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RESEARCH ARTICLE

Public Premiums and Benefit Design

The Effect of Premium Changes on SCHIP Enrollment Duration

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Research Objective. To examine the impact of premium changes in Florida's State Children's Health Insurance Program (SCHIP) on enrollment duration.

Data Sources. Administrative records, containing enrollment and demographic data, were used to identify 173,330 enrollment spells for 153,768 children in Florida's SCHIP from July 2002 through June 2004. Health care claims data were used to classify the children's health status.

Study Design. Accelerated failure time models were used to examine the immediate and longer term effects on enrollment length of a temporary premium increase of $15 to $20 per family per month (PFPM) for children in families with income between 101–150 percent of the federal poverty level (FPL) and a permanent premium increase of $15 to $20 PFPM for children in families with 151–200 percent FPL. Health status and sociodemographic variables were included as covariates. Transfers to other public health insurance programs were taken into account.

Principal Findings. Enrollment lengths decreased significantly immediately following the premium increases, with a greater percentage decrease among lower income children (61 percent) than higher income children (55 percent). Enrollment lengths partially recovered in the longer term for both the temporary and permanent changes. Those with significant acute or chronic health conditions had longer enrollment lengths and were less sensitive to premium changes than healthy children.

Conclusions. An increase in the PFPM premium amount had differential effects across income categories and health status levels. Enrollment lengths remained shortened after the premium increase was rescinded for lower income families, suggesting that it may be difficult to reverse the impacts of even a short-term premium increase.

Key Words. SCHIP, public health insurance, premiums, cost sharing, enrollment

In recent years, states have increased beneficiary cost sharing in their public health insurance programs by increasing premiums or copayments. Histor-

ically, most cost sharing increases affecting children occurred in the State Children's Health Insurance Programs (SCHIP) because states could not require cost sharing for children in their Medicaid programs without federal waivers. However, the passage of the Deficit Reduction Act (DRA) of 2005 allows for greater cost sharing in Medicaid, and states are now permitted to charge premiums for nonexempt children who reside in families with income greater than 150 percent of the federal poverty level (FPL).

SCHIP also is potentially facing major changes with reauthorization in 2007, which is under consideration at the time of this writing. Because it is a block grant, it has a fixed annual funding level and severe shortfalls are anticipated if the annual funding remains frozen with the reauthorization (Center on Budget and Policy Priorities 2006). States facing shortfalls in SCHIP funding typically have responded by reducing eligibility, eliminating benefits, or increasing family costsharing through copayments and premiums. Premiums can relieve some of the fiscal pressure that states face by reducing net program costs and discouraging crowd out of private insurance by public insurance. But premiums also may be a barrier to access if children do not obtain coverage because of the cost or if they experience intermittent coverage because of missed payments. SCHIP experiences with premium increases may yield important information for states to consider as they explore cost sharing options in SCHIP and Medicaid.

This article examines the effect of premium changes in Florida's SCHIP—the Florida Healthy Kids Program (FHKP). Effective on July 1, 2003, the premium for families with household income between 101 and 200 percent of the FPL increased by $5 per family per month (PFPM) from $15 to $20 (Table 1). The Centers for Medicare and Medicaid Services determined that the $20 PFPM amount exceeded federal cost sharing limits for families with income at or below 150 percent FPL. Premiums were consequently reduced to $15 PFPM for families whose income was 101–150 percent FPL as of October 1, 2003 and remained at $20 PFPM for families whose income was 151–200 percent FPL.

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Table 1: Premium Changes in the Florida Healthy Kids Program, 2003

	PFPM Premium Amount		
Family Income	*Before July 2003*	*July 2003–September 2003*	*October 2003 Onward*
101–150% FPL	$15	$20	$15
151–200% FPL	$15	$20	$20

Note: FPL, federal poverty level.

Families were given 60 days notice of the premium increase. Premium payments were due on the first of the month for the following month's coverage. Families had until the end of the month in which the premium was due to make a late payment and avoid cancellation. During that time, they received two notification letters and an automated call reminding them that their payment was overdue. Coverage was cancelled effective the first of the following month if the full premium was not paid. Children could be reinstated after a minimum 60-day waiting period if their families requested reinstatement and made a premium payment; however, payment of missed premiums was not required. When the premium changes occurred, the FHKP had a passive renewal process, and the average monthly disenrollment rate among families with 101 and 200 percent FPL was approximately 3 percent.

The primary purpose of our study is to examine the relationship between the premium changes in Florida's SCHIP and the children's enrollment durations. Secondarily, we are interested in knowing whether the premium increase had a differential impact on subgroups of children because children's sociodemographic characteristics (family income, child age, and place of residence) and health status may influence their enrollment lengths (Shenkman et al. 2002).

Our specific study objectives are to: (1) analyze the impact of the temporary premium increase of $5 PFPM on the enrollment duration of children in the 101–150 percent FPL group; (2) compare the impact of the $5 PFPM premium increase on the enrollment duration of children in the 101–150 percent FPL group to that of children in the 151–200 percent FPL group for the 3-month time period when families in both income groups faced the increased premium; (3) compare the shorter-term (first 3 months) versus longer-term (4–12 months) effects of the permanent $5 PFPM premium increase on the enrollment duration of children in the 151–200 percent FPL group; and (4) compare the differential effects of the premium changes on the

enrollment duration of children with different sociodemographic and health status characteristics.

Previous studies have found a positive relationship between premium amounts and the likelihood of disenrolling from SCHIP (Dick et al. 2002; Shenkman et al. 2002; Miller et al. 2004; Phillips et al. 2004). However, with the exception of Shenkman et al. (2002), the empirical methods employed in these studies made it difficult to tease out the premium effects from income effects because the different premium amounts corresponded to different income groups. More recent research uses duration analyses to examine disenrollment patterns before and after the introduction of new premiums (Kenney et al. 2007; Marton 2007).

Less research has been conducted on the effect of changes in pre-existing premiums in SCHIP programs. Kenney et al. (2006/2007) recently examined the effect of increases in pre-existing premiums in New Hampshire for families between 185 and 300 percent FPL and in Kansas for families between 151 and 200 percent FPL. However, in Kansas, cancellations for premium nonpayment were postponed until recertification, which made it difficult to separate out the effect of the premium increases on disenrollment. Other developments in the recent literature include defining program exit more broadly to include transfers to other public health insurance programs (e.g., from SCHIP to Medicaid) and to analyze short-term versus long-term impacts of premiums on enrollment (Marton 2007). We adopt similar approaches in our analysis.

This paper contributes to the literature in several ways. First, we extend the research on changes in pre-existing premiums to examine the effect of a relatively small nominal increase of $5 (from $15 to $20 PFPM) on the enrollment lengths of the lowest income families in SCHIP, those between 101 and 150 percent FPL, and compare that effect to the same increase for families between 151 and 200 percent FPL. The effect of this relatively small increase on enrollment length provides information about how sensitive families are to premium increases. Focusing on the lowest income families in SCHIP also provides insight into the potential impacts of the increased flexibility that states have to require cost sharing in their Medicaid programs as a result of the DRA. Second, we incorporate health status information from medical claims and encounter data to better understand the differential effects of the premium increases on children with different health status levels. Finally, unlike other studies, we include long-term program enrollees instead of focusing only on children who were newly enrolled during the observation period.

METHODS

Data Sources

The FHKP provided person-level enrollment files containing information about the children's age, gender, family income, place of residence, and enrollment status. These files were used to obtain the children's sociodemographic characteristics and to define their enrollment spells. The FHKP enrollment files were linked to Medicaid and to the state Title V Children with Special Health Care Needs (CSHCN) enrollment files to take into account transition to another public insurance program. The Title V program serves children eligible for Title XIX (Medicaid) or Title XXI (SCHIP) funding who meet clinical eligibility criteria for special health care needs. Transitions into and out of the Title V program occur when a child's clinical eligibility changes.

The enrollment files also were matched to health care claims and encounter data submitted by health plans participating in the FHKP. The person-level claims and encounter data contain Physician's Current Procedural Terminology (CPT) codes and International Classification of Diseases, 9th Revision (ICD-9-CM) codes. Claims and encounter data were used to classify the children's health status during their enrollment spells.

Sample Selection

The University of Florida Health Sciences Center Institutional Review Board approved this project. All children enrolled in the FHKP for at least 2 months between January 2003 and June 2003 with family income between 101 and 200 percent FPL were included in the analyses. We chose this time frame to include enrollees who were in the program immediately preceding the initial premium change that occurred in July 2003. Concurrent with the premium changes, Florida implemented an enrollment freeze in its SCHIP in July 2003. We did not include new enrollees from July 2003 onward to avoid at least some of the potential confounding effects of the enrollment freeze. To capture sufficient enrollment behavior before and after the premium changes, the observation window for our sample extends from July 1, 2002 to June 30, 2004. We ended our observation period on June 30, 2004, to avoid confounding effects from the implementation of an active renewal process in Florida effective July 2004. Children aged 18 and older were excluded so that those who were aging out of the program would not be included in the analyses.

Children frequently disenroll and reenroll in public insurance programs. Each period of enrollment is called an enrollment spell. We analyzed 173,330

enrollment spells for 153,768 children. Eighty-nine percent of the children had one enrollment spell, 10 percent had two spells, 1.2 percent had three spells, and less than 1 percent had four spells.

Variables and Measures

Enrollment and Disenrollment Spells. The outcome of interest is the duration of the children's enrollment spells, which is equal to the number of months between the first month of coverage and either the month of disenrollment or June 30, 2004 (at which point they were right censored because we no longer observed the children's outcomes after the study period ended). The beginning of an enrollment spell is defined as 2 consecutive months of enrollment in the FHKP. A child was considered disenrolled only if he or she was not enrolled in any public health insurance program for at least 2 consecutive months. Two consecutive months was selected to address administrative changes in the enrollment files that do not reflect actual changes in the continuity of health coverage. Disenrolled children begin a new enrollment spell if they are subsequently enrolled again for at least 2 consecutive months.

Prior Enrollment and Program Transition. We did not restrict our analyses to new enrollees because we wanted to include the impact of the premium changes on longer-term enrollees, who constitute an important segment of SCHIP enrollment. Approximately, 58 percent of our sample had an enrollment spell in progress at the beginning of the observation period. For these children, we accounted for the number of months of continuous enrollment before July 2002 in our analyses. In addition, we controlled for transfers to Medicaid and the State Title V CSHCN Program because program transitions may influence enrollment length.

Premium Change Variables. The premium changes were defined as a time-varying covariate equal to the dollar amount that the family paid during each of the three time periods: pre-July 2003, the July 2003 policy change, and the October 2003 policy change. To allow us to compare the immediate impact (July–September 2003) to the longer-run impact (October 2003 onward) of the permanent premium increase to $20 PFPM for families in the 151–200 percent FPL group, a time-varying dummy variable named "time" was created. This variable was assigned the value of zero before October 2003 and the value of one from October 2003 onward.

Children's Health Status. The Clinical Risk Groups (CRGs) was used to classify the children's health status. The CRGs use ICD-9-CM diagnosis codes from all health care encounters, except those associated with providers known to frequently report unreliable codes (e.g., nonclinician providers and ancillary testing providers), to assign individuals to a hierarchically defined core health status group (Neff et al. 2001). The CRG classification system has been tested and validated for identifying children with special health care needs (Neff et al. 2001; Bethell and Read 2002). Children older than 12 months must be enrolled for at least 6 months to be classified.

The CRGs have nine health status categories that were reduced to the following five groups using instructions from the developers: (1) healthy (including nonusers of health care services), (2) significant acute conditions (e.g., meningitis, traumatic brain injury), (3) minor chronic conditions (e.g., asthma, attention deficit disorder), (4) moderate chronic conditions (e.g., diabetes, depression), and (5) major chronic conditions (e.g., cystic fibrosis, cancer, schizophrenia). Children not meeting the minimum enrollment criteria of 6 months for CRG classification were labeled "unclassified." Unclassified children included new enrollees and children who cycled in and out of the program.

Children's health status can change across time and changes in health status may be related to families' decisions about their children's program enrollment. Therefore, we classified the children's health status at 6-month intervals throughout the study period (four time frames). Six-month intervals were selected in order to meet the CRG classification criteria. Claims and encounter data from January 2002 through December 2002 were used to classify the children's health status for children enrolled in July 2002 and for new enrollment spells originating from July 2002 through December 2002. The children's CRG classification was then updated every 6 months (at January 2003, July 2003, and June 2004) by advancing the claims and encounter data time intervals by 6 months for each classification update. Twelve months of data were used at each update to classify the children.

Demographic Variables. The following demographic characteristics were included: family income as a percentage of the FPL, child age, and child gender. An indicator of rural versus urban residence was constructed from Rural–Urban Commuting Areas (RUCA) codes (Economic Research Service, United States Department of Agriculture 2000). The codes categorize a family's residence using the zip code and census tract. The

RUCA categories were collapsed to represent metropolitan/large town areas versus small town/rural areas.

Analytic Methods

Accelerated failure time (AFT) models were used to analyze the impact of premium changes on the children's enrollment length over time. Health status and sociodemographic variables also were included in the models. Recent analyses of SCHIP enrollment behavior have used Cox proportional hazards models (e.g., Shenkman et al. 2002; Kenney et al. 2006/2007; Marton 2007). In the current analysis, however, the proportionality assumption was found to be violated even after considerable stratification. Parametric survival models, including AFT models, may be used as alternatives to the Cox model when the proportional hazards assumption is violated and have been used in public health research (Lee and Go 1997). In contrast to hazards models, AFT models assume that the effect of the covariates is multiplicative on survival time rather than on the hazard function (Kalbfleisch and Prentice 2002; Kleinbaum and Klein 2005). Consequently, results are reported in terms of enrollment length ratios instead of hazard ratios. We estimated both AFT models and hazards models. The results were consistent across the different hazards and AFT models tested: enrollment length ratios that were less than 1.00 in the AFT models corresponded to hazard ratios that were greater than 1.00 in the hazards models, where 1.00 represents the ratio for the reference group. Our results are from a generalized gamma model, which is a three-parameter distribution with a highly flexible function. Using the Akaike Information Criterion (AIC), the gamma model provided the best fit for these data. Because children could have more than one spell, robust standard errors were calculated and adjusted for clustering on the children's identifier variable. The *p*-values reported reflect the clustered robust standard errors. We used *Stata 9* to perform these analyses (Stata Corporation 2005).

As described above, we accounted for children who had an enrollment spell in progress at the start of the study period. These spells were treated as left truncated observations. Left truncation indicates that the subject was "at risk" for the event (in our case a shortened enrollment length) before he or she came under actual observation (Hosmer and Lemeshow 1999). We used the prior enrollment variable to account for when the child came at risk in our model in order to accurately capture the enrollment duration experience of longer-term enrollees.

Table 2: Descriptive Statistics for the Sample by Weighted Enrollment Spells

Characteristic	*Percentage*
Premium	
$15	70.14
$20	29.86
FPL	
101–150%	58.18
151–200%	41.82
Health Status	
Healthy	77.72
Significant acute	6.19
Minor chronic	4.38
Moderate chronic	4.42
Major chronic	0.46
Unclassified	6.83
Program Transition	
No transfer	97.43
Transfer to Medicaid	2.43
Transfer to Title V CSHCN Program	0.14
Age	
0–4	1.40
5–11	53.88
12–17	44.72
Gender	
Male	50.80
Female	49.20
Geographic location	
Rural	7.77
Urban	92.23

Note: FPL, federal poverty level; CSHCN, Children with Special Health Care Needs.

RESULTS

Descriptive Statistics

Table 2 provides a summary of the descriptive characteristics for the sample using weighted enrollment spells. The children's enrollment spells were weighted by the spell length to determine the time at risk for each covariate value. The majority of spells included a $15 PFPM premium amount (70 percent), family income of 101–150 percent FPL (58 percent), and children who were healthy (78 percent). Two percent of the weighted enrollment spells

included a transfer to Medicaid, while less than 1 percent included a transfer to the Title V CSHCN Program. A slight majority of the sample included children who were 5–11 years old (54 percent) followed by those who were 12–17 years old (45 percent). Gender was split roughly equally, and the place of residence was classified as urban for the majority of spells (92 percent).

Kaplan–Meier Estimates

Table 3 presents our sample's Kaplan–Meier survival estimates by premium amount, time period, and family income. The corresponding geometric mean monthly disenrollment rates are indicated in parentheses. The survival function indicates the probability of surviving past time t, where t represents analytic time in months. For children who remained enrolled for 12 months or longer, the premium increase decreased the probability of remaining enrolled in both the short term and the longer term. Under the $15 PFPM premium before the increase, for example, the probability of remaining enrolled longer than 12 months is 81 percent for children in the 101–150 percent FPL group compared with 84 percent for children in the 151–200 percent FPL group. The Kaplan–Meier estimates of the short-term impact of the premium increase to $20 PFPM indicate that the probability of remaining enrolled longer than 12 months decreased to 60 and 69 percent, respectively, for the lower and higher income groups. When the premium returned to $15 for children in the 101–150 percent FPL group, the estimated probability of remaining enrolled for longer than 12 months increased to 75 percent, but was still below the 81 percent probability before the increase. These results indicate that 19 percent of children in the 101–150 percent FPL group disenrolled within 12 months before the premium increase compared with 25 percent disenrollment within 12 months after the premium returned to $15 PFPM. The corresponding monthly disenrollment rates are 1.70 percent before the premium increase and 2.35 percent when the premium returned to $15 after the short-term increase. Using the longer-term estimate for children in the 151–200 percent group, approximately 80 percent of children were estimated to remain enrolled longer than 12 months under the $20 PFPM premium. Therefore, after allowing for some longer-term adjustment to the new premium level of $20 for children in the 151–200 percent FPL group, approximately 20 percent of children in the higher income group disenrolled within 12 months after the premium increase compared with 16 percent under the $15 PFPM premium.

Table 3: Kaplan–Meier Survival Estimates by Premium Amount and Family Income (Geometric Mean Monthly Disenrollment Rates Indicated in Parentheses)

	July 2002–June 2003 *$15*		*July 2003–September 2003* *$20*		*October 2003–June 2004* *$15*	*$20*
Time	*101–150% FPL*	*151–200% FPL*	*101–150% FPL*	*151–200% FPL*	*101–150% FPL*	*151–200% FPL*
0	1	1	1	1	1	1
	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
6	0.8985	0.9163	0.7686	0.8234	0.9416	0.958
	(1.77%)	(1.45%)	(4.29%)	(3.19%)	(1.00%)	(0.71%)
12	0.8139	0.8448	0.6038	0.6862	0.7515	0.8025
	(1.70%)	(1.40%)	(4.12%)	(3.09%)	(2.35%)	(1.82%)
18	0.7489	0.7881	0.4816	0.5849	0.6283	0.6988
	(1.59%)	(1.31%)	(3.98%)	(2.94%)	(2.55%)	(1.97%)
24	0.7001	0.7452	0.4072	0.5183	0.5273	0.6152
	(1.47%)	(1.22%)	(3.67%)	(2.70%)	(2.63%)	(2.00%)
30	0.6645	0.7099	0.3489	0.4614	0.4532	0.5518
	(1.35%)	(1.14%)	(3.45%)	(2.55%)	(2.60%)	(1.96%)
36	0.6307	0.683	0.3078	0.4169	0.3947	0.4973
	(1.27%)	(1.05%)	(3.22%)	(2.40%)	(2.55%)	(1.92%)
42	0.6042	0.6582	0.2716	0.3811	0.3489	0.4564
	(1.19%)	(0.99%)	(3.06%)	(2.27%)	(2.48%)	(1.85%)
48	0.5829	0.6329	0.2511	0.3497	0.3116	0.4199
	(1.12%)	(0.95%)	(2.84%)	(2.17%)	(2.40%)	(1.79%)
54	0.5612	0.6091	0.2269	0.3256	0.2757	0.3868
	(1.06%)	(0.91%)	(2.71%)	(2.06%)	(2.36%)	(1.74%)
60	0.55	0.6013	0.2113	0.3119	0.2477	0.3568
	(0.99%)	(0.84%)	(2.56%)	(1.92%)	(2.30%)	(1.70%)
66	0.5282	0.5755	0.198	0.2974	0.2219	0.3275
	(0.96%)	(0.83%)	(2.42%)	(1.82%)	(2.26%)	(1.68%)
72	—	—	—	—	0.1994	0.3081
	NA	NA	NA	NA	(2.21%)	(1.62%)
78	—	—	—	—	0.179	0.2852
	NA	NA	NA	NA	(2.18%)	(1.60%)

Note: FPL, federal poverty level; NA, not applicable.

AFT Modeling Results

Kaplan–Meier survival functions do not account for other factors that could influence enrollment behavior. Therefore, we used AFT methods to adjust for other variables. Table 4 presents the results of the generalized gamma multivariate model of enrollment duration with the time ratios (TRs). The TR is the exponentiated coefficient and reflects the variable's impact on enrollment length (Kleinbaum and Klein 2005). The TR for the reference group is 1.00

Table 4: Survival Model for Enrollment Duration in FHKP, July 2002–June 2004

	Model 1		*Model 2*	
Variable	*Time Ratio*	*p-Value*	*Time Ratio*	*p-Value*
Premium				
($15)*	1.0000		1.0000	
$20	0.5348	.0000	0.3919	.000
Income as a % of FPL				
(101–150% FPL)	1.0000		1.0000	
151–200% FPL	1.4692	.0000	1.1427	.000
Time				
(Before October 2003)	1.0000		1.0000	
October 2003 onward	0.7595	.0000	0.5104	.000
Health status				
(Healthy)	1.0000		1.0000	
Significant acute	2.2277	.0000	1.9769	.000
Minor chronic	1.6941	.0000	1.6304	.000
Moderate chronic	1.6811	.0000	1.6758	.000
Major chronic	1.8729	.0000	1.8463	.000
Unclassified	0.3144	.0000	0.3689	.000
Program transition				
(No transfer)	1.0000		1.0000	
Transfer to Medicaid	0.0969	.0000	0.0604	.000
Transfer to Title VCSHCN Program	3.9155	.0000	9.5950	.000
Age				
(0–4)	1.0000		1.0000	
5–11	0.6295	.0000	0.6009	.000
12–18	0.5783	.0000	0.5473	.000
Gender				
(Male)	1.0000		1.0000	
Female	1.0061	.5140	1.0052	.606
Residence				
(Urban)	1.0000		1.0000	
Rural	0.9278	.0000	0.9166	.000
Premium by FPL interaction				
151–200% FPL & $20 premium			1.1439	.000
Premium by time interaction			2.3941	.000
Premium by health status interaction				
Significant acute & $20 premium			1.5565	.000
Minor chronic & $20 premium			1.1789	.007
Moderate chronic & $20 premium			1.0474	.439
Major chronic & $20 premium			1.0627	.754
Unclassified & $20 premium			0.0517	.000
Premium by Age Interaction				
Age 5–11 & $20 premium			1.1199	.159
Age 12–18 & $20 premium			1.0971	.252

Note: *Reference category is indicated in parentheses.

FPL, federal poverty level; FHKP, Florida Healthy Kids Program; CSHCN, Children with Special Health Care Needs.

and represents enrollment lengths for healthy male children age 0–4 in urban areas with $15 premiums before the initial premium increase. TRs greater than 1.00 indicate longer enrollment lengths, and those less than 1.00 indicate shorter enrollment lengths.

Model 1 includes only the main effects. The premium amount, income, health status, child age, and place of residence are all significant predictors of enrollment length, after accounting for transfers to Medicaid and the State Title V CSHCN Program. The premium increase from $15 to $20 PFPM was associated with an overall reduction in enrollment length of 47 percent (TR = 1.00 to TR = 0.53). Children in higher income families had enrollment lengths that were 47 percent longer than those for children in lower income families. The main effects of the health conditions show that children with significant acute and chronic conditions had significantly longer enrollment durations, ranging from 68 to 123 percent longer, than healthy children. Finally, older children and children in rural areas had enrollment lengths that were shorter than younger children and children in urban areas. We were unable to detect any impact of gender on enrollment length.

Model 2 presents the results for the same specification as Model 1, but includes interactions between the premium and (1) FPL, (2) time (before and after October 2003), (3) health status (as measured by the CRGs), and (4) age. These interactions test for the differential impact of the premium changes on enrollment length depending on family income, time frame, child health status, and age. This allows us to evaluate whether the premium change particularly affects enrollment length for certain categories of children. The interactions are statistically significant except for the interactions between the premium amount and age. To understand fully the differences in the premium effects across these different categories of children, it is necessary to examine the main effects and interactions combined. Therefore, rather than discussing the individual coefficients in Model 2, we present the results of combining the main effects and interactions from Model 2 in Table 5.

Table 5 provides the median enrollment lengths (MEL), measured in months, predicted from the model; the corresponding TRs are indicated in parentheses. The reference group in this table is healthy children in the lower income group under the original premium, with a predicted median enrollment duration of 53 months and a TR of 1.000. There is a generally consistent pattern of premium impacts across income categories and health status levels, indicating a significant decrease in enrollment length immediately after the July 2003 premium increase, followed by some recovery in enrollment length from October 2003 onward. However, the results in Table 5 also demonstrate

Table 5: Estimated Effects of the FHKP Premium Changes on Median Enrollment Lengths in Months by Family Income and Health Status

	MEL (TR)					
	July 2002–June 2003 $15		*July 2003–September 2003 $20*		*October 2003–June 2004 $15*	*$20*
Variable	*101–150% FPL*	*151–200% FPL*	*101–150% FPL*	*151–200% FPL*	*101–150% FPL*	*151–200% FPL*
Family income as a percent of FPL						
(101–150%	53	NA	21	NA	27	NA
FPL)†	(1.0000)	NA	(0.3919)	NA	(0.5104)	NA
151–200%	NA	61	NA	27	NA	33
FPL	NA	(1.1427)	NA	(0.5123)	NA	(0.6260)
Health status						
(Healthy)†	53	61	21	27	27	33
	(1.0000)	(1.1427)	(0.3919)	(0.5123)	(0.5104)	(0.6260)
Significant	105	120	64	84	53	102
acute	(1.9769)	(2.2590)	(1.2060)	(1.5764)	(1.0090)	(1.9263)
Minor	86	99	40	52	44	64
chronic	(1.6304)	(1.8630)	(0.7533)	(0.9846)	(0.8322)	(1.2032)
Moderate	89	101	36	48	45	58
chronic	(1.6758)	(1.9150)	(0.6879)*	(0.8992)*	(0.8554)	(1.0988)*
Major chronic	98	112	41	53	50	65
	(1.8463)	(2.1097)	(0.7690)*	(1.0052)*	(0.9424)	(1.2283)*
Unclassified	20	22	0	1	10	1
	(0.3689)	(0.4215)	(0.0075)	(0.0098)	(0.1883)	(0.0119)

Note: These effects were calculated at the means of the other covariates: age, gender, residence, and program transition.

†Reference category is indicated in parentheses.

*The TR calculations for the moderate and major chronic categories with the $20 premium involve the statistically insignificant coefficients for the interactions between the premium = $20 variable and the health status variables. To test whether the calculated TRs (and, hence, median enrollment lengths) in Table 5 are meaningful, we performed Wald tests of the TRs for children with moderate and major chronic conditions against the corresponding TRs for children in the "healthy" health status category and found that they were significantly different at the $\alpha = 0.01$ level.

MEL, median enrollment length in months; TR, time ratio; NA, not applicable; FHKP, Florida Healthy Kids Program; FPL, federal poverty level.

important variations in the impact of the premium changes for children from different income and health status groups, and across time. Such variation is masked when examining the main effects from Model 1 in isolation, but becomes apparent when combining the main effects and interactions from Model 2.

The premium changes impacted children in the two income categories differently. When the premium increased from $15 to $20 PFPM, the median enrollment duration decreased for children in both income categories: from 53 to 21 months for children in the 101–150 percent FPL group and from 61 to 27 months for children in the 151–200 percent FPL group. However, enrollment length decreased by a greater percentage for children with family income of 101–150 percent FPL (61 percent) compared with those with family income of 151–200 percent FPL (55 percent). When the premium returned to $15 PFPM in October 2003 for children in families between 101–150 percent FPL, their enrollment length recovered somewhat (MEL = 21 months to MEL = 27 months), but remained only approximately one-half of that before the premium increase.

While children in families between 151–200 percent FPL experienced a permanent increase in the premium to $20 PFPM, their response to this permanent premium increase changed over time, as evidenced by the increase in the predicted median enrollment duration of 27 months from July 2003 through September 2003 to 33 months from October 2003 onward. Even in this latter period, however, the MEL of 33 months for these higher-income families remained significantly below the MEL of 61 months under the original $15 PFPM premium.

Children in all health status categories experienced a decrease in enrollment duration when the PFPM premium increased from $15 to $20 in the July 2003 to September 2003 period, with a partial recovery in enrollment duration from October 2003 onward. The initial decline in enrollment length was more pronounced, however, for children in the healthy CRG category compared with children in the significant acute and the chronic condition categories. For example, in the lower income group, healthy children experienced a 61 percent short-term decline in enrollment compared with a 39 percent short-term decline for children with significant acute conditions. Children with moderate and major chronic conditions had approximately a 58 percent decline in enrollment length in the lower income group and a 52 percent decline in the higher income group. The enrollment lengths showed some recovery in the longer term (4–12 months after the initial premium change) for healthy children and children with minor, moderate, or major chronic conditions in both income groups and for children with significant acute conditions in the higher income group. For example, the enrollment lengths from the short term to the longer term increased by approximately 10 percent (MEL = 40 months to MEL = 44 months) for children with minor chronic conditions in the 100–150 percent FPL group and by approximately 23 percent (MEL = 52 months to

MEL = 64 months) for children with minor chronic conditions in the 151–200 percent FPL group. For all children, however, the enrollment lengths remained below their values before the premium change.

DISCUSSION

The focus of our study was the effect of premium changes on enrollment lengths in Florida's SCHIP. Understanding the impact of premium changes on children's participation in public health insurance programs is important because continuity of coverage is positively associated with better access to care and fewer unmet health care needs (Szilagyi et al. 2000; Olson, Tang, and Newacheck 2005). Our results indicate that enrollment lengths decreased significantly immediately following the premium increase in July 2003, with a greater percentage decrease among lower income children (61 percent) than higher income children (55 percent). The decreased enrollment durations indicate that families are sensitive to what may appear to be a modest increase in the premium amount ($5 PFPM). In addition, our findings suggest that premium changes may have lasting impacts on enrollment durations. Enrollment lengths only partially recovered in the longer term for both the temporary and permanent changes, at least during the one-year time period that we observed.

The premium increases also had different effects on children based on their health status. Children who were healthy experienced greater reductions in enrollment length when the premiums increased than those with significant acute and chronic conditions. Parents may not perceive an immediate need for health insurance when their children are healthy. However, the effect of these changes on healthy children should not be overlooked. All children require preventive care visits, which is an important time to screen for potential health problems and to provide anticipatory guidance to parents (Council on Children with Disabilities 2006; Earls and Hay 2006). Lack of health insurance, which may result from cost sharing changes, may reduce access to this important type of care for low-income children.

Children with significant acute and chronic conditions experienced declines in enrollment length after the premiums increased, but those declines were less pronounced than those observed for healthy children. Parents who have children with significant acute conditions, such as meningitis and traumatic injuries, likely have an immediate and clearly recognized need for insurance and thus do not experience the same strong impact of the premium

increase on enrollment length. Asthma is the most frequently observed diagnosis in the minor chronic condition health status category. Parents whose children have conditions like asthma may be more likely to retain health insurance for their children due to the need for more frequent health care visits and prescriptions. Families whose children had moderate and major chronic conditions (e.g., diabetes, cystic fibrosis, cancer, depression, and schizophrenia) had enrollment lengths that were 68 to 87 percent longer than those of healthy children and were less sensitive to the premium changes than families with healthy children. However, these findings do not mean that increased cost sharing does not adversely affect families of the most severely ill children. Although federal requirements limit total cost sharing to 5 percent of family income, this limitation applies to premiums and copayments only for covered services. Families whose children have chronic conditions often incur out-of-pocket expenses for their children's health care that are only partially mitigated by public insurance coverage. In part, this occurs because some services are not covered or families select providers who are not in the program's network (Kuhlthau et al. 2005; Chen and Newacheck 2006; Galbraith et al. 2006). Therefore, increased cost sharing may create additional financial risk for these families.

About 7 percent of enrollment spells were not assigned to a health status category ("unclassified") because the children's enrollment durations were less than the 6 months required for classification. Because the CRGs do not capture the health status for these spells, it is possible that we missed important information about them that could have been gained if we used parent-reported pediatric health status measures. However, 93 percent of the enrollment spells in our analyses had a health status classification, and the findings shed important information about the impact of premium changes on those with different health status levels.

Finally, children in the 12–17-year-old age cohort had shorter enrollment lengths than younger children, even after considering shortened enrollment due to aging out of the program in our models. Adolescents are at increased risk for morbidity, mortality, and high health care use due to their risky behaviors (Youngblade et al. 2006). Therefore, maintaining health insurance is vitally important for this age group.

The premium changes in Florida's SCHIP occurred at the same time that enrollment was frozen (July 2003). To avoid confounding effects of the enrollment freeze, we did not include new enrollees from July 2003 onward. It is possible that the closed enrollment policy discouraged families from disenrolling their children. To the extent that this deterrent effect existed, our

estimates of the premium effects on enrollment durations are understated. The premium changes also occurred under a passive renewal process. States with active renewal processes experience spikes in disenrollment at recertification, which could confound the effect of premium changes on enrollment. However, under Florida's passive renewal process, there were no such spikes (Dick et al. 2002). The passive recertification policy, combined with our inclusion of long-term enrollees in the analyses, may account for the relatively long median enrollment durations observed before the premium changes. We did not examine the impact of the premium increase on enrollment into the program but rather focused on time to disenrollment. Future analyses examining the impact on program enrollment may provide further useful information for states as they modify their public insurance programs.

The Kaplan–Meier estimates of survival indicate that the average monthly disenrollment rates among our sample were relatively small—ranging from less than 1 percent to just over 4 percent. These estimates are consistent with the relatively low disenrollment rates in Florida's SCHIP under passive recertification found in other studies (Dick et al. 2002). Therefore, while the magnitude of the premium impact is large in relative terms, this impact is operating on a base of low disenrollment rates. However, the effect of premium changes on families should not be underestimated. An increase of one percentage point in disenrollment on our sample size of approximately 150,000 children amounts to an additional 1,500 children disenrolling each month, or an additional 18,000 children disenrolling within 1 year.

Because shorter enrollment durations translate into increased disenrollment, our findings are significant for states considering premium increases in their SCHIP programs or implementing premiums in their Medicaid programs under the DRA. Doing so could lead to increased disenrollment rates, particularly for the lowest income families, thereby increasing the risk of children becoming uninsured. A survey of SCHIP disenrollees in ten states found that 48 percent of children who left SCHIP were uninsured when they left, and one-third of all children who left SCHIP remained uninsured 6 months later (Wooldridge et al. 2005).

In summary, states have many options to consider as they structure their public health insurance programs for children. The decisions that are made have important consequences for children depending on their families' income, their age, and their health status. Particularly because enrollment lengths remained shortened after the premium increase was rescinded for lower income families, policymakers should be cautious about their ability to reverse the impacts of even a short-term premium increase.

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REFERENCES

Bethell, C., and D. Read. 2002. "Approaches to Identifying Children and Adults with Special Health Care Needs: A Resource Manual for State Medicaid Agencies and Managed Care Organizations." Oregon Health and Science University: The Child and Adolescent Health Measurement Initiative [accessed on January 22, 2007]. Available at http://cshcndata.org/ViewDocument.aspx?item=13

Center on Budget and Policy Priorities. 2006. "Freezing SCHIP Funding in Coming Years Would Reverse Recent Gains in Children's Health Coverage" [accessed on January 23, 2007]. Available at http://www.cbpp.org/6-5-06health.htm

Chen, A. Y., and P. W. Newacheck. 2006. "Insurance Coverage and Financial Burden for Families of Children with Special Health Care Needs." *Ambulatory Pediatrics* 6 (4): 204–9.

Council on Children with Disabilities, Section on Developmental Behavioral Pediatrics, Bright Futures Steering Committee, and Medical Home Initiatives for Children with Special Needs Project Advisory Committee. 2006. "Identifying Infants and Young Children with Developmental Disorders in the Medical Home: An Algorithm for Developmental Surveillance and Screening." *Pediatrics* 118 (1): 405–20.

Dick, A. W., R. A. Allison, S. G. Haber, C. Brach, and E. Shenkman. 2002. "Consequences of States' Policies for SCHIP Disenrollment." *Health Care Financing Review* 23 (3): 65–88.

Earls, M. F., and S. S. Hay. 2006. "Setting the Stage for Success: Implementation of Developmental and Behavioral Screening and Surveillance in Primary Care Practice—The North Carolina Assuring Better Child Health and Development (ABCD) Project." *Pediatrics* 118 (1): e183–8.

Economic Research Service, United States Department of Agriculture. 2000. "Rural-Urban Commuting Area Codes" [accessed on July 14, 2006]. Available at http://www.ers.usda.gov/Data/RuralUrbanCommutingAreaCodes/

Galbraith, A. A., S. T. Wong, S. E. Kim, and P. W. Newacheck. 2006. "Out-of-Pocket Financial Burden for Low-Income Families with Children: Socioeconomic Disparities and Effects of Insurance." *Health Services Research* 40 (6, part 1): 1722–36.

Hosmer, D. W. Jr., and S. Lemeshow. 1999. *Applied Survival Analysis: Regression Modeling of Time to Event Data.* New York: John Wiley & Sons.

Kalbfleisch, J. D., and R. L. Prentice. 2002. *The Statistical Analysis of Failure Time Data*, 2d Edition. Hoboken, NJ: John Wiley & Sons.

Kenney, G., R. A. Allison, J. F. Costich, J. Marton, and J. McFeeters. 2006/2007. "The Effects of Premium Increases on Enrollment in SCHIP Programs: Findings from Three States." *Inquiry* 43 (4): 378–92.

Kenney, G., J. Marton, J. McFeeters, and J. Costich. 2007. "Assessing Potential Enrollment and Budgetary Effects of SCHIP Premiums: Findings from Arizona and Kentucky." *Health Services Research* forthcoming.

Kleinbaum, D. G., and M. Klein. 2005. *Survival Analysis: A Self-Learning Text*, 2d Edition. New York: Springer.

Kuhlthau, K., K. S. Hill, R. Yucel, and J. M. Perrin. 2005. "Financial Burden for Families of Children with Special Health Care Needs." *Maternal and Child Health Journal* 9 (2): 207–18.

Lee, E. T., and O. T. Go. 1997. "Survival Analysis in Public Health Research." *Annual Review of Public Health* 18: 105–34.

Marton, J. 2007. "The Impact of the Introduction of Premiums into a SCHIP Program." *Journal of Policy Analysis and Management* 26 (2): 237–55.

Miller, J. E., D. Gaboda, J. C. Cantor, T. M. Videon, and Y. Diaz. 2004. "Demographics of Disenrollment from SCHIP: Evidence from NJ KidCare." *Journal of Health Care for the Poor and Underserved* 15 (1): 113–26.

Neff, J. M., V. Sharp, J. Muldoon, J. Graham, J. Popalisky, and J. Gay. 2001. "Identifying and Classifying Children with Chronic Conditions Using Administrative Data with the Clinical Risk Group Classification System." *Journal of Ambulatory Pediatrics* 2 (1): 72–79.

Olson, L. M., S. S. Tang, and P. W. Newacheck. 2005. "Children in the United States with Discontinuous Health Insurance Coverage." *New England Journal of Medicine* 353 (4): 382–91.

Phillips, J. A., J. E. Miller, J. C. Cantor, and D. Gaboda. 2004. "Context or Composition: What Explains Variation in SCHIP Disenrollment?" *Health Services Research* 39 (4): 865–85.

Shenkman, E., B. Vogel, J. M. Boyett, and R. Naff. 2002. "Disenrollment and Reenrollment Patterns in a SCHIP." *Health Care Financing Review* 23 (3): 47–63.

Stata Corporation. 2005. *Stata (Release 9) Statistical Software.* College Station, TX: Stata Corporation.

Szilagyi, P. G., J. L. Holl, L. E. Rodewald, L. P. Shone, J. Zwanzinger, D. B. Mukamel, S. Trafton, A. W. Dick, and R. F. Raubertas. 2000. "Evaluation of Children's Health Insurance: From New York State's Child Health Plus to SCHIP." *Pediatrics* 105 (3, suppl): 687–91.

Wooldridge, J., G. Kenney, C. Trenholm, L. Dubay, I. Hill, M. Kim, L. Moreno, A. Sommers, and S. Zuckerman. 2005. *Congressionally Mandated Evaluation of the State Children's Health Insurance Program: Final Report to Congress*, Vol. 8782-130. Washington, DC: Mathematica Policy Research.

Youngblade, L. M., L. Curry, W. B. Vogel, M. A. Novak, and E. A. Shenkman. 2006. "Effects of Community Characteristics on Adolescents' Risky Behavior and Health-Care Utilization and Expenditures." *Journal of Adolescent Health* 38 (5): 486–94.