CKD). This study described the relationships between insurance and health and dental care utilization among children and young adults with childhood-onset CKD. Those with public health insurance were more likely to report emergency room visits and hospitalizations, and not visit a private doctor. Similarly, the lack of dental insurance was strongly associated with not seeing a dentist. These relationships varied by strata of socioeconomic status and race. Secular trends indicated that the Affordable Care Act likely increased access to health insurance among those aged ≥19 years. Directing supportive resources to these high-risk groups may be a clinical consideration.

between ages 0.5 and 16 years starting in 2005. Briefly, before kidney replacement therapy initiation, participants attended annual visits and provided clinical data, and completed standardized questionnaires related to insurance, health care utilization, and dental care utilization. The CKiD Study design has been previously described.[20,21] Participants and their families provided informed consent/assent, and all protocols were approved by local institutional review boards. Data for this analysis were included through 2019. Participants at the 3 Canadian sites were excluded from this analysis because of differences in their health care system compared to the United States.

Exposures

For the health care utilization analysis, the exposure was self-reported current health insurance status categorized as private, public, or no insurance (ie, uninsured). Private was defined as only private health insurance and public was defined as any type of public insurance, even if they also reported some form of private. Private insurance included employer plans, private plans through state/local governments or community programs, plans purchased directly, and student health coverage. Public insurance included state-sponsored plans (eg, Medi-CAL, Maryland Medical Assistance), federal plans (eg, Medicaid, Children's Health Insurance Program [CHIP]), and plans through the military or Veterans Affairs. For the dental care utilization analysis, the exposure was any self-reported dental insurance (yes or no).

Outcomes

Four separate health care utilization outcomes were assessed in this analysis: (1) not attending a private physician visit in the past year, (2) any emergency room (ER) visit in the past year, (3) 2 or more ER visits in the past year, and (4) any hospitalization in the past year. For private physician visits, participants were asked if they received medical care from "a private doctor's office (not part of a clinic or hospital)" in the past year; the outcome was classified as, "did not visit a private doctor's office." Since the majority of US-based pediatric nephrologists practice in academic medical centers, including all attending nephrologists of the CKiD participants, we assumed that they were not considered a private doctor by the participant. No additional details about the private physician were collected. If the participant reported ER use over the past year, they then provided the frequency, which was classified as ≥2 versus <2 visits. Hospitalizations in the past year did not include overnight stays in the ER. For dental care utilization, the question was, "Have you received care from a dentist or dental hygienist in the past year?" and this outcome was defined as not receiving dental care in the past year.

Outcomes were defined as suboptimal health care utilization and dental care utilization, specifically, not attending a private physician visit, any ER visit, ≥2 ER visits, hospitalization, and not receiving dental care, reflecting a putative higher risk for health care utilization and unmet dental care needs.

Covariates

Self-reported sociodemographic variables included participant age, sex (male or female; only collected at study baseline), race (Black or non-Black), ethnicity (Hispanic or non-Hispanic), family structure (2 parents living together or other), maternal education (some college completed or more, or high school), and annual household income (>$36,000 or ≤$36,000).

CKD type was classified as either nonglomerular (predominantly congenital anomalies of the kidney and urinary tract) or glomerular diagnosis. Disease severity variables included proteinuria (urinary protein-to-creatinine ratio in mg/mg Cr), nephrotic range proteinuria (urinary protein-creatinine ratio ≥2 mg/mg Cr), and estimated glomerular filtration rate (eGFR; mL/min/1.73 m^2).[22,23] Pediatric CKD risk stage summarized proteinuria and eGFR to characterize disease severity (from least to most severe: A, B, C, D, E, F, and eGFR <15).[24]

Statistical Analysis

The unit of analysis was person-visits. To investigate changes over time, we estimated the proportions of person-visits in 3-year intervals between 2005 and 2019 reporting private, public, or no health insurance. Repeated measures logistic regression models with generalized estimating equations, robust variances, and working independence correlation structures provided estimated proportions with 95% confidence intervals (CIs). This analysis was in the context of the ACA, which was signed into law in March 2010, with major provisions implemented through 2014.[25,26] The ACA required insurance providers to allow young adults to remain on parental plans until age 26. Before the ACA, children ≥19 years or after college graduation could not remain on parental plans,[27,28] so analyses were stratified by <19 and ≥19 years.

Table 1. Baseline Characteristics of Analytic Population Comprising 953 Participants Contributing 4,369 Person-Visits, Stratified by Baseline Health Insurance Status, and 951 Participants Contributing 4,336 Person-Visits, Stratified by Baseline Dental Insurance Status

	Health Insurance Status at Baseline			Dental Insurance Status at Baseline	
	Private	Public	None	Yes	No
Participants	469	473	11	708	243
Sociodemographic characteristics					
Age	10.5 [6.2, 14.7]	8.8 [4.6, 13.2]	12.9 [9.4, 14.8]	10.1 [5.0, 14.2]	9.0 [4.6, 14.2]
Male sex	311 (66.3%)	285 (60.3%)	5 (45.5%)	461 (65.1%)	139 (57.2%)
Black race	67 (14.3%)	166 (35.2%)	1 (9.1%)	172 (24.3%)	63 (25.9%)
Hispanic ethnicity	49 (10.4%)	99 (21.0%)	4 (36.4%)	98 (13.9%)	53 (21.9%)
Annual income ≤$36,000	63 (13.7%)	310 (69.0%)	8 (72.7%)	246 (35.7%)	132 (57.6%)
Maternal education: high school	111 (23.7%)	236 (50.6%)	8 (72.7%)	233 (33.1%)	119 (49.6%)
Two parent household	390 (83.2%)	275 (58.1%)	7 (63.6%)	514 (72.6%)	161 (66.3%)
Kidney disease characteristics					
CKD duration (y)	7.0 [3.2, 12.3]	5.4 [2.9, 10.3]	12.9 [9.4, 14.8]	6.4 [3.3, 11.3]	5.7 [2.4, 10.4]
Age at CKD onset					
At birth	315 (67.6%)	330 (70.7%)	11 (100%)	490 (69.7%)	165 (68.5%)
1-5 y	55 (11.8%)	55 (11.8%)	0 (0%)	82 (11.7%)	29 (12.0%)
5-10 y	36 (7.7%)	32 (6.9%)	0 (0%)	47 (6.7%)	21 (8.7%)
>10 y	60 (12.9%)	50 (10.7%)	0 (0%)	84 (11.9%)	26 (10.8%)
Glomerular diagnosis	127 (27.1%)	115 (24.3%)	1 (9.1%)	179 (25.3%)	64 (26.3%)
eGFR (mL/min/1.73 m^2)	53 [40, 67]	53 [37, 67]	49 [38, 65]	54 [40, 68]	49 [36, 63]
Urine protein/creatinine (mg/mg Cr)	0.4 [0.1, 0.9]	0.4 [0.2, 1.2]	0.2 [0.1, 0.9]	0.4 [0.1, 0.9]	0.5 [0.2, 1.6]
Nephrotic range proteinuria (≥2 mg/mg Cr)	50 (11.5%)	69 (16.2%)	1 (9.1%)	75 (11.5%)	45 (20.7%)
CKD risk stage					
A or B	305 (71.4%)	280 (66.5%)	9 (81.8%)	467 (72.3%)	126 (59.7%)
C, D, or E	112 (26.2%)	122 (29.0%)	2 (18.2%)	164 (25.4%)	71 (33.6%)
F or eGFR <15 mL/min/1.73 m^2	10 (2.3%)	19 (4.5%)	0 (0%)	15 (2.3%)	14 (6.6%)
Insurance characteristics					
Public health insurance	NA	NA	NA	309 (44.1%)	157 (66.5%)
Longitudinal data					
Person-years	4.2 [1.1, 7.0]	3.2 [1.0, 6.5]	4.1 [1.1, 9.0]	3.8 [1.0, 6.9]	3.8 [1.1, 6.6]
Total accumulated person-years	2,100.5	1,875.4	60.7	2,990.7	1,030.5

Note: Presented as n (%) or median [interquartile range].
Abbreviations: CKD, chronic kidney disease; Cr, creatinine; eGFR, estimated glomerular filtration rate, NA, not applicable.

Repeated measures Poisson regression models with generalized estimating equations, robust variances, and working independence correlation structures were used to estimate the prevalence rates for each outcome by insurance status and disease severity (ie, CKD risk stage). The independent variables were insurance status (health: private vs public; dental: insured vs uninsured) and CKD risk stage at the prior visit. Separate models for each outcome included interaction terms between prior CKD risk stage and insurance. P values were obtained for pairwise differences between insurance categories within each risk stage.

These models were extended to include additional covariates and estimate prevalence rate ratios (PRRs) between private versus public versus uninsured for health care utilization outcomes, and presence versus lack of dental insurance for the dental care utilization outcome. Each exposure/outcome association was modeled separately unadjusted and adjusted for age, sex, family structure, CKD duration, diagnosis, and risk stage at the prior visit.

Because insurance correlates with socioeconomic status (SES), maternal education level (college or more vs high school) and annual household income (>$36,000 vs. ≤$36,000) were included as interaction terms with insurance, and likewise for Black race (because of documented racial disparities in health care),[29] for both health care utilization and dental care utilization. Person-visits with no health insurance were excluded from interaction models because of their small numbers.

Analyses were performed in SAS 9.4 (SAS Institute Inc), and figures were created using R 4.0.2 (R Foundation).

RESULTS

Population Characteristics

Table 1 presents baseline characteristics of participants by insurance status in the health care utilization and dental care utilization analyses. For the health care utilization analysis, 953 participants contributed 4,369 person-visits;

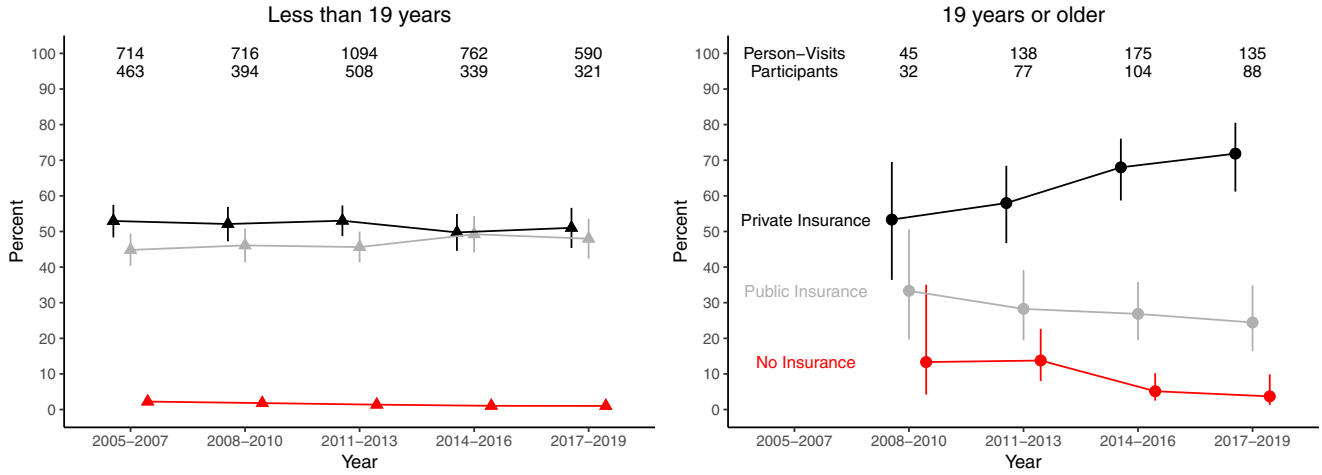

Figure 1. Change in health insurance status over time, stratified by under 19 years versus 19 years of age or older. The percentage reporting each health insurance type is on the y-axis, and the time in 3-year bins is presented on the x-axis. Person-visits contributed by those under the age of 19 years are represented by triangles (▲) and by circles (•) for those 19 years of age or older. Black markers represent private insurance, gray represents public insurance, and red represents no health insurance coverage. The numbers of person-visits and individual participants contributing to each time period and age group are listed across the top of each plot. No data are shown for those 19 years of age or older in the 2005-2007 time period because fewer than 20 person-visits were present.

469 (49.2%), 473 (49.6%), and 11 (1.2%) participants reported private, public, and no health insurance coverage at baseline, respectively. Compared with those with private insurance, participants with public insurance were more likely to identify as Black (35.2% vs 14.3%), Hispanic (21.0% vs 10.4%), have an annual income ≤$36,000 (69.0% vs 13.7%), have a high school maternal education (50.6% vs 23.7%), and were less likely to report living in a 2-parent household (58.1% vs 83.2%). Compared with those with private insurance, participants with no insurance were older (median age, 12.9 vs 10.5 years), and were more likely to identify as Hispanic (36.4% vs 10.4%), have lower (≤$36,000) income (72.7% vs 13.7%), and have a high school maternal education (72.7% vs 23.7%).

For the dental care utilization analysis, 951 participants contributed 4,336 person-visits; 243 (25.6%) of participants reported no dental insurance at baseline. Compared with those with dental insurance, those without dental insurance were more likely to have lower SES (57.6% vs 35.7% with low income; 49.6% vs 33.1% with high school maternal education). Characteristics of the study population by person-visits are shown in Table S1.

Health Insurance Status Over Time

Figure 1 displays changes in health insurance over calendar time, stratified by age (<19 vs ≥19 years). The percentage of person-visits reporting private, public, and no insurance among those <19 years remained consistent throughout the follow-up. However, among those ≥19 years, the percent uninsured decreased over time: 13.8% in 2011-2013 (95% CI, 8.0%-22.7%) to 5.1% in 2014-2016 (95% CI, 2.5%-10.2%). The proportion reporting private insurance in this ≥19 years age group increased over time; the highest was 71.9% (95% CI, 61.2%-80.5%) in 2017-2019. There was a corresponding decrease in public insurance with the lowest level observed in 2017-2019 (24.4%; 95% CI, 16.3%-34.9%).

Association Between Utilization and Kidney Disease Severity

Figures 2A and B depict differences in health care and dental care utilization by CKD risk stage (at the previous year) and insurance status, with significant pairwise differences by insurance status indicated. Those with eGFR <15 mL/min/1.73 m^2 were excluded from this portion of the analysis (n = 2), as well as those without health insurance (n ≤ 15 in 4 of 6 risk stage groups).

The proportion of participants not attending a private physician visit over the previous year increased with more severe CKD regardless of health insurance; however, those with public insurance had significantly higher proportions of participants not reporting private physician care than those with private insurance for 4 of the 6 CKD risk stages (A, B, C, and E). Similarly, those with public insurance consistently reported a higher proportion of person-visits with any ER visit and ≥2 ER visits across all risk stages compared to private insurance. Lastly, a higher proportion of those with public insurance consistently reported past year hospitalization compared with those with private insurance.

For dental care utilization, both exposure groups were overall less likely to receive dental care as CKD severity increased. However, those without dental insurance were

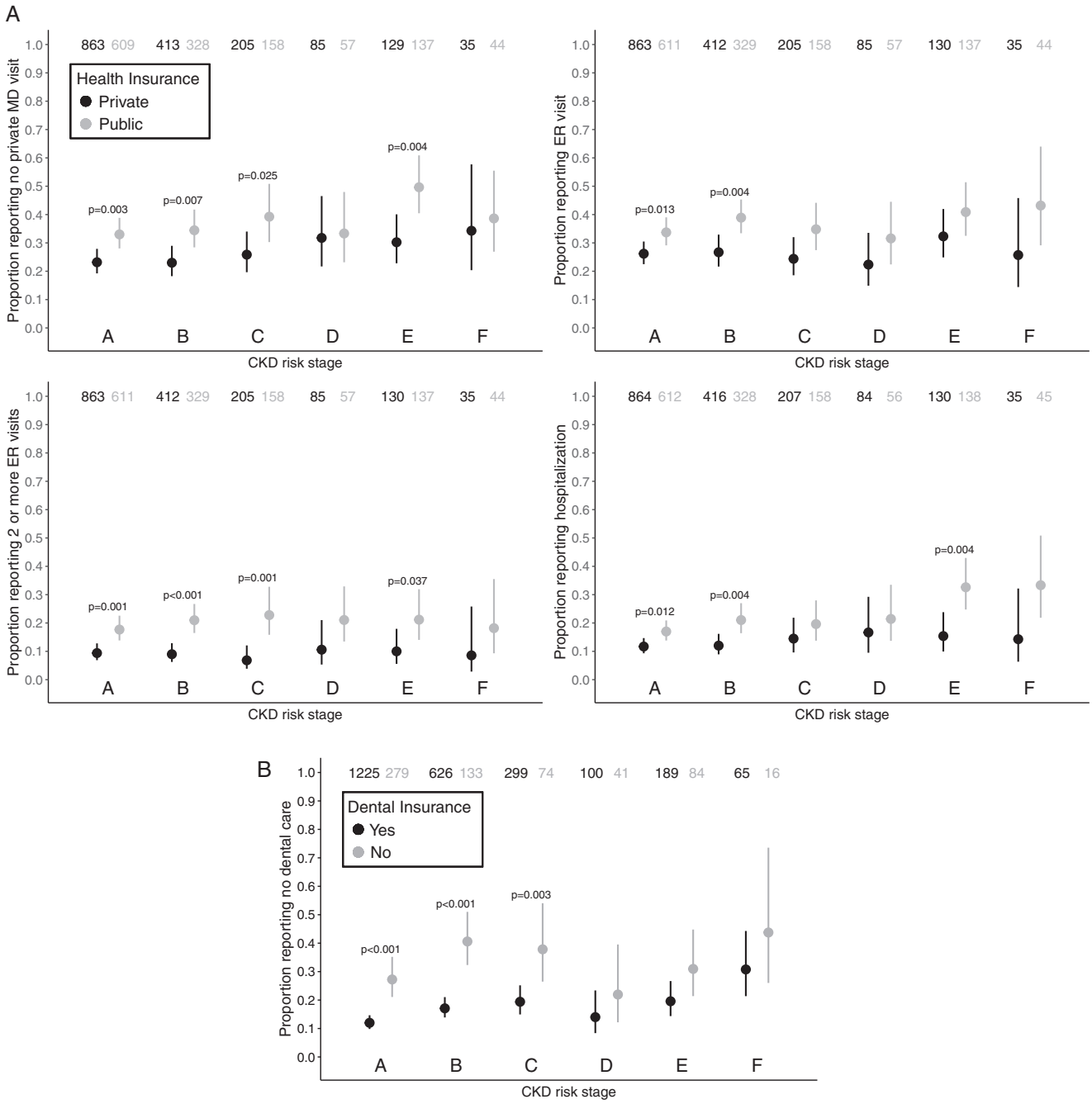

Figure 2. **(A)** Proportion per person-visits and 95% confidence intervals (CIs) of past year health care use by health insurance status and chronic kidney disease (CKD) risk stage (A, B, C, D, E, or F) at the previous study visit. Number of person-visits (denominators) are shown above each health insurance status and CKD risk stage group. Statistically significant pairwise *P* values comparing those with private versus public insurance are indicated within each CKD risk stage. **(B)** Proportion per person-visits and 95% CIs of past year dental care use by dental insurance status and CKD risk stage (A, B, C, D, E, or F) at the previous study visit. Number of person-visits (denominators) are shown above each dental insurance status and CKD risk stage group. Statistically significant pairwise *P* values comparing those with yes versus no dental insurance are indicated within each CKD risk stage.

significantly more likely to report no dental care utilization at less severe risk stages but not at higher disease severity. The highest proportions reporting no dental care utilization in the past year were in risk stage F for those without and with dental insurance: 43.8% (95% CI, 26.0%-73.6%) and 30.8% (95% CI, 21.4%-44.3%), respectively.

Association Between Health Insurance Status and Health Care Utilization

Table 2 describes the associations between health insurance status and health care utilization in unadjusted and adjusted models. Generally, the adjusted PRRs (aPRRs) were attenuated compared with unadjusted but significant

Table 2. Unadjusted and Adjusted Prevalence Rate Ratios (95% Confidence Interval) to Estimate the Association Between Health Insurance Status and Health Care Utilization Outcomes

	No Private MD Visit		ER Visit		≥2 ER Visits		Hospitalization	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Main HCU analysis								
Private insurance	REF	REF	REF	REF	REF	REF	REF	REF
Public insurance	1.61 (1.39, 1.87)[a]	1.45 (1.22, 1.71)[a]	1.37 (1.23, 1.53)[a]	1.27 (1.10, 1.47)[a]	2.11 (1.72, 2.58)[a]	1.94 (1.48, 2.56)[a]	1.42 (1.21, 1.67)[a]	1.49 (1.20, 1.85)[a]
No insurance	2.32 (1.74, 3.11)[a]	1.98 (1.47, 2.68)[a]	0.88 (0.62, 1.25)	0.79 (0.51, 1.23)	0.68 (0.33, 1.37)	0.65 (0.26, 1.62)	1.05 (0.67, 1.66)	1.19 (0.66, 2.15)
Income interaction								
Private and >$36,000	REF	REF	REF	REF	REF	REF	REF	REF
Private and ≤$36,000	1.90 (1.52, 2.36)[a]	1.58 (1.23, 2.03)[a]	0.97 (0.78, 1.21)	0.98 (0.75, 1.28)	1.12 (0.75, 1.68)	1.12 (0.67, 1.86)	0.88 (0.65, 1.19)	0.85 (0.55, 1.32)
Public and >$36,000	1.32 (1.06, 1.65)[a]	1.18 (0.92, 1.52)	1.17 (0.99, 1.38)	1.16 (0.95, 1.42)	1.66 (1.26, 2.19)[a]	1.69 (1.19, 2.40)[a]	1.11 (0.89, 1.39)	1.23 (0.93, 1.65)
Public and ≤$36,000	2.11 (1.76, 2.53)[a]	1.91 (1.56, 2.34)[a]	1.50 (1.32, 1.71)[a]	1.38 (1.16, 1.63)[a]	2.50 (1.97, 3.17)[a]	2.28 (1.64, 3.16)[a]	1.60 (1.33, 1.92)[a]	1.65 (1.28, 2.13)[a]
Maternal education interaction								
Private and college	REF	REF	REF	REF	REF	REF	REF	REF
Private and HS	1.34 (1.04, 1.74)[a]	1.20 (0.90, 1.61)	1.24 (1.02, 1.51)[a]	1.36 (1.06, 1.74)[a]	1.45 (0.97, 2.18)	1.52 (0.87, 2.64)	1.08 (0.80, 1.44)	0.90 (0.58, 1.40)
Public and college	1.54 (1.27, 1.87)[a]	1.37 (1.11, 1.71)[a]	1.38 (1.20, 1.58)[a]	1.38 (1.16, 1.64)[a]	2.14 (1.68, 2.72)[a]	2.10 (1.54, 2.86)[a]	1.36 (1.12, 1.64)[a]	1.47 (1.15, 1.88)[a]
Public and HS	1.96 (1.61, 2.37)[a]	1.70 (1.36, 2.14)[a]	1.49 (1.29, 1.72)[a]	1.30 (1.06, 1.59)[a]	2.46 (1.91, 3.18)[a]	2.16 (1.51, 3.08)[a]	1.55 (1.25, 1.92)[a]	1.46 (1.08, 1.96)[a]
Black race interaction								
Private and non-Black	REF	REF	REF	REF	REF	REF	REF	REF
Private and Black	1.50 (1.13, 1.99)[a]	1.33 (0.96, 1.84)	1.08 (0.84, 1.39)	1.15 (0.85, 1.55)	1.14 (0.75, 1.75)	1.40 (0.83, 2.36)	0.72 (0.50, 1.03)	0.79 (0.49, 1.29)
Public and non-Black	1.61 (1.35, 1.93)[a]	1.44 (1.18, 1.76)[a]	1.26 (1.01, 1.43)[a]	1.20 (1.01, 1.43)[a]	1.86 (1.46, 2.37)[a]	1.86 (1.35, 2.58)[a]	1.29 (1.07, 1.55)[a]	1.38 (1.07, 1.76)[a]
Public and Black	1.91 (1.55, 2.36)[a]	1.67 (1.30, 2.16)[a]	1.64 (1.42, 1.90)[a]	1.52 (1.26, 1.85)[a]	2.72 (2.10, 3.52)[a]	2.51 (1.74, 3.61)[a]	1.53 (1.23, 1.91)[a]	1.66 (1.24, 2.22)[a]

Note: Income, maternal education, and race were included as effect measure modifiers of insurance status. Adjusted models control for age, sex, family structure, duration of kidney disease in years, primary kidney disease diagnosis, and kidney disease severity at the visit before the outcome.

Abbreviations: ER, emergency room; HCU, health care utilization; HS, high school education; MD, medical doctor; REF, reference.

[a]Indicates statistical significance.

Table 3. Unadjusted and Adjusted Prevalence Rate Ratios (95% Confidence Interval) to Estimate the Association Between Dental Insurance Status and No Dental Care in the Past Year

	No Dental Care	
	Unadjusted	**Adjusted**
Main dental care utilization analysis		
Insured	REF	REF
No insurance	1.95 (1.68, 2.26)[a]	1.96 (1.62, 2.37)[a]
Income interaction		
Insured and >$36,000	REF	REF
Insured and ≤$36,000	1.61 (1.33, 1.94)[a]	1.58 (1.24, 2.01)[a]
No insurance and >$36,000	1.99 (1.58, 2.51)[a]	2.05 (1.52, 2.75)[a]
No insurance and ≤$36,000	2.55 (2.10, 3.10)[a]	2.52 (1.96, 3.25)[a]
Maternal education interaction		
Insured and college	REF	REF
Insured and HS	1.84 (1.51, 2.24)[a]	1.73 (1.35, 2.22)[a]
No insurance and college	1.94 (1.57, 2.40)[a]	1.88 (1.44, 2.46)[a]
No insurance and HS	2.88 (2.34, 3.54)[a]	2.89 (2.21, 3.77)[a]
Black race interaction		
Insured and non-Black	REF	REF
Insured and Black	1.48 (1.19, 1.85)[a]	1.44 (1.10, 1.87)[a]
No insurance and non-Black	2.18 (1.83, 2.61)[a]	2.21 (1.78, 2.74)[a]
No insurance and Black	2.07 (1.61, 2.66)[a]	1.96 (1.33, 2.88)[a]

Note: Income, maternal education, and race were included as effect measure modifiers of insurance status. Adjusted models control for age, sex, family structure, duration of kidney disease in years, primary kidney disease diagnosis, and kidney disease severity at the visit before the outcome. Abbreviations: HS, high school education; REF, reference.
[a]Indicates statistical significance.

associations were consistent; public insurance was associated with suboptimal health care utilization. Specifically, compared with participants with private insurance, those with public insurance were more likely to report not visiting a private physician (aPRR, 1.45; 95% CI, 1.22-1.71), an ER visit (aPRR, 1.27; 95% CI, 1.10-1.47) or ≥2 ER visits (aPRR, 1.94; 95% CI, 1.48-2.56), and hospitalization (aPRR, 1.49; 95% CI, 1.20-1.85) in the previous year. Compared with participants with private insurance, participants who were uninsured were significantly more likely to have not visited a private physician (aPRR, 1.98; 95% CI, 1.47-2.68).

In models including an interaction between insurance and annual income, those with both public insurance and low income (≤$36,000) had a significantly higher risk of suboptimal health care utilization for all outcomes compared with those with private insurance and high income. This was not always the case for those with public insurance and high income, or those with private insurance and low income. Those with private insurance and low income had a significantly higher risk of not attending a private physician visit (aPRR, 1.58; 95% CI, 1.23-2.03), while those with public insurance and high income had a significantly higher risk of ≥2 ER visits (aPRR, 1.69; 95% CI, 1.19-2.40).

Maternal education and race interactions did not follow the same pattern; those with public insurance, regardless of maternal education level, had a significantly increased risk of suboptimal health care utilization outcomes, whereas those with private insurance and high school education only experienced a significantly increased risk of at least one ER visit (aPRR, 1.36; 95% CI, 1.06-1.74).

Public insurance, regardless of race, was significantly associated with suboptimal health care utilization outcomes. Additionally, those identifying as Black with private insurance had consistently increased risks of suboptimal health care utilization outcomes, with the exception of hospitalization but these associations were not statistically significant. For example, among those with private insurance, Black participants were 33% more likely to not visit a private doctor compared with non-Black participants (aPRR, 1.33; 95% CI, 0.96-1.84). Similarly, among those with public insurance, Black participants consistently had higher aPRRs for suboptimal health care utilization across all outcomes.

Association Between Dental Insurance Status and Dental Care Utilization

Table 3 presents the associations between dental insurance status and dental care utilization. Not having dental insurance was significantly associated with not receiving dental care over the past year (aPRR, 1.96; 95% CI, 1.62-2.37). All 3 comparison levels for both income and maternal education had significant aPRRs, indicating suboptimal dental care utilization compared with participants with dental insurance and high markers of SES. Notably, those with no dental coverage and low markers of SES consistently had the highest risk of lack of dental care in the past year: 2.52 (95% CI, 1.96-3.25) for income ≤$36,000, and 2.89 (95% CI, 2.21-3.77) for high

school maternal education. For interactions with race, all 3 comparison groups were more likely to have not received dental care over the past year. However, the aPRRs among those without dental insurance were similar, indicating no significant effect measure modification by race.

DISCUSSION

This study of children, adolescents, and young adults with childhood-onset CKD described insurance changes over a period with key policy changes, the relationship between insurance status and health care utilization and dental care utilization, and elucidated utilization patterns over the course of CKD progression. We also investigated markers of SES and self-reported Black race as potential effect measure modifiers to more fully understand how these groups experience and utilize health care differently because of systemic factors. Although it is not known what specific care or level of care is appropriate among those with childhood-onset CKD, our results indicate that utilization varied by insurance type. Specifically, those with public insurance were less likely to visit a private physician and more likely to receive emergency care or be hospitalized, even after adjustment for CKD severity. This study adds to the growing literature suggesting that additional support for access to and receipt of health care-related resources for those who are underinsured is warranted.

From 2005 to 2019, the proportion reporting private, public, and no health insurance among children (<19 years) was remarkably consistent. However, from 2008 to 2019, private insurance increased for participants ≥19 years, with a corresponding decrease for both public and no insurance. We hypothesize that the ACA is responsible for these changes because of provisions requiring insurers to allow children to be on parental plans until age 26.[27,28] Multiple studies have demonstrated that the ACA substantially increased access to and utilization of health care among young adults,[30-32] including those with special health care needs.[33] For example, Salciccioli et al[34] demonstrated that among US hospitalizations, the proportion of uninsured patients among young adults with congenital heart disease decreased steadily from 2007-2010 (10.9%), to 2007-2013 (9.3%), to 2014-2016 (6.4%). However, it should be noted that in the CKiD population, only 2.2% were uninsured, likely reflecting recruitment among those already integrated into specialty care. We had no data on children with CKD who are uninsured and not managed by pediatric nephrologists but this group is likely to be at the highest risk.

Those without dental insurance were more likely to report no past year dental care utilization, and more severe CKD was associated with lower rates of dental care utilization. Dental care may be a lower priority as patients approach kidney failure when family resources and time are directed toward CKD management. This is congruent with the previously reported association between more severe childhood-onset CKD and worse oral health-related quality of life.[35] Pediatric nephrology programs may consider oral health screenings and discussions on the importance of dental care utilization with their patients and families.

In our study, those with public health insurance reported significantly worse health care utilization for all outcomes compared with those with private insurance, consistent with findings seen in other populations of children with chronic diseases, such as those with cardiac conditions. Studies have shown that postnatal mortality risk among publicly insured infants with congenital heart defects is higher than privately insured infants, potentially because of barriers to accessing timely and quality care,[36] and that conversely, private health insurance is protective of poor outcomes in the first year of life, specifically hospital readmission or death, in this same population.[37] Among children with special health care needs, more broadly, those covered through Medicaid have higher care coordination needs and are more likely to use the ER,[8] and among children with asthma, those with public health insurance are more likely to experience an ER visit or inpatient hospitalization but are less likely to have an outpatient visit.[38] In our study, lack of treatment by a private physician was likely a surrogate measure for preventive care deficits: previous research has shown that those with public insurance are less likely to receive care from primary providers and specialists because of costs.[9,10,39] This could lead to a higher incidence of emergency care, which is not restricted by insurance status.

Our results showed that those with low income and public health insurance were consistently the most likely to report suboptimal health care utilization. However, this was not observed for those with high income and public insurance, or low income and private insurance. SES affects access to health care,[40] and those with low SES and public insurance are more likely to experience longer and costlier hospital stays.[13] Interventions that support and advocate for childhood-onset CKD patients in low-income households, especially those with public insurance, could be effective in reducing burden.

Race was not a statistically significant effect measure modifier for worse health care utilization in our analysis; both Black and non-Black participants with public insurance were more likely to report suboptimal health care utilization compared to non-Black participants with private insurance. However, estimates for Black participants with public insurance were consistently further from the null than non-Black participants with public insurance, reflecting well-established racial and socioeconomic bias, and their intersectionality, within the US health care system.[29,41]

In this analysis, we defined "suboptimal" health care utilization as the lack of a visit to a private physician, an ER visit, or hospitalization all over the past year. We recognize that this is a broad categorization, and "suboptimal" in our usage does not imply that these individuals should not

have received emergency and intensive care or that the care received was inadequate. This definition rather encompasses a component of disease severity and health care experience that is not captured by eGFR and proteinuria and represents a suboptimal profile. For dental care utilization, current recommendations for children include dental visits every 6 months, and our definition of suboptimal dental care reflects unmet dental care needs.

Our analysis had several limitations. First, the quality of insurance coverage can vary within insurance class, and details of coverage were not collected. Private plans may differ drastically in coverage depending on the insurance company and policies. Also, we could not assess the quality of care or if the treatment received was sufficient for each report of health care use.[42] Additionally, the question concerning private physician visits did not specify primary or specialty care, although nearly all pediatric nephrologists in the US practice in an academic medical center and are typically not considered private physicians. Similarly, ER visits and hospitalizations could have been for any reason, not only CKD-related complications. Further, because CKiD recruits children already integrated into specialty care, these results may not be generalizable to children with CKD who do not receive specialty care. Lastly, the relationship between public insurance and suboptimal health care utilization should not be interpreted as causal because public insurance is likely an indicator of a range of present systemic socioeconomic barriers and a variety of inadequate resources available for care. Given the observational nature of CKiD, we were unable to make causal contrasts by insurance status and were unable to determine precisely why some families use public insurance, which may be useful in addressing suboptimal health care utilization. Future research should explore these 2 important domains.

In summary, public health insurance and lack of dental insurance were associated with suboptimal health care utilization and dental care utilization patterns in a cohort of children, adolescents, and young adults with childhood-onset CKD. These findings suggest that insurance status may be useful in identifying children requiring additional attention directed to preventive care and support to avoid ER visits. We further identified CKD severity as a risk factor for not receiving regular dental care and that those who lack dental insurance are at risk of suboptimal dental care utilization. Pediatric nephrology programs may consider designing or evaluating interventions to direct supportive resources toward these high-risk patients and families. Policymakers may encourage insurance providers to expand access to pediatric CKD preventive care to minimize emergency health care use and advocate for improving access to services for those with public health insurance.

SUPPLEMENTARY MATERIAL

Supplementary File (PDF).

Item S1: List of CKiD Study Investigators.

Table S1: Characteristics of Analytic Population Stratified by Health Insurance Status and Dental Insurance Status.

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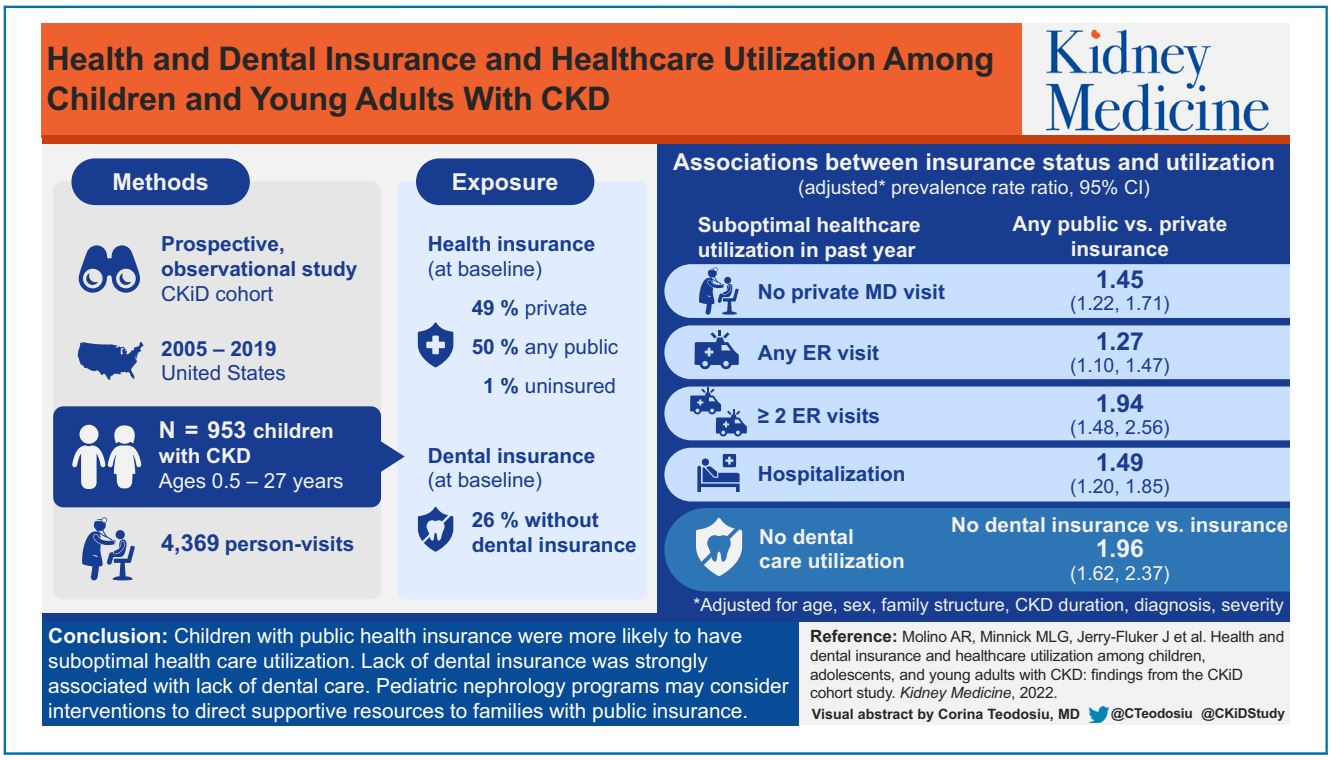
Health and Dental Insurance and Healthcare Utilization Among Children and Young Adults With CKD
Kidney Medicine
Methods
Prospective, observational study
CKiD cohort
2005 – 2019
United States
N = 953 children with CKD
Ages 0.5 – 27 years
4,369 person-visits
Exposure
Health insurance (at baseline)
49 % private
50 % any public
1 % uninsured
Dental insurance (at baseline)
26 % without dental insurance
Associations between insurance status and utilization
(adjusted* prevalence rate ratio, 95% CI)
Suboptimal healthcare utilization in past year
Any public vs. private insurance
No private MD visit
1.45
(1.22, 1.71)
Any ER visit
1.27
(1.10, 1.47)
≥ 2 ER visits
1.94
(1.48, 2.56)
Hospitalization
1.49
(1.20, 1.85)
No dental care utilization
No dental insurance vs. insurance
1.96
(1.62, 2.37)
*Adjusted for age, sex, family structure, CKD duration, diagnosis, severity
Conclusion: Children with public health insurance were more likely to have suboptimal health care utilization. Lack of dental insurance was strongly associated with lack of dental care. Pediatric nephrology programs may consider interventions to direct supportive resources to families with public insurance.
Reference: Molino AR, Minnick MLG, Jerry-Fluker J et al. Health and dental insurance and healthcare utilization among children, adolescents, and young adults with CKD: findings from the CKiD cohort study. Kidney Medicine, 2022.
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