Predictors of Children's Health Insurance Coverage Discontinuity in 1998 Versus 2009: Parental Coverage Continuity Plays a Major Role

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Abstract To identify predictors of coverage continuity for United States children and assess how they have changed in the first 12 years since implementation of the Children's Health Insurance Program in 1997. Using data from the nationally-representative Medical Expenditure Panel Survey, we used logistic regression to identify predictors of discontinuity in 1998 and 2009 and compared differences between the 2 years. Having parents without continuous coverage was the greatest predictor of a child's coverage gap in both 1998 and 2009. Compared to children with at least one parent continuously covered, children whose parents did not have continuous coverage had a significantly higher relative risk (RR) of a coverage gap [RR 17.96, 95 % confidence interval (CI) 14.48–22.29 in 1998; RR 12.88, 95 % CI 10.41–15.93 in 2009]. In adjusted models, parental continuous coverage was the only significant predictor of discontinuous coverage for children (with one exception in 2009). The magnitude of the pattern was higher for privately-insured children [adjusted relative risk (aRR) 29.17, 95 % CI 20.99–40.53 in 1998; aRR 25.54, 95 % CI 19.41–33.61 in 2009] than publicly-insured children (aRR 5.72, 95 % CI 4.06–8.06 in 1998; aRR 4.53, 95 % CI 3.40–6.04 in 2009). Parental coverage continuity has a major influence on children's coverage continuity; this association remained even after public health insurance expansions for children. The Affordable Care Act will increase coverage for many adults; however, 'churning' on and off programs due to income fluctuations could result in coverage discontinuities for parents. If parental coverage instability persists, these discontinuities may continue to have a negative impact on children's coverage stability as well.

Keywords Health insurance · Child · Access to care · Medicaid · CHIP

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Introduction

The health insurance landscape in the United States (US) has changed significantly over the past two decades due to political and economic factors. Employer-sponsored and other private coverage options have become less accessible for children and adults [1–3], and public insurance eligibility cutoffs prevent many adults from gaining coverage [4]. Public coverage options; however, have expanded for children with the creation of the Children's Health Insurance Program (CHIP) in 1997 [5]. CHIP has led to substantial increases in coverage; seven million children gained health insurance in its first 10 years and coverage rates significantly improved for children in families earning <400 % of the federal poverty level (FPL) [6–8].

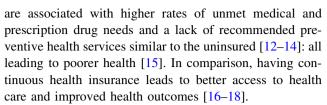**Table 1** Child and family demographic characteristics, 1998 versus 2009

	Weighted %		
	1998 (n = 5,879; weighted n = 64 million)	2009 (n = 9,125; weighted n = 68.7 million)	P value[a]
Family income[b]			0.09
Low income (<200 % FPL)	37.1	40.8	
Middle income (200 to <400 % FPL)	34.0	31.6	
High income (≥400 % FPL)	28.9	27.6	
Child age			0.39
0–4	27.9	29.7	
5–9	28.9	28.0	
10–13	21.5	20.9	
14–17	21.8	21.5	
Region			0.07
Northeast	18.9	17.4	
Midwest	25.1	22.0	
South	32.3	36.7	
West	23.7	23.9	
Health status			0.59
Excellent/very good	82.4	81.8	
Good/fair/poor	17.6	18.2	
Race/ethnicity			**<0.01**
White, non-Hispanic	66.4	55.7	
Non-white, non-Hispanic	19.6	22.4	
Hispanic, any race	14.0	22.0	
Family composition			0.33
One parent in household	26.8	25.4	
Two parents in household	73.2	74.6	
Child insurance type			**<0.01**
Any private	76.0	64.6	
Only public	24.0	35.4	
Parent(s) insurance			**<0.01**
Parent(s) continuous	82.6	78.0	
Parent(s) discontinuous	12.2	10.9	
Parent(s) no coverage	5.2	11.1	

Bold values are statistically significant ($P < 0.05$)

Source: Medical Expenditure Panel Survey-Household Component (MEPS-HC), 1998–2009

[a] *P* value compares change from 1998 to 2009

[b]FPL = federal poverty level. We based household income stratifications on established MEPS-HC categories: low income [(<200 % of the FPL) combining MEPS-HC poor, near poor and low categories]; middle income (200 to <400 % FPL); and high income (≥400 % FPL) [26]. The FPL was $16,450 in 1998 and $22,050 in 2009 [44, 45]

Though CHIP has improved health insurance rates, many children continue to experience gaps in coverage [9–11]. This is problematic because insurance discontinuities are associated with higher rates of unmet medical and prescription drug needs and a lack of recommended preventive health services similar to the uninsured [12–14]: all leading to poorer health [15]. In comparison, having continuous health insurance leads to better access to health care and improved health outcomes [16–18].

Child age and ethnicity, and family income have been shown to be predictors of discontinuous health insurance coverage for children [19, 20]. Few studies have included parental health insurance continuity as a potential predictor of discontinuous coverage; many of which were conducted in one state only [12, 21–24]. Further, little is known about whether there have been changes in the predictors associated with discontinuous coverage for children in the first 12 years after implementation of CHIP. Thus, this study examines the strength of association between known and potential *predictors of children's health insurance continuity* in both 1998 and 2009.

Methods

Data Source and Study Population

This analysis used data from the Medical Expenditure Panel Survey (MEPS)—Household Component (HC), which collects information from a subsample of households from the National Health Interview Survey, utilizes a stratified, clustered random sample with weights that produce estimates for the civilian, non-institutionalized US population [25, 26]. MEPS selects a new panel of respondents each year, and data are collected from each panel five times over a 2-year period. Each annual public use file contains data from two overlapping panels of the MEPS. Each year of MEPS data constitutes a nationally-representative sample. MEPS survey design and methodology are reported elsewhere [27–29]. We used MEPS-HC annual public use files from 1998 to 2009 [30].

An individual child was the unit of analysis. We selected children aged 0–17 years, with responses to one full year of the survey (n = 6,912 in 1998; n = 10,081 in 2009). To account for parental characteristics associated with children's insurance coverage, we linked each child with at least one biological, adopted, and/or stepparent residing in the same household (MEPS does not include variables for linking foster parents or non-parent guardians in this manner) [26] and excluded children for whom no identifiable parent records could be linked. Because we were interested in comparing discontinuous versus continuous coverage, we excluded children who were uninsured. This resulted in a final study population of 5,879 children in 1998 and 9,125 children in 2009, weighted to represent

approximately 64 million fully- or partially-insured US children in 1998 and 68.7 million in 2009.

Variables

MEPS-HC asks about monthly insurance coverage status and type at each data collection round; these responses are then logically edited and constructed by MEPS-HC staff into monthly variables. We utilized each child's monthly coverage information to construct a variable that represented the child's insurance continuity during a given calendar year: (1) continuous coverage and (2) discontinuous coverage [30]. For continuous coverage, the child had to have at least 1 day of coverage reported in every month of the calendar year. Children with coverage reported in 1–11 months of the calendar year, but not in all 12 months, were classified as having discontinuous coverage. Children with no health insurance reported in any of the 12 months were considered uninsured and were excluded from the analysis. Parental insurance coverage continuity was defined similarly: for continuous coverage, at least one parent had to have at least 1 day of health insurance coverage in every month of the calendar year. Parent(s) with coverage reported in 1–11 months of the calendar year, but not all 12 months were classified as having discontinuous coverage. If both parents or the sole parent in the household reported no coverage in all 12 months, parental coverage was designated as no coverage.

We also utilized each child's monthly coverage information to construct a variable that represented the child's insurance coverage *type* during a given calendar year: (1) only private insurance, (2) only public insurance and (3) both private and public insurance. Children who were reported to have at least 1 day of public insurance (e.g. Medicaid, CHIP) in each calendar month were considered to have had public insurance for that month; those reported to have least 1 day of private insurance (e.g. employer/union group insurance) in each calendar month were considered to have had private insurance for that month. For both private and public insurance, the child could have both private and public types of coverage reported for any or all months of the calendar year. Note that because of small sample sizes (n < 30) of for some categories of the interaction term between child's insurance type and parental insurance status in our final models, we re-categorized the insurance type variable as (1) any private insurance—those with only private insurance during the year or a combination of public and private, and (2) only public insurance.

We examined the following characteristics previously shown to influence coverage or coverage continuity: child's age, race/ethnicity, family income, region of residence, health status (as perceived by the reporting parent),

family composition (one parent in the household vs. two parents in the household), child's insurance type, and parent's insurance continuity (continuous, discontinuous, or no coverage) [13, 19–24, 31].

Analysis

We conducted chi-square tests to assess significant differences in sample characteristics, comparing 1998–2009. We used univariate logistic regression to identify factors significantly associated with whether or not a child had discontinuous coverage (vs. continuous) in 1998 and in 2009. We conducted chi-square tests to assess significant changes in these percentages, comparing 1998–2009. We used multivariate logistic regression to explore characteristics associated with children's discontinuous (vs. continuous) coverage in 1998 and in 2009. All covariates (except family composition) from univariate analyses were entered into the multivariate models because each was significantly associated with the primary outcome in 1998 and/or in 2009. Family composition was not retained in final models due to its high collinearity with parental insurance continuity. Further, we found evidence of significant effect modification by child's insurance type on the association between parent's and child's insurance continuity, which led us to include an interaction term between child's insurance type and parent's insurance continuity in the final models.

We assessed measures of association from logistic regression modeling as relative risks (RR) because odds ratios tend to overestimate the risk for commonly occurring outcomes [32]. Sampling stratification variables and weights accounted for the complex sample design of the survey; all analyses were conducted using SUDAAN software, version 11.0 (Research Triangle Institute, Research Triangle Park, NC). A *P* value of <0.05 was considered statistically significant for all analyses. This study was deemed exempt by the Oregon Health & Science University Institutional Review Board as MEPS data are publicly available.

Results

When assessing the demographic characteristics of our study sample, we found statistically significant differences in three of the variables: race/ethnicity, child insurance type, and parent(s) insurance in 1998 versus 2009. The distribution of other characteristics did not change during this time period (Table 1).

Several characteristics were associated with having a higher likelihood of discontinuous coverage (vs. continuous) in unadjusted models for both 1998 and 2009 (Table 2). Low- and middle-income children had a higher

Table 2 Child and family characteristics associated with a child having discontinuous health insurance coverage (vs. continuous health insurance coverage), 1998 versus 2009

	Prevalence and relative risk of a child having discontinuous coverage (vs. continuous coverage)				
	1998		2009		
	Child discontinuous coverage n (weighted %)	Unadjusted RR[a] (95 % CI[b])	Child discontinuous coverage n (weighted %)	Unadjusted RR (95 % CI)	P value[c]
Family income					
Low income (<200 % FPL[d])	649 (21.9)	3.73 (2.53–5.50)	848 (15.8)	3.38 (2.42–4.73)	**<0.01**
Middle income (200 to <400 % FPL)	241 (10.6)	1.81 (1.21–2.70)	280 (11.1)	2.38 (1.64–3.45)	0.75
High income (≥400 % FPL)	77 (6.0)	1.00	73 (4.7)	1.00	0.33
Child age					
0–4	300 (15.4)	1.43 (1.13–1.82)	364 (12.1)	0.99 (0.78–1.26)	**0.03**
5–9	280 (14.9)	1.38 (1.08–1.77)	312 (10.3)	0.84 (0.66–1.07)	**<0.01**
10–13	194 (11.4)	1.04 (0.82–1.33)	241 (10.5)	0.86 (0.69–1.08)	0.60
14–17	193 (11.2)	1.00	284 (12.2)	1.00	0.53
Region					
Northeast	124 (10.8)	1.00	135 (8.5)	1.00	0.31
Midwest	152 (11.2)	1.03 (0.68–1.56)	140 (7.9)	0.93 (0.63–1.37)	0.07
South	369 (15.7)	1.44 (1.01–2.06)	566 (13.6)	1.59 (1.17–2.17)	0.17
West	321 (15.1)	1.39 (0.94–2.05)	360 (12.8)	1.50 (1.06–2.12)	0.25
Health status					
Excellent/very good	713 (12.5)	1.00	910 (10.9)	1.00	0.09
Good/fair/poor	254 (17.9)	1.41 (1.16–1.71)	291 (13.2)	1.21 (0.97–1.51)	**0.03**
Race/ethnicity					
White, non-Hispanic	375 (11.5)	1.00	308 (9.4)	1.00	0.09
Non-white, non-Hispanic	175 (14.0)	1.26 (0.95–1.67)	315 (9.8)	1.04 (0.82–1.33)	**0.02**
Hispanic, any race	417 (22.1)	1.94 (1.53–2.47)	578 (17.5)	1.85 (1.52–2.25)	**0.04**
Family composition					
One parent in household	349 (17.9)	1.50 (1.22–1.84)	398 (13.7)	1.31 (1.07–1.61)	**0.02**
Two parents in household	618 (11.8)	1.00	803 (10.5)	1.00	0.21
Child insurance type					
Any private	450 (9.7)	1.00	400 (8.0)	1.00	0.08
Only public	517 (25.5)	2.70 (2.15–3.40)	801 (17.4)	2.19 (1.82–2.63)	**<0.01**
Parent(s) insurance					
Parent(s) continuous	226 (3.8)	1.00	300 (4.0)	1.00	0.63
Parent(s) discontinuous	531 (67.1)	17.96 (14.48–22.29)	541 (51.6)	12.88 (10.41–15.93)	**<0.01**
Parent(s) no coverage	199 (41.0)	10.94 (8.28–14.45)	360 (22.6)	5.65 (4.40–7.24)	**<0.01**

Bold values are statistically significant ($P < 0.05$)

Source: Medical Expenditure Panel Survey-Household Component (MEPS-HC), 1998–2009

[a] RR = relative risk

[b] CI = confidence interval

[c] P value compares change from 1998 to 2009

[d] FPL = federal poverty level, same as above

prevalence of discontinuous coverage, as compared to high-income children. Greater proportions of Hispanic children had discontinuous coverage, as compared to white, non-Hispanic children, and children with only public insurance had a higher prevalence of discontinuous coverage than children with any private coverage. In univariate analyses, having parents without continuous coverage was the greatest predictor of a child's coverage gap versus having a parent with continuous coverage in 1998 (RR 17.96, 95 % confidence interval (CI) 14.48–22.29) and

Table 3 Child and family characteristics associated with a child having discontinuous (vs. continuous) health insurance coverage in 1998 and in 2009

	Relative risk of a child having discontinuous coverage (vs. continuous coverage)	
	1998 adjusted RR[a] (95 % CI[b])	2009 adjusted RR (95 % CI)
Family income		
Low income (<200 % FPL[c])	1.16 (0.87–1.55)	1.09 (0.80–1.48)
Middle income (200 to <400 % FPL)	1.11 (0.87–1.43)	1.24 (0.91–1.68)
High income (≥400 % FPL)	1.00	1.00
Age		
0–4	0.89 (0.75–1.06)	0.90 (0.74–1.09)
5–9	0.91 (0.78–1.07)	**0.80 (0.65–0.97)**
10–13	0.92 (0.77–1.09)	0.93 (0.76–1.14)
14–17	1.00	1.00
Region		
Northeast	1.00	1.00
Midwest	0.96 (0.74–1.25)	0.87 (0.63–1.19)
South	1.08 (0.84–1.40)	1.18 (0.91–1.52)
West	1.06 (0.85–1.33)	1.10 (0.84–1.45)
Health status		
Excellent/very good	1.00	1.00
Good/fair/poor	1.01 (0.88–1.15)	1.00 (0.85–1.18)
Race/ethnicity		
White, non-Hispanic	1.00	1.00
Non-white, non-Hispanic	0.96 (0.77–1.19)	0.84 (0.70–1.00)
Hispanic, any race	1.02 (0.84–1.24)	1.03 (0.88–1.20)
Family composition		
One parent in household	N/A	N/A
Two parents in household	1.00	1.00
Child's insurance type		
Any private	1.00	1.00
Only public	–	–
Parent(s) insurance		
Parent(s) continuous	1.00	1.00
Parent(s) discontinuous coverage	–	–
Parent(s) no coverage	–	–
Child's insurance type × parent(s) insurance		
Child any private		
Parent(s) continuous	1.00	1.00
Parent(s) discontinuous coverage	**29.17 (20.99–40.53)**	**25.54 (19.41–33.61)**
Parent(s) no coverage	*	*
Child only public		
Parent(s) continuous	1.00	1.00

Table 3 continued

	Relative risk of a child having discontinuous coverage (vs. continuous coverage)	
	1998 adjusted RR[a] (95 % CI[b])	2009 adjusted RR (95 % CI)
Parent(s) discontinuous coverage	**5.72 (4.06–8.06)**	**4.53 (3.40–6.04)**
Parent(s) no coverage	**4.61 (3.15–6.75)**	**2.75 (2.03–3.72)**

Bold values are statistically significant ($P < 0.05$)

Source: Medical Expenditure Panel Survey-Household Component (MEPS-HC), 1998–2009

We adjusted each variable for all other variables in the model

[a] RR = relative risk

[b] CI = confidence interval

[c] FPL = federal poverty level, same as above

N/A not applicable. Family composition was removed from the final model due to multicollinearity with parent(s) insurance

– Results from main effects are not presented in the presence of a significant interaction term

* Sample sizes too small (n < 30) to produce reliable estimate

also in 2009 (RR 12.88, 95 % CI 10.41–15.93). Having parents with no coverage also predicted a gap in children's coverage as compared to continuous coverage in 1998 (RR 10.94, 95 % CI 8.28–14.45) and in 2009 (RR 5.65, 95 % CI 4.40–7.24).

In multivariate analyses, having parent(s) with discontinuous or no coverage was the greatest predictor of a child having a health insurance coverage gap. There was significant effect modification by child's insurance type on the association between parents and children's insurance continuity. The magnitude of association was much greater among privately-insured children than publicly-insured children. Among privately-insured children, those whose parent(s) had discontinuous coverage were significantly more likely to have a coverage gap in 1998 [adjusted relative risk (aRR) 29.17, 95 % CI 20.99–40.53] and 2009 (aRR 25.54, 95 % CI 19.41–33.61) as compared to those whose parents were continuously covered. Among publicly-insured children, parental coverage discontinuity was also significantly associated with child having discontinuous coverage in 1998 (aRR 5.72, 95 % CI 4.06–8.06) and 2009 (aRR 4.53, 95 % CI 3.40–6.04). We are unable to report reliable estimates on the association between no parental coverage and child's coverage gaps among privately-insured children due to small sample sizes (n < 30). However, among the publicly-insured children, significant associations between no parental coverage and child's coverage gaps were seen in 1998 (aRR 4.61, 95 % CI 3.15–6.75) and 2009 (aRR 2.75, 95 % CI 2.03–3.72),

though not to the same magnitude as the association with parental discontinuity. No other variables were significantly associated with child's discontinuous coverage in multivariate models, with one exception: in 2009, children ages 5–9 were less likely to have a coverage gap than the oldest children aged 14–17 (aRR 0.80, 95 % CI 0.65–0.97) (Table 3).

Discussion

CHIP has improved coverage for children, yet many still experience gaps [9–11]. Previous research found child age (older) and Hispanic ethnicity were the strongest predictors of a child not maintaining continuous coverage [13, 19]. One study found among publicly-insured children, having a parent with public coverage lowers the child's risk of disenrollment, compared to children whose parents were not publicly insured [22]. We found parental continuous coverage was the only significant predictor of discontinuous coverage for children in both 1998 and 2009 (with one exception in 2009). Thus, our study contributes new information to this important body of knowledge by highlighting the strong association between coverage continuity for parents and children, which remained significant after CHIP policies expanded children's coverage opportunities and decoupled children's coverage eligibility from parental employment. The magnitude of this association was much greater among children with private coverage as compared to children with public coverage. The strong correlation between parent and child insurance continuity for privately-insured children is understandable given that employer-sponsored private health insurance plans are usually obtained by a parent who then adds his/her children to the plan. However, public coverage for children does not come from a parent's plan; children can acquire individual coverage from Medicaid or CHIP. Thus, it was much more surprising to see that the association between coverage for children and parents remained highly significant among publicly-insured children in 2009, 12 years after CHIP expanded individual coverage to millions of US children [7].

Policy Implications

From 1998 to 2009, opportunities for children to gain and maintain coverage were expanded and children's eligibility requirements were relaxed; however, we found the association between coverage continuity for parents and children remained nearly as strong in 2009 as it was in 1998. Our findings suggest that if parents experience discontinuity, it will likely impact their children's health insurance continuity even if the child remains eligible for coverage.

The Patient Protection and Affordable Care Act (known as the ACA) of 2010 has provisions to expand public coverage options for adults, which may lead to improved coverage continuity for many parents [33, 34]. The Supreme Court did not uphold the requirement to enforce state participation in Medicaid expansions, so it is unclear whether coverage options will be affordable to low- and middle-income families in states choosing not to expand their Medicaid programs [35–37]. The ACA also established a mechanism to allow people making up to 400 % FPL to receive subsidies for purchasing health insurance through state exchanges. Income fluctuations experienced by many low- and middle-income families, however, may cause parents to 'churn' on and off Medicaid and other subsidized health insurance plans [33, 38]. These fluctuations in eligibility could result in unstable coverage for parents [38, 39]. Based on the findings of our study children whose parents experience coverage instability will likely continue to be vulnerable to coverage discontinuities. Additionally, CHIP provisions are scheduled to expire in 2015, and little is known about what impact the lack of its reauthorization will have on children's coverage [40].

With these policy changes, there is a need to closely monitor children's health insurance continuity. Because insurance coverage gaps of only a few months are associated with unmet health care needs [13, 18], it is important to understand factors associated with a child being at risk for a coverage gap. If we focus only on increasing coverage status rates, we may miss persistent discontinuities in coverage, especially among vulnerable subgroups. Further, if not carefully investigated, a new coverage "gain" may actually just be the same child who had a coverage gap and then re-enrolled in coverage.

As it is essential to get a complete picture of how policies are affecting children's health insurance coverage, it will be important to closely monitor factors that continue to predict discontinuities in coverage in order to develop better mitigating strategies to keep children continuously insured [41]. In addition to monitoring children's health insurance, there are ways for states and health care providers to intervene to improve coverage. For example, states should continue to conduct outreach to eligible children and adults, and state policies to streamline enrollment and re-enrollment (i.e. express lane eligibility and enrollment) could make it easier to enroll and stay enrolled in coverage. Another possibility is for health care providers to devise systems to help their patients obtain and maintain coverage, as is being done within the OCHIN

practice-based research network in Oregon through electronic health record tools [42, 43].

Limitations

Our analyses were limited by use of existing data: the MEPS-HC data is of an observational nature—causal associations cannot be inferred; and, as with all studies that rely on self-report, response bias remains a possibility. However, the MEPS-HC survey assesses monthly insurance status and asks several questions about insurance status and type of coverage at various time-points, and survey staff ensure that the final dataset has consistency across variables [26]. Finally, publicly-available MEPS data are not able to account for state-level differences in policies, nor does this study account for specific economic trends.

Conclusions

Despite gains in US children's health insurance coverage from 1998 to 2009, many children continue to experience coverage discontinuity. Children whose parents had discontinuous or no health insurance coverage were significantly more likely to experience coverage gaps as compared to children whose parents maintained continuous coverage. The Affordable Care Act will increase coverage for many adults; however, 'churning' on and off programs due to income fluctuations could result in coverage discontinuities for parents. If parental coverage instability persists, these parental discontinuities may continue to have a negative impact on children's coverage stability as well.

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