Does Context Affect SCHIP Disenrollment?

Findings from a Multilevel Analysis

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Abstract

Background: The State Children's Health Insurance Program (SCHIP) was enacted in 1997 under Title XXI of the Social Security Act to improve coverage of low-income children. Once most states achieved acceptable enrollment rates, attention turned to the issue of retention, which has historically been problematic in other programs such as Medicaid that serve poor families. Most existing reports of SCHIP disenrollment do not take into account variation in time since enrollment, producing biased estimates of disenrollment. Preliminary studies of disenrollment from NJ KidCare (New Jersey's SCHIP program) reveal wide variation across counties, with a nearly three-fold difference in rates between the highest and lowest disenrollment counties.

Using county-level data to control for program attributes and other contextual characteristics shared by families living in the same area, survival models and multilevel statistical approaches are combined to determine the relative contribution of family and contextual characteristics in explaining disenrollment from NJ KidCare.

Data and methods: Information on over 24,000 families enrolled in NJ KidCare Plan B, C or D before April 2000 was taken from family-level administrative records on enrollment and disenrollment. Plans B and C cover families with income between 133-150% and 150-200% of the Federal Poverty Line (FPL), respectively, while Plan D extended coverage to children in families with income 200-350% of the FPL. Plans C and D required cost sharing in the form of monthly premiums per family and co-payments for some services. Family level demographic information included race/ethnicity and language, and age and sex of each enrolled child. County-level information on socioeconomic and demographic factors, employment/occupational composition, and programmatic attributes were collected from the Department of Human Services NJ FamilyCare physician roster, the 2001 Area Resource File, the 2000 Census, and the City and County Data Book.

To determine the factors that affect the risk of disenrollment for families in NJ KidCare, a two-level model was applied, combining detailed data on characteristics of individual families enrolled in the program and the geographic areas in which they live. The model comprised a family-level and a geographic-level specification. Multilevel discrete-time survival models were used to identify which contextual factors are most strongly related to SCHIP disenrollment, and to measure the effects of individual characteristics once contextual factors were taken into account.

Results: At the family level, disenrollment was higher among black families, those with only one child enrolled in NJ KidCare, and those for whom cost sharing was required. However, some variation across counties remained in disenrollment rates even when the effects of family characteristics were taken into account. In terms of county-level characteristics, both geographic density of NJ KidCare physicians and population density were inversely related to the overall risk of disenrollment, accounting for much of the intercounty variation in disenrollment. County-level measures of poverty, unemployment, income inequality, race or language composition and residential segregation were not significantly related to disenrollment.

Discussion and conclusions: Family characteristics, SCHIP program attributes, and sociodemographic factors all play a role in explaining variation in rates of SCHIP program retention. Some county variation in disenrollment remains even when family characteristics are controlled, suggesting that contextual factors may explain some of the observed patterns. The effects of race on disenrollment levels from Plans C and D persist even after controlling for residential context, suggesting that the estimated race differences are individual, rather than compositional, in nature. As one of the first studies to apply multilevel hazards models to the analysis of a social policy issue, this paper contributes methodological as well as substantive insight to health services research concerned with child health and health insurance coverage.

Introduction

The State Children's Health Insurance Program (SCHIP) was enacted in 1997 under Title XXI of the Social Security Act to improve coverage of low-income children. Children covered by health insurance have better access to outpatient care and are more likely to use preventive health services than those who are uninsured (Szilagyi et al., 2000; Piehl et al., 2000; Lave et al., 1998; McCormick et al., 2000; Newacheck et al., 1998). Those who remain covered by SCHIP are more likely to receive coordinated, comprehensive preventive health services (Mann, 2001). To ensure that eligible children are covered by SCHIP, both program uptake and retention must be maximized.

Initial research on SCHIP focused on low enrollment rates seen in almost every state as states struggled to reach their targeted enrollment and to avoid losing their share of federal funds (Kenney et al., 2000; HCFA, 2001). However, with enhanced outreach and enrollment efforts, enrollment rates have improved, and attention has turned to the issue of retention (Schott, 2001). Little is known about the family, programmatic or contextual factors that are associated with high program retention. Most studies do not examine variation across demographic or geographic subgroups, or across different plan designs (e.g., for different income levels or with cost sharing). Few studies examine disenrollment for reasons other than non-renewal. Finally, most existing estimates of disenrollment rates fail to take into account varying lengths of time since families were enrolled, resulting in biased estimates of disenrollment rates.

This analysis uses multilevel or hierarchical linear models (HLM) to build upon the findings of previous disenrollment studies. Preliminary analyses of data from NJ KidCare (New Jersey's SCHIP program) revealed wide variation in disenrollment rates by county, with nearly a three-fold difference in life table estimates of disenrollment between the counties with the highest and lowest rates (Miller et al., 2001c). Using county-level data to control for program attributes and other contextual characteristics shared by families living in the same area, survival methods and multilevel statistical approaches are combined to determine the relative contribution of family and geographic characteristics in explaining disenrollment from NJ KidCare.

The SCHIP program

The Balanced Budget Act of 1997 was a federally funded insurance initiative aimed at expanding health insurance to the estimated 11 million uninsured low-income children in the United States (Szilagyi et al., 2000). Under Title XXI of the Social Security Act, $48 billion in federal funds was made available to states over a ten-year period to help implement SCHIP (HCFA, 2001). By the close of FFY 2001, all fifty states and the District of Columbia had implemented SCHIP programs, and more than four and a half million children had been enrolled in SCHIP (HCFA, 2002). A recent report by the Kaiser Commission on Medicaid and the Uninsured concluded that SCHIP programs contributed substantially to the decrease in the number of uninsured low-income children (Holohan, 2001). Between 1999 and 2000, public health insurance coverage of near-poor children increased 3.4 percentage points - nearly all attributable to rising SCHIP enrollment (Hoffman and Pohl, 2002).

Although all states must cover children in families with incomes up to 100% of the Federal Poverty Level (FPL) and provide a basic package of health services, states have discretion about other aspects of plan design, including extension of coverage to higher income levels (usually involving cost-sharing; Rosenbaum and Smith, 2001). Twenty-nine states have extended benefits to 200% of the FPL or higher; New Jersey is among the most generous with upper eligibility at 350% of the FPL (HCFA, 2000).

NJ KidCare

NJ KidCare[1] took effect in January 1998 with three plan levels for children with family incomes up to 200% of the FPL (Department of Human Services, 1998). Plan A covered children with family income up to 133% of the FPL, Plan B for family income 133-150% of the FPL, and Plan C for family income 150-200% of the FPL. Plan D, which took effect in July 1999, extended coverage to children in families with income 200-350% of the FPL. Plans C and D required cost sharing in the form of monthly premiums per family (Plan C: $15; Plan D: sliding scale from $30-$100) and co-payments for some

[1] NJ KidCare is now NJ FamilyCare, covering adults as well as children up to 200% of the FPL.

services. Plan A was a Medicaid expansion program, while Plans B, C and D were separate state programs. In New Jersey, uninsured children from families with incomes below 350% of the poverty line comprised nearly 90% of all uninsured children (ASPE, 1999).

Previous studies

Qualitative studies of SCHIP retention

A recent report by the National Academy for State Health Policy (NASHP; Pernice et al., 2002) summarized the findings of a seven-state study "Why eligible children lose or leave SCHIP". The study, which was conducted in states from every region of the country, combined focus groups and surveys of both currently and formerly enrolled families to give a detailed overview of program satisfaction and reasons for disenrollment. They found that overall, satisfaction with SCHIP was quite high, with most participants stating that they wanted to remain enrolled, or to re-enroll if they had been dropped from the program. Roughly one-third of those who disenrolled believed they were still eligible, although some of these families incorrectly assessed their eligibility. In addition, some families who were still eligible believed they no longer qualified for the program. Many families believed that if their income rose, they were no longer eligible.

In their analysis of eligible families who no longer participated ("lapsers"), Pernice and colleagues (2002) found that only one-quarter intentionally left SCHIP. Two-thirds of those who lapsed believed that the program dropped their children. Complaints about the complexity of the renewal process, including information gathering and paperwork/documentation, were relatively common, indicating that administrative reasons were often behind disenrollment. Others stated that they had never been told that they needed to renew. Most families who paid premiums felt that those premiums were reasonable, but many had at least occasional trouble making the payments due to income fluctuations or the need to pay other bills that they perceived were more pressing. These issues were more common among lapsers than among those who remained in SCHIP.

The NASHP study provided a comprehensive view of qualitative aspects of program retention and disenrollment, but did not give estimates of the extent of disenrollment overall or by demographic or geographic characteristics of program participants.

Quantitative studies of SCHIP retention

To date, there has been little large-scale quantitative research on disenrollment patterns. In their report on FFY 1999, Rosenbach and colleagues (2001) estimated that nationwide, 18% of children enrolled in 1999 were no longer enrolled by the fourth quarter of that year. They report that South Carolina experienced lower disenrollment from SCHIP than from Medicaid (8.6% and 11.1%, respectively), but also point out that individual states varied in how they calculated disenrollment rates.

Aggregate statistics reported by the New York State Coalition of PHSPs suggest that about half of children enrolled in Medicaid and SCHIP plans failed to complete the renewal process (Bachrach et al., 2000). The corresponding figure for the MassHealth program was 38% (Mann, 2001). Evidence from New Jersey suggests that other reasons such as non-payment of premium, placement in other government programs, and finding other insurance are also important (Miller et al., 2001a,b). Although some of those reasons for disenrollment lead to other forms of health insurance coverage, transferring between insurance sources can disrupt continuity of care and cause unnecessary administrative burdens on families, health care providers and insurance providers (Mann, 2001).

Some research has begun to address methodological issues in estimating disenrollment rates, and to investigate the role of sociodemographic characteristics of the family. The few studies that have been conducted suggest substantial levels of disenrollment. In a comparison of SCHIP programs in Kansas, Oregon, New York and Florida, Dick and colleagues found disenrollment rates of roughly 20% within a year of enrollment (Dick et al., 2002). That study was one of the few to calculate disenrollment rates using survival methods to correct for differences in duration of enrollment. Miller and colleagues (2001a) estimated that 13.2% of children enrolled in the non-Medicaid SCHIP plans disenrolled from NJ KidCare within 9 months of their enrollment date; 18.9% and 33.6% had dropped out of the program by 12 and 18 months, respectively. Black children had notably higher disenrollment rates than white, Hispanic or children of other races, but racial differences were found only in Plans C and D. Disenrollment rates were

higher among children under age 6, English speakers, and Spanish speakers who did not speak any English. Children with no siblings on the family NJ KidCare account also had higher than average disenrollment rates.

The two plans involving cost-sharing by families lost children far more rapidly: By 9 months after enrollment, 15% to 17% of children in Plans C and D had dropped out, compared to only 5% of children in Plan B. The same relative pattern was observed at 12 and 18 months after enrollment, with a roughly three-fold higher risk of disenrollment in Plan C than in Plan B (Miller et al., 2001a). Analysis of reasons for disenrollment within 9 months of enrollment revealed that most of the excess disenrollment in Plans C and D was due to non-payment of the monthly premium (premiums do not apply to Plan B). Non-payment accounted for about 60% of disenrollees from Plans C and D. Finding alternative insurance was another important reason for disenrollment, particularly in Plans C and D. In Plan B, placement in other government programs accounted for most disenrollments. Of children who remained enrolled for at least 12 months and hence were up for redetermination of eligibility, 6% and 3% were disenrolled due to non-response to redetermination notices from Plans B and C, respectively (Miller et al., 2001a).

Analysis of SCHIP disenrollment in New Jersey also reveal wide variation across counties, with more than a two-and-a-half-fold difference in rates between the highest and lowest disenrollment counties (Miller et al., 2001c). These geographic variations, along with variation by sociodemographic characteristics of the family, suggest a need to study the issue of retention using statistical techniques that take into account contextual factors in addition to family characteristics.

Multilevel studies of health and programs

Researchers have long noted variation across place in health outcomes (Blaxter 1990; Duncan et al., 1998). While such geographic variation may in part be attributable to compositional factors (e.g., people more likely to have poor health are clustered within certain areas), certain environmental characteristics, such as the level of socioeconomic disadvantage, also may directly impact health. Jencks and Mayer (1990) identified five primary ways in which neighborhood conditions may influence individual outcomes. Most relevant to health research are those related to epidemic or contagion theory, which refers to the power of peer/neighbor influences in promoting specific types of behavior (that may or may not be conducive to good health), and 'institutional models', which assert that a neighborhood's institutions rather than its residents are what matters (see also Leventhal and Brooks-Gunn, 2000; Duncan and Raudenbush, 1999).

A growing number of studies have examined the possible influence of contextual factors in explaining individual-level health outcomes, and conclude that contextual characteristics, net of population composition, do indeed explain some of the observed spatial variation in health outcomes. Using a nationally representative sample of adults in the U.S., Robert (1998) found that a person's health is associated with socioeconomic characteristics of the community over and above individual characteristics such as income and education. Ross (2000) used multilevel methods to demonstrate that the stress involved in living in a socially disorganized environment is associated with depression. Elo and colleagues (2001) have provided evidence that contextual factors influence various birth outcomes. Sampson et al. (1997) found that community-level collective efficacy was associated with lower victimization from violent crime, net of individual-level risk factors. Furthermore, there is evidence that program characteristics can be important in explaining individual outcomes. A recent study noted that features of job training programs were important in explaining wage outcomes for inner-city youth, net of individual background characteristics (Lundgren and Rankin, 1998).

Hypotheses about contextual effects on program retention

A number of different contextual characteristics might be expected to influence SCHIP program retention, over and above effects of family characteristics. Some of these factors, such as those that measure the accessibility and quality of care and availability of alternative forms of health insurance, are related to institutions that may affect disenrollment rates. Others, namely demographic and socioeconomic characteristics, may alter the probability of disenrollment more indirectly, through their influence on both normative climate and individual health status.

Certain *programmatic* features of NJ KidCare, such as geographic density of health care services or number of children served by each medical provider, may play an important role in explaining geographic variation in disenrollment rates. Some counties, particularly rural ones, have few health care providers associated with SCHIP. Thus, SCHIP participants living in those areas have limited access to services and increased costs and travel time. Furthermore, families living in counties with many enrolled children for each physician may experience longer waits and shorter patient-doctor contact time, factors that may increase dissatisfaction with the program. To the extent that these characteristics reduce the perceived value of SCHIP program participation, non-payment of premiums and subsequent disenrollment are expected to be higher in counties of this nature.

Families are required to disenroll from SCHIP if they obtain alternative health insurance through their employment. Therefore, the *availability of employment-based insurance*, as measured by unemployment and occupational composition, is expected to be related to disenrollment. The service and retail sectors and small firms are less likely to offer employer-sponsored health insurance coverage (e.g., Cantor, Long and Marquis, 1995). Hence, counties with high shares of employment in those categories would be expected to have lower rates of SCHIP disenrollment due to families finding other insurance. Similarly, counties with high unemployment rates offer fewer opportunities for employer-based insurance.

Finally, s*ocioeconomic* and *demographic* characteristics of counties may influence retention rates. There are several potentially offsetting mechanisms through which such characteristics could affect program participation. Contagion theory suggests that individual behavior is influenced by interactions with others (Crane, 1991; Robert, 1998; Sampson et al., 1997). Applied to health-related issues, living among individuals who do not engage in health-promoting behaviors or who do not typically carry health insurance might increase a family's propensity to disenroll. For example, if some demographic groups, such as minorities or the poor, place lower value in insurance and health behavior, local norms might reduce SCHIP retention in counties with high shares of racial minorities or high poverty rates. Alternatively, disadvantaged communities may have poorer infrastructure, including public transportation, which would increase time costs of program use and inhibit participation.

Conversely, living in economically disadvantaged communities could have any of several positive impacts on program retention. First, such areas may worsen individual health status through exposure to high levels of stress that may affect mental health or environmental hazards. Poor health would increase the incentive to remain enrolled in SCHIP. Second, economically disadvantaged areas may attach less stigma to participation in government programs, reducing the "costs" associated with such participation and increasing program retention.

In this analysis, survival models and multilevel statistical approaches are combined to determine the relative contribution of family and geographic characteristics in explaining disenrollment from NJ KidCare. Using county-level data to control for program attributes and other contextual characteristics shared by families living in the same area, this study builds upon the findings of previous disenrollment studies in several ways. First, the family characteristics, net of context, that predict disenrollment from SCHIP are identified. Second, the study determines the key contextual characteristics that influence SCHIP disenrollment.

Data and methods

Data

The data used here comprise 24,628 families (41,271 children) who enrolled in Plans B, C and D of NJ KidCare between January 1998 and April 2000 (Birch and Davis, 2000a,b).[2] These data were merged with county-level data on the participant's county of residence. Characteristics of the 21 New Jersey counties represented were drawn from a variety of state and national sources as described below.

[2] Data for families who were enrolled in NJ KidCare Plan A (the Medicaid expansion plan) through county social service agencies were not available. Data on Plan A families, those who enrolled through the HMOs, are not representative of all Plan A families because those families are likely to differ from those enrolled through county social service agencies. Hence the analyses include Plans B through D.

Variables

Family-level variables

Information on demographic characteristics of enrolled families was taken from the NJ KidCare administrative records and aggregated to the family level. Age composition was measured in terms of the number of children in the family in each of the following age groups: infants (<1 at the time of enrollment), 1 to 5 years, 6 to 12 years, and 13 to 17 years.[3] Race, language, and NJ KidCare plan are classified as shown in Table 1. For families who disenrolled, a single reason code was available from the administrative record; possible reasons include finding other insurance, becoming eligible for another government program, non-payment of premium (Plans C and D only), non-renewal at redetermination, moving out of state and other reasons.

County-level variables

County demographic characteristics

Information on the 2000 total population, number of black persons, the percent foreign born in 1990 (the latest available date), and land area was extracted from the 2001 Area Resource File. From that information, the percent of the county that is black and population density (persons per square mile) were calculated. The Index of Dissimilarity for blacks and for Hispanics – measures of residential segregation based on the 2000 Census (Iceland et al., 2002) – were extracted for each of the nine PMSAs that encompass parts of New Jersey and was assigned to each of the pertinent counties.

County socioeconomic characteristics

Child poverty for 1997 was calculated from data on the number of poor children and the number of children in each county (Quality Resource Systems, 2001). Table 2 presents information on the demographic and socioeconomic characteristics of the 21 counties in New Jersey, organized into five major geographic regions within the state.

Availability of alternative insurance

To assess availability of alternative insurance at the county level, data from the 2000 City and County Data Book were used to calculate measures of the share of firms with fewer than 20 employees and the share of county earnings that occurred within the service and retail sectors. Persons employed in service and retail are also more likely to be employed in jobs that do not provide health insurance coverage. Finally, the county unemployment rate for 1999, obtained from the Area Resource File (Quality Resource Systems, 2001), is included.

Program characteristics

Program characteristics for each of the 21 New Jersey counties are shown in Table 3. Data on the number and medical specialty of health care providers were obtained from the NJ FamilyCare provider roster as of March 2001 (Department of Human Services, 2002).[4] To measure the number of physicians who provided medical services to children in NJ KidCare, physician specialties whose primary focus was adults were excluded.[5] Of the 10,789 physicians who met those criteria, 43% were primary care pediatricians, 27% primary care family practitioners, and the rest general practitioners and subspecialists within pediatrics. Each provider was counted in as many counties as they had offices. For example, a physician with offices in Somerset and Middlesex Counties was included in both counties' NJ KidCare provider tally. Two measures of provider availability were calculated for each county: number of providers per enrolled child and number of providers per land area.

Program uptake was calculated as the percentage of those eligible for Department of Human Services programs (including Medicaid, NJ KidCare and NJ FamilyCare) who were enrolled as of March 2002. Statistics reported by the NJ Managed Care Bureau on number of persons enrolled and eligible

[3] Although persons aged 18 were eligible for NJ KidCare, by definition they would all disenroll from the program within a year by "aging out", hence inflating the disenrollment rates. They are omitted from the sample in order to focus on other reasons for disenrollment.

[4] Rosters of NJ KidCare providers were not available for earlier periods.

[5] The NJ FamilyCare program serves adults as well as children in eligible families. Hence the NJ FamilyCare provider roster includes some specialists that do not serve children.

were taken from the New Jersey Department of Human Services Office of Statistical Analysis and Managed Care Reimbursement (New Jersey Division of Insurance, 2002b). In preliminary analyses, counties with high overall HMO penetration were found to have higher rates of disenrollment from NJ KidCare; however, those HMO penetration measures combine commercial and public HMO enrollees. To test whether counties in which public programs comprise a small share of total HMO enrollment in the county are less appealing to NJ KidCare families, DHS enrollment as a percentage of all HMO enrollment in the county are calculated (NJ Division of Insurance, 2002a, b).

Data structure

To estimate discrete-time hazards models (see below), one family-month record was created for each month a family was enrolled in NJ KidCare. The 24,628 families who enrolled between January 1998 and April 2000 contributed a total of 173,232 family-month records. Families rather than children are used as the unit of analysis because if each enrolled child in a family is treated as a separate unit of observation, standard errors associated with the parameter estimates are understated because of the inflation in sample size. This effect differentially affects characteristics associated with larger families. Moreover, most of the major reasons for disenrollment affected all enrolled children from one family, resulting in perfect correlation of reasons for disenrollment within a family. For example, non-payment of premium, non-renewal at redetermination, and moving out of state each result in disenrollment of all children in a family. Finding other insurance or being enrolled in a different government program could affect only one child within the family, but in most cases also affected all children. Aging out of the program usually affected only one child in the family, but was a relatively rare reason for disenrollment in these data because children older than 17 are excluded and because the follow-up period was relatively short. Approximately 10% of families had children disenroll for different reasons, or had some but not all children disenroll. Comparison of analyses using children versus families as the unit of analysis revealed that substantive conclusions were not affected by this decision (not shown).

Number of months since enrollment and calendar month vary across family-month records, but all other individual-level variables are fixed for a given family because those characteristics were not updated on program administrative records. If the family disenrolled in a given month, the disenrollment indicator for that month was coded 1; if they remained enrolled or were censored by the end of the observation period, the indicator for that month's record was coded 0.

To create the analytic file, county-level variables were merged onto each family-month record according to family's county of residence as of April 2000 or the time of disenrollment. Each of the county-level variables was measured at one point in time. Hence, those variables are the same for each family-month record on which they appear.

Methods

To analyze patterns of disenrollment from NJ KidCare, survival (event history or hazards) analysis and multilevel modeling approaches are combined. Information on disenrollment and demographic/economic characteristics for families in NJ KidCare are recorded over a series of months – a set of longitudinal data on the occurrence of an event – for which survival models are appropriate. With regard to these data, survival models take into account the fact that different families enrolled at different dates as well as censoring by the end of the observation period (April 2000) (Allison, 1995; Yamaguchi, 1991). Plan D took effect 18 months later than the other Plan levels in NJ KidCare, meaning that families enrolled in D had less time to disenroll than those in Plans B or C. In addition, because re-determination of program eligibility occurs 12 months after initial enrollment, none of the families in Plan D had been enrolled long enough to reach re-determination. Some families in Plans B and C did not renew at redetermination. A discrete-time hazards specification, which can be estimated using logistic regression, is used (see Allison, 1995 and Yamaguchi, 1991 for more detail). An additional advantage of discrete-time hazards models is that they provide an estimate of the baseline hazard of disenrollment for each time interval, as well as the relative hazard of disenrollment for each of the covariates.

In addition, the data analyzed in this study have a hierarchical (or multilevel) structure in that families enrolled in NJ KidCare are nested within geographic areas. In multilevel linear model parlance,

the data structure can be formulated as a two–level hierarchical linear model, with families (the level–1 unit of analysis) clustered within geographic units (the level–2 unit of analysis) (Bryk and Raudenbush, 1992; Mason et al., 1983). Until recently, sociological research has typically analyzed the contribution of individual and contextual effects in explaining social processes using individual-level data only, with simple controls for contextual factors such as county of residence (e.g., Miller, 2001c). However, modeling the two levels explicitly has several advantages over such model specifications. A multilevel approach corrects for common-group correlation and non-constant variance in the error term, which can lead to underestimated standard errors for geographic effects when individuals are the only unit of analysis (Barber et al., 2000; Kreft, 1994). Furthermore, unlike a fixed-effects approach, a random-effects model permits actual estimation of geographic effects, which are of particular relevance to this project.

To determine the factors that affect the risk of disenrollment for families in NJ KidCare, a two-level model is applied using detailed data on characteristics of individual families enrolled in the program and the geographic areas in which they live. The model consists of a family-level and a geographic-level specification. Multilevel discrete-time survival models are used and estimated using the GLIMMIX macro contained in SAS software (SAS Institute website).[6] Using this approach, an estimate of the baseline hazard is obtained and tests of whether the proportionality assumption is violated can be conducted by determining whether the values of the estimated parameters differ by time interval (Kuate-Defo, 2001).

The family-level equation is defined identically for each geographic area and is of the following general form (Bryk and Raudenbush, 1992; Judge et al., 1985; Wong and Mason, 1985).

$$(1)\ \log(P_{t(ij)}/(1-P_{t(ij)})) = \beta_{tj} + \beta_{1j}X_{1t(ij)} + \beta_{2j}X_{2t(ij)} + ... + \beta_{kj}X_{kt(ij)}$$

The dependent variable is the logit of the probability of disenrollment in time interval t for family i living in geographic area j, given that the family remained enrolled at the beginning of interval t. β_{tj} is an estimate of the log of the baseline hazard of disenrollment for each time interval t. $X_{t(ij)}$ represents the matrix of independent variables for each family i in area j and interval t. The family-level characteristics measured include demographic controls, such as the race of the family and the language spoken at home. Other covariates measured at the family level are the number of siblings enrolled in NJ KidCare, plan level (plan B, C or D), and age composition of the family.

Variation in the risk of disenrollment across geographic areas is estimated by the following level-2 equation:

$$(2)\ \beta_{kj} = \theta_{k0} + \theta_{k1}Z_{1j} + \theta_{k2}Z_{2j} + ... + \theta_{kq}Z_{qj} + \mu_{kj}$$

The family-level parameters, β, are assumed to vary across geographic area as a function of certain area-level characteristics, Z_j, as well as random variation, μ_j. Program conditions, unemployment and occupational composition, and demographic/socioeconomic factors constitute the matrix of Z_j variables that may partially explain the random variation in disenrollment rates. The level-two error terms, μ_j, are random effects that model the correlation between timing of disenrollment for families in the same county and are assumed to have a normal distribution, mean of zero, and an unknown variance-covariance matrix.

These two sets of equations are combined, by substituting equation (2) into equation (1), to obtain a mixed model. The model contains the fixed θ parameters in addition to the random coefficients (μ), which are allowed to co-vary across geographic place. The error structure of this mixed model allows for correlation and heterogeneous variances among the data. SAS, which employs a restricted/residual pseudo likelihood (REPL) procedure, is used to estimate the parameters of the mixed model (SAS Institute).

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[6] Three key assumptions are necessary to estimate multilevel discrete-time models. Namely: (1) the modeling assumption – the hazard probability is assumed to be a function of only j^{th} family's past covariates; (2) the conditional independence assumption – the j^{th} family's decision to disenroll at time t is independent of other family's (in the same county) decisions at time t; and (3) the noninformative covariates assumption – that covariates at time t are independent of the error term given past responses and covariates. See Barber et al. (2000) for more detail.

A number of specifications of the mixed model are considered. A simple discrete-time hazards model is estimated with only family-level characteristics to determine the extent to which the hazard of disenrollment is affected by these factors. County of residence is initially ignored, but county clustering among the data is later considered through the estimation first of a fixed effects and then a random effects model. Finally, models that include contextual characteristics are estimated to determine which aspects of the environment in which families live (1) can explain between-county variation in disenrollment rates and (2) alter in any way effects of the family-level factors on odds of disenrollment.

In exploratory work, random-coefficients models that allow the coefficients for the family-level explanatory variables to vary randomly across geographic area (j) were estimated. In subsequent models, those family-level coefficients that did not vary significantly across place (excluding the intercept) were specified as fixed across geographic area. Possible cross-level interactions were also considered. For example, it may be that the effect of race varies depending on the level of racial residential segregation, and the analyses explicitly test for such effects. The final models presented estimates main effects for all explanatory variables, any significant cross-level interactions, variance components at level-2 for the intercept, and variance components for coefficients that exhibit significant variation across the level-2 units of analysis.

Results

Characteristics of enrolled families

Table 1 presents the distribution of enrolled families according to demographic characteristics and NJ KidCare plan. Information on the number of family-months of observation, number of disenrolled families, and average monthly disenrollment rates are also shown. Overall, 3,233 of 24,628 (13%) of enrolled families had disenrolled from NJ KidCare by April 2000. However, the average monthly disenrollment rate provides a more appropriate perspective on extent of disenrollment, because it takes into account differences across families and NJ KidCare plans in date of enrollment, and hence length of time at risk of disenrollment. On average across all counties, NJ KidCare plans, and demographic groups, 1.9% of enrolled families disenrolled per month.

There is considerable variation in monthly disenrollment rates according to family characteristics, however. Black families, English-speakers, Spanish speakers who do not also speak English, those with only one child enrolled, and families without infants were more likely than other families to drop out of the program. Average monthly disenrollment rates were more than twice as high for families enrolled in plans that involved cost sharing as for the free plan (Plan B). The average monthly disenrollment rate for families in Plan C was slightly higher than that in Plan D (2.2% and 1.9%, respectively). This difference likely reflects the fact that some families in Plan C had been enrolled for at least a year, hence requiring redetermination of eligibility, whereas Plan D had not been in effect long enough for any families to reach redetermination.

Inter-county variation in disenrollment

Disenrollment varies markedly across counties in New Jersey. Life table estimates of cumulative disenrollment within 9 months of enrollment[7] vary from a low of 14.2% in Warren County to a high of 36.3% in Salem County (Map A). Average monthly disenrollment rates for each county are shown in Appendix Table A, along with the number of family-months of observation and the number of disenrolled families.

Multilevel model results for overall disenrollment

Family-Level Discrete Time Hazards Models

The results of a set of preliminary models that exclude county-level characteristics are displayed as Models 1, 2 and 3 in Table 4. The number of months enrolled and months-squared are specified as level-1 covariates to obtain an estimate of whether the hazard of disenrollment changed with duration of enrollment, and if so, whether it followed a linear pattern of increase. The monthly disenrollment rate

[7] Because Plan D had only been in effect for 9 months at the end of the observation period, estimates of cumulative proportion disenrolled after 9 months control for variation in plan composition by county.

increases at a decreasing rate with time since enrollment for Plans C and D, but at an increasing rate with time since enrollment for Plan B. The intercept of these models provides an estimate of the natural log of the average monthly hazard of disenrollment in the reference category, controlling for the other factors included in the model. For example, based on Model 3, the average monthly hazard of disenrollment from Plan B is approximately 0.4% per month ($.004 = e^{-5.421}$). The estimated coefficients for the other covariates measure the ln(relative hazard) relative to the reference category; exponentiating that coefficient yields the relative hazard. For example, the relative hazard for one-child families compared to families with more children enrolled is 1.372 ($=e^{0.316}$).

Model 1 ignores county clustering, but Models 2 and 3 use two different approaches to take into account county of residence. Model 2 includes county dummy variables, hence controlling for all county characteristics that do not vary over time, whereas Model 3 allows the intercept to vary randomly across counties. Several points are worth noting about the results. First, very little difference is found in the estimated effects of the family-level characteristics on odds of disenrollment from NJ KidCare, whether county of residence is controlled or not. Indeed, the parameter estimates are virtually identical. This finding suggests that little of the observed relationships between family-level characteristics and disenrollment is due to county clustering. For example, the strong and persistent effect of race on the odds of disenrollment from Plans C and D apparently cannot be attributed to differences in the places (counties) in which black families and families of other races are concentrated.

Second, based on Model 3, the odds of disenrollment appear to vary non-randomly across counties even after accounting for family-level characteristics. Families who live in counties that are one standard deviation above the 'average county' (in terms of all possible characteristics) in New Jersey are 11.6% ($e^{\sqrt{0.012}}$) more likely to disenroll from SCHIP in any given month. This between-county random effect, although small, is significant at the 10% level (p=.056), indicating that a correctly specified model should consider variation between counties.[8] This result is consistent with descriptive statistics of disenrollment rates by county.

The effects of family-level characteristics on disenrollment are largely consistent with findings of prior research. Type of plan is very important in predicting disenrollment. The hazard of disenrollment for non-black families enrolled in Plans C and D, which involve cost sharing, is 128% greater, on average, than those enrolled in Plan B (hazard ratio (HR) = 2.28) (Model 3).[9] Furthermore, some variation by plan is found in monthly disenrollment rates by time since enrollment, with increasing rates in all plans through the first nine months after enrollment.[10] None of the other covariates exhibited a time-varying effect.[11]

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[8] Some simulations have shown that the approximation to the maximum-likelihood estimation used in standard software (including the SAS glimmix macro, HLM, and MLN) underestimates the size of the random effect when the between-group variance is large (Barber et al., 2000; Rodriguez and Goldman, 1995). There are several reasons to believe that this bias is not problematic in this application. First, the between-group variance appears to be small. Second, the bias is not large when the number of level-1 observations is large and the number of level-2 groups small (personal communication with German Rodriguez, November 2002). Third, estimates of the random effect using MLN, which provides a second-order approximation that gives decent estimates of the random effect even when the intraclass correlation is large, are very similar to those obtained using SAS.

[9] Exploratory analyses (not shown) found no significant difference in the monthly hazard of disenrollment between Plans C and D.

[10] Plan D had only been in effect for 9 months by the end of the observation period, so comparisons are focused across plans on that time interval. In addition, although some families in Plans B or C could have reached the 12 month redetermination date, none in Plan D could have done so. Hence non-renewal at redetermination could elevate rates after 1 year for Plans B and C but not D.

[11] To test the proportionality assumptions of the discrete-time hazards model, specifications that include interactions of each explanatory variable with time were considered. Only the effect of plan varied over time.

Also consistent with prior research, the effects of race on disenrollment are found to differ by plan. Although there is no significant difference in the hazard of disenrollment by race for those enrolled in Plan B, in Plans C and D black families are far more likely than their counterparts in other racial groups to disenroll from the program (Figure 1). The model predicts that the relative hazards of disenrollment from Plans C and D for black, Hispanic, and white families are 3.7, 2.5, and 2.3, respectively, when each is compared to white families in Plan B. Within Plans C and D, blacks are 1.6 times as likely as non-blacks to disenroll.

Finally, the number of children enrolled, age composition of the family, and the family's language are important predictors of disenrollment. Having only one child enrolled in the program is associated with higher disenrollment (HR = 1.37). Families with infants enrolled in the program are less likely to disenroll (HR = 0.57). However, the odds of disenrollment increases by 18% for each additional child aged 1-4 years, all else equal. The number of children above age 5 does not affect disenrollment rates. Finally, the analysis reveals that families who speak Spanish with some English are less likely to disenroll (HR = 0.87) than are families who speak English only; odds for those who speak only Spanish are comparable to those for English speakers.

In summary, even after controlling for family-level characteristics, some differences in the hazard of disenrolling from NJ KidCare across counties are found. County-level characteristics are now introduced to determine which factors may explain the between-county variation in disenrollment rates.

Two-Level Discrete Time Hazards Model

Only a few county-level variables can be included in the models at one time because the number of counties (21) is limited and because some of the county characteristics are highly correlated (Appendix B). In exploratory analysis, a number of parsimonious model specifications, that included representatives of the different theoretical constructs within the same model and took into account correlation among the variables, were considered. Model 4 in Table 4 represents the best-fitting multilevel model, based on overall goodness-of-fit statistics for the model and significance levels of the county variables. Controlling for the extent of poverty within a county, the number of KidCare providers per square mile is significantly related to the odds of disenrollment. As expected, the greater the number of KidCare providers per square mile, the lower the probability of disenrollment from the program. A one-provider increase per square mile is associated with a 1.9% decline in the odds of disenrollment. After controlling for this program characteristic, there are no longer significant between-county differences in the disenrollment rate. In other words, there is little variance in the county-specific intercept that is not explained by the measure of provider density.

Exploratory analyses revealed that population density is also significantly related to overall disenrollment. Overall disenrollment rates are lower in counties with a higher population density, but because measures of physician density and population density are almost perfectly correlated ($r=0.96$, $p<0.01$), they cannot be included in the same model. It is therefore difficult to distinguish whether it is access to physicians, availability of information (proxied by population density) or some combination of the two that is explaining patterns of disenrollment across counties. None of the socioeconomic factors, unemployment or occupational composition were significantly related to overall disenrollment in any of the model specifications considered. Because of the small number of level-2 units, models that included each of the county characteristics alone were also estimated. These exploratory analyses confirmed the findings presented above -- only population density and KidCare provider density ever approached conventional levels of statistical significance.

Discussion

This study is one of a handful (Barber et al., 2000; Hedeker, Siddiqui and Hu, 2000; Kuate-Defo, 2001; Ma and Willms, 1999; Reardon et al., 2001) that has employed multilevel discrete-time hazards models, and one of the first to apply these methods to policy issues. Findings reveal that family characteristics and the plan in which families are enrolled have substantial effects on rates of disenrollment from NJ KidCare. These family characteristics account for some, but not all, of the inter-county variation in disenrollment rates. The remaining inter-county variation is largely explained by introduction of controls for geographic density of NJ KidCare physicians. However, physician density

and population density are highly correlated, so this effect should not be interpreted as a purely programmatic effect. Somewhat surprisingly, none of the county-level socioeconomic, unemployment or occupational composition factors were associated with NJ KidCare disenrollment. The lack of significant socioeconomic or demographic contextual effects may be due to the fact that effects of those factors may operate in conflicting ways, resulting in a net effect of zero (see "hypotheses" section for a discussion). Among the county-level demographic factors, only population density was related to disenrollment; relative size of the black population and residential segregation were not.

Several family-level sociodemographic and plan characteristics remained important predictors of disenrollment, and effects were remarkably robust regardless of the level-2 specification. Families in plans involving cost sharing were more than twice as likely to disenroll as those in the free plan – an effect that was particularly pronounced among black families (see below). Plan effects should not be interpreted as simply due to cost sharing, because higher income is associated with both cost sharing and a greater chance of alternative insurance being available through a parent's employer. In addition, non-payment of premium and non-renewal at redetermination may be hiding effects of finding other insurance because the administrative records allow space to record only one reason per family, and families who lapse often do not give a reason for their disenrollment (Pernice et al., 2002).

Families with only one child enrolled were found to have lower retention rates than larger families. For plans that involve cost sharing, the per-family monthly premium is spread across more children in larger families. However, higher disenrollment for one-child families was also observed in Plan B (the free plan), suggesting that cost was not the only consideration (Miller et al., 2001a). Another possible explanation for this pattern is that larger families are at greater risk of having at least one member with health needs/problems so these families perceive the program as more beneficial.

In addition, the effects of race on disenrollment levels from Plans C and D persist even after controlling for the context in which racial groups live. This finding suggests that the estimated race differences are individual, rather than compositional, in nature. Indeed, results of the fixed effects model suggest that other stable factors not measured in this analysis, such as quality of services in counties with high concentrations of black enrollees, do not explain the observed racial differences. Cross-level interactions were included to test hypotheses regarding how the family-level effect of race may be altered by the context in which blacks live (e.g. that race has a smaller effect on the risk of disenrollment in places with higher levels of residential segregation). However, the cross-level interactions were not significant, indicating that the data do not support such conjectures.

Age composition of families was also an important determinant of retention. Families with an infant enrolled were only 57% as likely to disenroll, perhaps because many preventive health care visits are recommended during the first year of life. This finding suggests that families may be viewing SCHIP as health *care* rather than health *insurance* – using it to pay for expected, needed preventive care, for example, but not retaining it "just in case" of expensive or unexpected health care needs. Somewhat surprisingly, number of children between the ages of 1 and 5 was inversely related to retention, despite the fact that children in this age range are relatively heavy users of health care for both preventive care (e.g., immunizations) and sick visits. Number of older children did not affect retention.

For policy and program purposes, it is useful to distinguish between disenrollment of those who continue to be eligible and those who are not. SCHIP was created to provide health insurance coverage for uninsured children in low-income families. Therefore, disenrolling due to finding other insurance (e.g., through a parent's employer) or placement in another government program is an acceptable reason for disenrolling from SCHIP. In contrast, dropping out due to non-payment or non-renewal of eligibility among families that remain eligible for SCHIP would leave them without health insurance coverage. Preliminary competing risks models (not shown) suggest that pooling all reasons for SCHIP disenrollment obscures some important differences in the effects of family, program, and contextual factors. Future studies should analyze these reasons separately, using richer data on reasons for disenrollment and information on income and family structure that allows for accurate assessment of whether each family continued to be eligible.

Implications for policy

These findings have several implications for modifications to improve retention in SCHIP programs. States have money for retention efforts, and these findings suggest several ways in which those funds could be targeted. Black families and counties with high disenrollment rates should receive special attention to understand and address the reasons for their lower retention.

This study suggests that charging premiums can lead to high rates of disenrollment. New Jersey has one of the more generous SCHIP programs, extending benefits to families with incomes up to 350% of the Federal Poverty Level. Given the failure of comprehensive insurance reform, incremental approaches such as extending public health insurance to otherwise uninsured low to moderate income families represents a likely direction for initiatives to improve coverage. If states are to expand their SCHIP programs to higher income groups, as New Jersey has done, they should carefully consider the implications of cost sharing. However, the higher disenrollment rates observed for the two cost-sharing plans cannot be interpreted as solely due to costs: The plans that involve premiums are for families with higher incomes (200% to 350% of the FPL). National statistics suggest that families in those income ranges are more likely to have access to alternative forms of insurance coverage, such as employer-based health insurance.

Finally, the results suggest that physician density is related to program retention. Counties that have sparse physician density should consider changes to increase the number and physical distribution of medical providers to improve access to care for enrolled children.

Limitations

There are several limitations to the current study. First, administrative records appear to overstate the extent of "lapsing" among eligible families. Comparison of survey data with administrative data by the NASHP revealed that many of the families who were dropped because they did not pay premiums or renew their eligibility were in fact, no longer eligible (Pernice et al., 2002), although the survey responses overstated loss of eligibility.

Second, the administrative data used do not provide estimates of program quality or satisfaction. The NASHP report revealed higher levels of satisfaction among currently than formerly enrolled persons, supporting the idea that dissatisfied families were less likely to remain in the program (Pernice et al., 2002). However, that report did not examine the extent to which satisfaction varied across demographic, plan or geographic groups. Hence, their data cannot be used to address whether variation in satisfaction could explain observed intergroup and inter-county differences in program retention.

Third, using data at the county level, little of the observed relationship between family-level characteristics such as race and disenrollment was found to be due to the contexts in which families live. However, this result may be an artifact of the level of aggregation. If data were available for smaller geographic units such as neighborhoods, it may be found that, in fact, context does play a role. Moreover, several of the hypotheses tested in this analyses, particularly those concerning normative climate, would be better tested using measures that more closely proxy neighborhoods. Data at a greater level of disaggregation were not available at the time of this analysis.

Finally, this analysis does not adjust for possible endogeneity bias. If there are unmeasured factors, such as health status, that predict both enrollment into the program and whether a family disenrolls, coefficient estimates may be biased. In addition, if there are unmeasured factors that determine both where a family lives and whether a family disenrolls, the effect of context may be measured with some error. For example, if a family has some unobserved characteristic that makes them more likely to disenroll *and* more likely to live in a poor county, the effect of poverty would be overstated in the models. There are not many satisfactory solutions to these possible biases (Duncan and Raudenbush, 1999). In the absence of true or quasi-experimental designs, one must rely on statistical solutions such as instrumental variables or fixed effects models, each of which has its own limitations (Barber et al., 2002).

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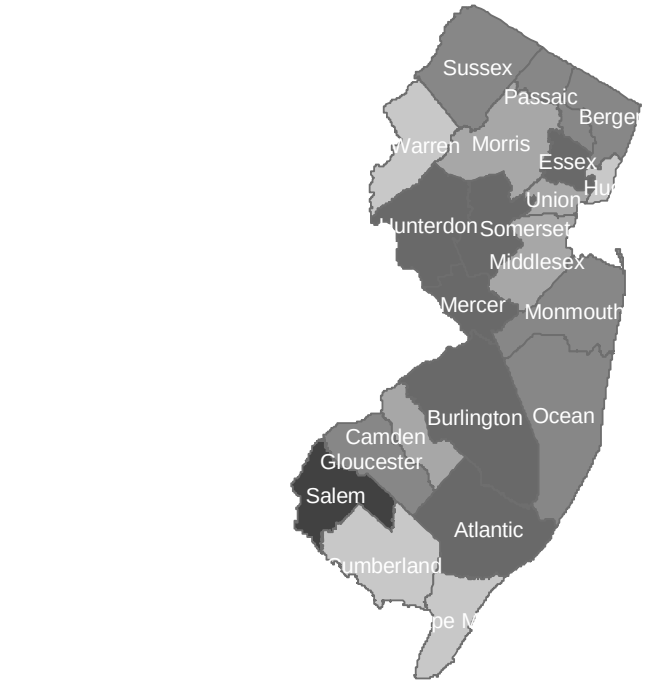
Map A: Cumulative percentage disenrolled within 9 months of enrollment, by county, NJ KidCare, 1998-April 2000



Estimated using life table methods.

Table 1 – Distribution of ever-enrolled families[12] and disenrollment rates by family characteristics, NJ KidCare Plans B, C and D, January 1998-April 2000

	# families	# family-months	# disenrolled	Avg. monthly disenr. rate
All children[13]	24,628	172,232	3,233	1.9%
Gender[14]				
Male	16,095	113,308	2,070	1.8%
Female	15,548	109,835	1,975	1.8%
Race				
Non-Hispanic white	9,455	67,159	1,144	1.7%
Non-Hispanic black	4,707	30,928	803	2.6%
Hispanic	6,921	48,315	837	1.7%
Other	2,344	15,855	265	1.7%
Missing race	1,360	11,077	196	1.8%
Age group[14]				
<1 year	458	3,352	36	1.1%
1-5 years	11,248	77,422	1,545	2.0%
6-12 years	13,554	96,947	1,688	1.7%
13-17 years	7,481	56,940	876	1.5%
Language				
English	11,505	65,913	1,310	2.0%
Spanish, some Engl.	4,855	34,117	564	1.7%
Spanish, no Engl.	550	3,226	56	1.7%
Other language	1,797	12,966	161	1.2%
Missing language	5,951	56,268	1,145	2.0%
# children on account				
One	12,448	84,136	1,826	2.2%
Two	8,633	61,873	973	1.6%
Three	2,815	20,791	350	1.7%
Four or more	731	5,432	84	1.5%
Plan				
B	4,336	34,765	322	0.9%
C	14,375	108,027	2,342	2.2%
D	5,917	29,490	569	1.9%

[12] Enrolled at any time from January 1998 through April 2000.
[13] Includes children through age 17 years at time of enrollment.
[14] Families may have children in more than one age or gender group, hence #s add up to more than the total.

Table 2 - Sociodemographic characteristics, unemployment and occupational composition by county, New Jersey, 1999

	Demographic and socioeconomic						Unemployment & occupation comp.			
Region	Tot. pop. (1000s)	Pop. Dens. (pop/mile^2)	% black	Black res. seg.	% non-Engl.	Child pov. rate (%)	% <20 empl.	% Serv/ retail	% <HS	Unemp. rate (%)
New York City MSA - NJ										
Bergen	884.1	3778	5.3	.856	5.5	7.5	67.1	42.0	18.4	3.7
Essex	793.6	6299	41.2	.920	9.7	25.2	66.4	36.3	29.9	5.7
Hudson	609.0	12957	13.5	.774	21.9	27.9	71.1	29.7	35.9	7.2
Passaic	489.0	2644	13.2	.856	13.3	20.5	65.2	35.4	31.2	6.2
Union	522.5	5073	20.8	.920	9.8	14.0	64.6	35.6	24.8	4.8
West/Central NJ										
Hunterdon	122.0	284	0.6	.674	1.0	3.9	72.0	37.3	14.1	2.1
Mercer	350.8	1552	19.8	.782	3.4	14.2	69.6	39.8	22.9	4.0
Morris	470.2	1003	2.8	.920	3.0	4.6	71.0	36.8	13.0	2.8
Somerset	297.5	975	7.5	.674	2.8	5.8	64.4	33.1	13.7	2.5
Sussex	144.2	277	1.0	.920	0.8	5.9	80.1	42.0	14.9	3.5
Warren	102.4	286	1.9	.920	1.2	10.0	62.2	31.0	22.4	4.2
Philadelphia MSA - NJ										
Burlington	423.4	526	15.1	.867	1.4	9.3	62.5	39.6	18.1	3.3
Camden	508.9	2292	18.1	.867	2.8	21.2	69.7	42.4	24.5	4.6
Gloucester	254.7	784	9.1	.867	1.0	11.6	62.4	33.5	22.5	4.5
North/Central Jersey Shore										
Middlesex	750.6	2142	9.1	.674	5.3	10.1	60.7	35.8	20.6	3.8
Monmouth	615.3	1304	8.1	.778	2.0	9.8	78.2	47.1	17.2	4.0
Ocean	510.9	803	3.0	.778	1.6	13.5	77.3	47.7	25.1	4.6
South Jersey Shore										
Atlantic	252.6	450	17.6	.788	3.0	16.9	74.4	67.1	27.1	7.2
Cape May	102.3	401	5.1	.788	1.0	16.6	87.8	49.1	26.0	10.1
Cumberland	146.4	299	20.2	.548	5.1	26.0	57.1	29.0	36.6	8.6
Salem	64.3	190	14.8	.867	1.1	17.2	70.8	38.3	27.4	4.7

Table 3 - Health care and NJ KidCare programmatic characteristics of New Jersey counties, 1999

	Program uptake[15]	Public/total HMO enrollment %	# ever enrolled children[16]	# KidCare providers[17]	# enrolled kids per KidCare provider	# KidCare Providers/sq. mile
New York City MSA - NJ						
Bergen	72.5	17.0	3552	847	4.2	3.6
Essex	76.3	47.6	4088	1391	2.9	11.0
Hudson	79.7	57.6	3804	928	4.1	19.7
Passaic	80.0	47.6	3834	804	4.8	4.3
Union	76.1	35.5	2656	465	5.7	4.5
West/Central NJ						
Hunterdon	70.2	6.9	321	275	1.2	0.6
Mercer	74.8	28.7	1689	407	4.1	1.8
Morris	63.2	8.9	1112	387	2.9	0.8
Somerset	72.0	14.2	770	428	1.8	1.4
Sussex	70.5	16.0	582	85	6.8	0.2
Warren	74.8	26.5	489	139	3.5	0.4
Philadelphia MSA - NJ						
Burlington	76.4	17.0	1706	400	4.3	0.5
Camden	79.9	35.4	3162	1193	2.7	5.4
Gloucester	78.5	23.4	1463	209	7.0	0.6
North/Central Jersey Shore						
Middlesex	78.1	24.6	3693	1081	3.4	3.5
Monmouth	76.8	23.8	2278	756	3.0	1.6
Ocean	80.0	31.1	2989	349	8.6	0.5
South Jersey Shore						
Atlantic	74.0	33.5	1260	335	3.8	0.6
Cape May	78.6	39.7	617	100	6.2	0.4
Cumberland	79.5	45.1	918	141	6.5	0.3
Salem	77.0	43.2	288	69	4.2	0.2

[15] # enrolled in /# eligible, expressed as a percentage.
[16] Enrolled between January 1998 and April 2000 in the NJ KidCare program.
[17] Based on NJ FamilyCare roster for March 2001. Includes family practitioners, pediatricians and general practitioners and subspecialities of pediatrics.

Table 4 – Multilevel discrete-time hazards models of disenrollment from SCHIP for any reason, January 1998-April 2000.

	Ignoring county of residence (1)		County Fixed Effects Model (2)		Random Effects Model Family characteristics only (3)		Random Effects Model Family and county factors (4)	
Variable	LRH[18]	s.e.	LRH	s.e.	LRH	s.e.	LRH	s.e.
Intercept	-5.426	(.140)	-5.581	(.159)	-5.421	(.142)	-5.429	(.151)
Family-level characteristics								
Months enrolled	0.018	(.034)	0.018	(.034)	0.018	(.034)	0.018	(.034)
Months enrolled-squared	0.0046	(.0017)	0.0046	(.0017)	0.0046	(.0017)	0.0046	(.002)
Black race	0.016	(.149)	0.047	(.150)	0.038	(.149)	0.049	(.149)
Hispanic race	0.091	(.062)	0.121	(.064)	0.109	(.063)	0.124	(.063)
Plans C and D (ref = Plan B)	0.819	(.142)	0.826	(.142)	0.823	(.142)	0.824	(.142)
One enrolled child	0.313	(.038)	0.317	(.038)	0.316	(.037)	0.317	(.038)
Age composition of family								
# infants	-0.555	(.168)	-0.562	(.168)	-0.555	(.168)	-0.554	(.168)
# 1 to 4 year olds	0.174	(.028)	0.165	(.028)	0.167	(.028)	0.166	(.028)
Spanish w/ some English	-0.152	(.068)	-0.136	(.069)	-0.144	(.069)	-0.141	(.069)
Spanish w/ no English	0.015	(.146)	0.009	(.146)	0.008	(.146)	0.011	(.146)
Interactions								
Black * Plans C/D	0.461	(.154)	0.449	(.154)	0.456	(.154)	0.456	(.154)
Plans C/D * months	0.078	(.036)	0.078	(.036)	0.078	(.036)	0.078	(.036)
Plans C/D*(months-squared)	-0.0069	(.0019)	-0.0069	(.0019)	-0.0069	(.0019)	-0.0069	(.0019)
County-level characteristics								
KidCare provider density							-0.019	(.007)
% poor							0.005	(.0047)
Random effects								
Between-county variance					0.012	(.007)	0.004	(.005)
Scaled Deviance Statistic	30877.6		30824.5		30948.4		30890.7	

[18] LRH = log(relative hazard). Exp(LRH) = relative hazard or hazard ratio.

Appendix Table A - Family-months of observation, number of disenrollments and disenrollment rate by county, families enrolled in NJ KidCare, 1998-April 2000

	# enrolled families	# family months	# disenrolled	Avg. monthly disenrl. rate (%)
New York City MSA - NJ				
Bergen	2,089	14,270	250	1.8%
Essex	2,678	18,172	367	2.0%
Hudson	2,435	16,753	247	1.5%
Passaic	2,259	16,726	336	2.0%
Union	1,613	11,163	193	1.7%
West/Central NJ				
Hunterdon	168	1,166	27	2.3%
Mercer	1,038	6,993	169	2.4%
Morris	673	4,925	83	1.7%
Somerset	461	3,103	54	1.7%
Sussex	320	2,233	36	1.6%
Warren	266	1,849	26	1.4%
Philadelphia MSA - NJ				
Burlington	1,020	7,100	161	2.3%
Camden	1,837	12,478	326	2.6%
Gloucester	825	5,994	123	2.1%
North/Central Jersey Shore				
Middlesex	2,188	15,570	299	1.9%
Monmouth	1,350	9,543	171	1.8%
Ocean	1,644	11,540	220	1.9%
South Jersey Shore				
Atlantic	748	5,072	91	1.8%
Cape May	326	2,460	45	1.8%
Cumberland	527	4,102	74	1.8%
Salem	163	1,073	38	3.5%
All Counties	24,628	172,232	3,233	1.9%

Appendix B: Correlations[19] among county[20] (level-2) variables, New Jersey 1999-2001											
	Demographic and socioeconomic characteristics						**Unempl. & occupation comp.**			**Program characteristics**	
	Tot. pop.	**Pop. Dens.**	**% black**	**Black res. seg.**	**% non-Engl.**	**Child pov. rate**	**% <20 empl.**	**% Serv/ retail**	**Unempl. rate (%)**	**# kids per provider**	**# Providers /mile^2**
Demographic & socioeconomic											
Pop/mile^2	.58*										
% black	.31	.39									
Black res. seg.	.18	.11	.10								
% non-Engl.	.49*	.91*	.39	.04							
Child pov. rate (%)	.12	.53†	.69*	-.11	.61*						
Unemployment & occupation composition											
% <20 empl.	-.18	-.09	-.33	.12	-.21	-.11					
% Serv/ retail	-.03	-.31	-.05	.04	-.35	-.09	.63*				
Unempl. rate (%)	-.16	.22	.31	-.22	.33	.75*	.22	.20			
Program characteristics											
# enrolled kids per KidCare provider	-.19	-.12	-.10	.03	-.05	.22	.14	.08	.42		
# KidCare provs/mile^2	.54	.96*	.43†	.09	.89*	.61*	-.08	-..30	.24	-.19	
Program uptake[21]	.11	.25	.35	-.28	.31	.69*	-.12	-.05	.56*	.40	.29

[19] *: p<.05; †: p<.01

[20] N = 21 counties.

[21] # enrolled in /# eligible, expressed as a percentage.

Figure 1: Relative hazards of NJ KidCare disenrollment by race and plan