THE EFFECTS OF REINSURANCE IN FINANCING CHILDREN'S HEALTH CARE

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ABSTRACT

We examine the effects of reinsurance on the financial performance of health plans serving enrollees in a State Children's Health Insurance Program (SCHIP). Our simulations, which reflect actual experience in the SCHIP, suggest that common reinsurance policies can reduce substantially the variation in financial performance of plans with different case mixes. We also find that the incremental effects of more generous reinsurance policies can be relatively modest.

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Many states are struggling to design public health insurance programs that will deliver adequate health care to all children in the state. States face challenges in attracting health care plans to participate in these programs, in part because of the perceived financial risk of participation.[1] States often pay a capitated payment to a plan to care for a child's needs. Although capitated (fixed) payments can provide strong incentives for efficient operation, they can impose substantial financial risk on health care plans. Even when capitated payments are risk adjusted (i.e., even when the payment vary with the expected cost of addressing the health care needs of individual children), the payments can diverge significantly from the actual costs of providing adequate health care. Consequently, even when payments are risk adjusted and set at levels that cover realized health care expenditures on average, a plan can suffer a large financial loss if it happens to enroll children whose actual health care needs substantially exceed predicted needs.

In principle, a fee-for-service (FFS) policy could eliminate the financial risk that arises when actual health care costs diverge from expected costs. Under a FFS policy, the plan is reimbursed for its actual health care expenditures, rather than for its predicted expenditures. Although a FFS policy can eliminate a plan's financial risk, it also can eliminate a plan's incentives to operate efficiently and to appropriately limit health care expenditures.

Reinsurance can complement risk adjusting by protecting plans against extreme financial losses while providing substantial – although perhaps not ideal – incentives for the efficient delivery of health care services. In limiting downside financial risk, reinsurance also can reduce a plan's incentive to avoid serving high-risk children whose medical needs may impose high costs and financial losses. Reinsurance can serve this dual role of reducing financial risk and limiting incentives for favorable selection by limiting the share of exceptionally high health care expenditures on a child for which the plan is responsible. Under a common form of reinsurance, the plan bears the full cost of its expenditures on a child up to a threshold (known as the "attachment point"), but is responsible for only a fraction (e.g., 20 percent) of the expenditures on the child in excess of the attachment point.

The purpose of this research is to analyze the effects of reinsurance policies of this sort using data that reflects the actual experience of plans that participated in one State Children's

Health Insurance Program (SCHIP).[2] Under the simplifying assumption that the level of reinsurance does not affect the efficiency of a plan's operations, we analyze the extent to which reinsurance limits the downside financial risk for a plan and the plan's incentive for favorable selection.[3] We focus on how the effects of reinsurance vary with the characteristics of the population of children a plan serves (i.e., with the plan's case mix), holding constant the number of enrollees in each plan.[4] We employ bootstrap procedures (e.g., Stine, 1990; Mooney and Duval, 1993; Davison and Hinkley, 1997) to simulate three types of plans: (i) high-profit plans that enroll children for whom health care expenditures are relatively low, on average; (ii) low-profit plans that enroll children for whom expenditures are relatively high; and (iii) median-profit plans that enroll children for whom expenditures are intermediate in magnitude.

Four primary conclusions arise from our research. First, reinsurance increases substantially the (very low) average profit of low-profit plans while reducing more modestly the (quite high) average profit of high-profit plans. Second, reinsurance reduces the largest financial loss of low-profit and high-profit plans alike. The reduction is particularly pronounced for low-profit plans. Third, reinsurance reduces moderately the variation in the profitability of serving different children, even after premiums are risk adjusted to reflect demographic characteristics and health status. The reductions are most pronounced for low-profit plans. Fourth, although the effects of moderate levels of reinsurance are sometimes pronounced, the *incremental* effects of higher levels of reinsurance typically are relatively modest.

We develop and present these conclusions as follows. First, we describe the methodology employed in our study. Second, we present our main findings. Finally, we discuss extensions of our analysis, including our findings regarding how the effects of reinsurance vary with plan size (i.e., with the number of plan enrollees).

Study Methodology

Our analysis is based on data from the thirteen plans that participated in the SCHIP between June 1, 2001 and May 31, 2002.[5] During this time period, the state paid each plan a capitated payment to provide comprehensive health care to an SCHIP enrollee. The capitated payments were not risk adjusted. The SCHIP was open to children who were: (i) less than nineteen years of age; (ii) born in the United States; and (iii) from families that were not eligible for Medicaid and that had incomes below 200% of the federal poverty limit. The average age of the 496,276 children in the sample was 9.4 years. Approximately 51% of the children were

male, roughly 60% were Hispanic, 28% were White non-Hispanic, and 9% were Black non-Hispanic.

Our analysis proceeded as follows. First, we recorded three key types of data for each of the children enrolled in the plans we studied: (1) the child's demographic characteristics, including age and gender; (2) the child's health status, as measured by the Clinical Risk Groups (CRGs);[6] and (3) the health care services provided to the child during the sample year. Second, we employed the health care use data to estimate the actual expenditure on health care services for each child in the sample.[7] The state's Medicaid fee schedule was employed to estimate expenditures on outpatient and emergency room services. The Medicaid fee schedule was selected because most health plans participating in SCHIP use Medicaid rates or similar fee schedules to compensate their health care providers. Each day of inpatient stay was assumed to cost $3,000.

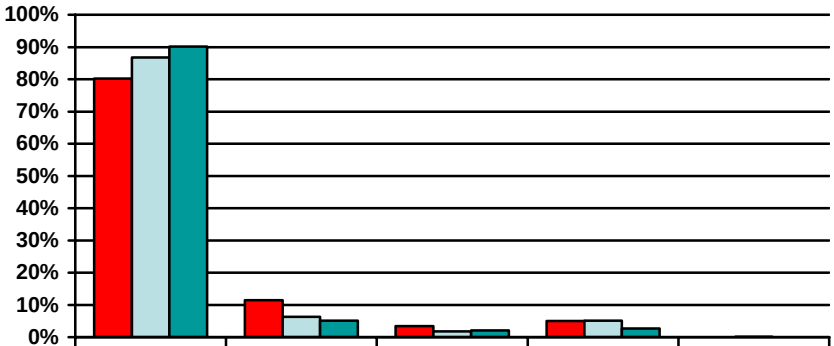
Third, we employed these data to calculate risk adjusted capitated payments (premiums) for the sample population. These premiums represent payments by the state to the health plan on behalf of the children being served. The premium for a child with a specific set of demographic and health status characteristics was set equal to the estimated cost of caring for a child with those characteristics. We employed the two-part model (Duan et al., 1982) to estimate these cost in light of the large incidence of zero health care expenditures in our sample (which is typical of this type of data). Under the two-part model, the probability that a child incurs any health care expenditure during the sample period is estimated first (assuming that the underlying dependent variable follows a logistic distribution). Then health care expenditures are estimated for those children that make use of the health care system (using ordinary least squares and a log-linear specification).[8]

Fourth, we calculated the net payment for each child in the sample, which facilitated our subsequent calculation of plan profit. A plan's net payment for a child is the difference between the risk-adjusted premium the plan receives from the state on behalf of the child and the plan's expenditures on the child's health care. Even though premiums were calculated to cover the cost of caring for children with identifiable demographic and health status characteristics on average, unpredictable variation in medical needs leads to divergences between the premium received on behalf of a child and the cost of the health care ultimately delivered to the child. A plan's profit from participating in the children's public health insurance program is the sum of the net payments for all of the children enrolled in the plan.

Fifth, to examine how the effects of reinsurance vary according to the mix of enrollees in a plan, we ordered the plans in our sample from most profitable to least profitable. We then simulated equally-sized high-profit, median-profit, and low profit plans. The high-profit plans were simulated by drawing 25,000 children randomly from the enrollees of the most profitable plan. One hundred repetitions of this procedure produced one hundred simulated "high-profit" plans, each with 25,000 enrollees. Similarly, 25,000 children were then drawn randomly one hundred times from the enrollees of the least profitable plan to produce one hundred simulated "low-profit" plans, each with 25,000 enrollees. Finally, the corresponding procedure was employed using the enrollees of the plan with the median level of profit in our sample population. This procedure produced one hundred simulated "median-profit" plans, each with 25,000 enrollees.[9] One hundred plans of each type were simulated in order to provide both a reliable estimate of the average effects of reinsurance and a plausible illustration of the range of likely effects of reinsurance. Each plan was assumed to enroll 25,000 children in order to reflect the experience of a typical mid-sized health care plan.

The relatively low profit of the low-profit plan in our study stems in part from the smaller fraction of healthy children the plan served during our sample period. As Figure 1 reveals, approximately 80% of the children enrolled in the plan with the lowest profit in our sample were classified as "healthy". In contrast, 90% of the children enrolled in the plan with the highest profit in our sample arises were classified as "healthy".[10] The relative profits of the three plans on which our simulations are based also reflect their relative health care expenditures. The average annual per-child expenditure by the low-profit plan in our sample was $1,651. The corresponding expenditures by the median-profit and high-profit plans were $1,147 and $776, respectively.

Figure 1. Distribution of Enrollees Classified by Clinical Risk Group (CRG) Health Status Category.



	Healthy	Significant Acute	Minor Chronic	Moderate Chronic	Malignant & Catastrophic
Low-Profit Plan	80.19%	11.46%	3.39%	4.93%	0.03%
Medium-Profit Plan	86.81%	6.25%	1.80%	5.07%	0.07%
High-Profit Plan	90.14%	5.06%	2.12%	2.65%	0.04%

Reinsurance

We analyzed the effects of three distinct reinsurance policies: one with a $75,000 attachment point, another with a $100,000 attachment point, and a third with a $150,000 attachment point. The lower is the attachment point, the greater is the reinsurance protection. Each policy entailed 20% cost sharing, so the plan was responsible for all covered health expenditures on a child below the specified attachment point and for 20% of the expenditures on the child above the attachment point. The state paid directly for the 80% of expenditures above the threshold in our study. For a policy with a $75,000 attachment point, for example, the health plan is responsible for all of the covered health costs for a child until expenditures reach $75,000, at which point the health plan is responsible for only 20% of the additional expenditures. Premiums paid to the plans were reduced to offset the state's expected reinsurance costs in the sample population as a whole, thereby making reinsurance neutral in its fiscal impact on the state's overall costs. In other words, reinsurance did not increase the state's expected costs, nor did it alter the overall *expected* profits of the health care plans.[11] This funding procedure is consistent with a policy in which the state employs the savings it secures from reduced premium payments to finance special care for children with particularly pronounced health care needs. For example, these children might be placed in a program that combines care coordination with

expanded access to health care providers who specialize in the care of children with special health care needs.

Tables 1 and 2 summarize the frequency and magnitude of reinsurance reimbursements for the simulated plans in our study. Table 1 identifies by type of plan the average number of children for whom expenditures exceeded the specified reinsurance attachment point. Table 2 presents the average reinsurance reimbursement received by the low-profit, median-profit, and high-profit simulated plans in our study.

Table 1. Average Number of Enrollees with Expenditures Above the Attachment Point.

Reinsurance Attachment Point	Low-Profit Plans	Median-Profit Plans	High-Profit Plans
$150,000	8.4	9.7	0.0
$100,000	19.8	20.6	4.7
$ 75,000	30.7	23.5	6.7

Table 2. Average Plan Reinsurance Reimbursement.[12]

Reinsurance Attachment Point	Low-Profit Plans	Median-Profit Plans	High-Profit Plans
$150,000	$3,962,000	$ 437,000	$ 0
$100,000	$4,466,000	$1,034,000	$ 55,000
$ 75,000	$5,009,000	$1,479,000	$156,000

Three features of Tables 1 and 2 warrant emphasis. First, less than one percent (approximately 0.24%) of the children served by the simulated plans had annual expenditures in excess of $75,000. The low-profit plans served half of these children, while the median-profit and high-profit plans served 39% and 11% of these children, respectively. Second, no high-profit plan spent more than $150,000 on an enrollee, while, on average, the low-profit plans and the median-profit plans spent more than $150,000 on the health care of approximately .03% and .04% of their enrollees, respectively. Third, while the low-profit and median-profit simulated

plans served similar percentages of children with expenditures above $100,000 and above $150,000, the low-profit plans spent far more caring for these children (and so received much greater reinsurance reimbursement) than did the median-profit plans.

The Effects of Reinsurance on Plan Profits

As explained above, one important potential benefit of reinsurance is its ability to limit particularly large financial losses that health care plans might otherwise incur. Table 3 identifies how reinsurance affected the average profit from participating in the state-sponsored children's health insurance program for the simulated plans in our study. Three features of Table 3 warrant emphasis. First, reinsurance reduced considerably the large financial loss incurred by the typical low-profit plan. The reinsurance policy with a $150,000 attachment point reduced this loss by approximately 29% from -$10,200,000 to -$7,241,000. The corresponding reductions under the reinsurance policies with $100,000 and $75,000 attachment points were approximately 29% and 30%, respectively. Second, reinsurance reduced moderately the average profit of the high-profit plans. The profit for these plans decreased because the high-profit plans secured relatively little reinsurance reimbursement, but received the lower premiums that were reduced to offset the reinsurance reimbursements paid to all of the plans, on average. Third, reinsurance also reduced the average profit of the median-profit plans. However, the reduction was relatively modest, as the higher reinsurance reimbursements these plans secured helped to offset the lower premiums they received.

Table 3. Average Plan Profit With and Without Reinsurance.

Reinsurance Attachment Point	Low-Profit Plans	Median-Profit Plans	High-Profit Plans
No Reinsurance	-$10,200,000	$494,000	$10,100,000
$150,000	-$ 7,241,000	$ 176	$ 9,193,000
$100,000	-$ 7,223,000	$155,000	$ 8,823,000
$ 75,000	-$ 7,071,000	$243,000	$ 8,593,000

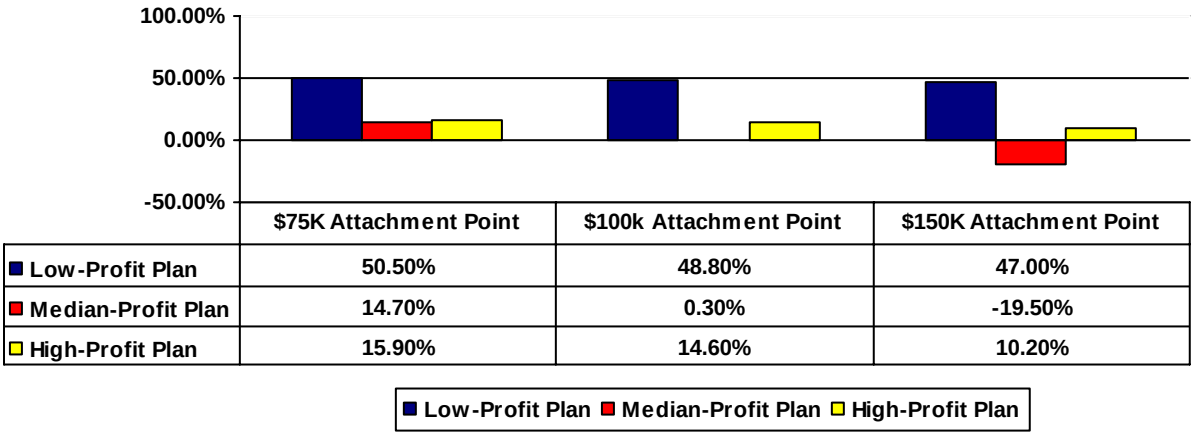
While reinsurance had fairly substantial and systematic impacts on average plan profit, it had even more pronounced effects on the smallest profit earned by a plan of each type. Table 4 reveals how the smallest profit earned by the low-, median-, and high-profit simulated plans in

our study varied with the reinsurance policy in effect. Figure 2 presents the corresponding percentage changes in the smallest plan profit relative to the profit secured in the absence of reinsurance.

Table 4. Smallest Plan Profit With and Without Reinsurance.

Reinsurance Attachment Point	Low-Profit Plans	Median-Profit Plans	High-Profit Plans
No Reinsurance	- $20,393,000	- $1,751,000	- $8,529,000
$150,000	- $10,808,000	- $2,092,000	- $7,659,000
$100,000	- $10,491,000	- $1,746,000	- $7,288,000
$ 75,000	- $10,120,000	- $1,493,000	- $7,173,000

Figure 2. Percentage Increase in the Smallest Plan Profit Under Reinsurance Relative to No Reinsurance.



Four features of Table 4 warrant emphasis. First, in the absence of reinsurance, the greatest financial loss suffered by a plan of all three types was substantial, but was particularly pronounced for the low-profit plans. The largest loss by a low-profit plan was more than twice the corresponding loss by a high-profit plan and more than ten times greater than the corresponding loss by a median-profit plan. Recall these pronounced losses arose even though premiums were risk adjusted to reflect both demographic and health status characteristics and set

to match health care expenditures, on average. Second, reinsurance systematically increased the smallest profit of both the low-profit plans and the high-profit plans. In contrast, reinsurance tended to reduce the smallest profit of the median-profit plans.

Third, reinsurance increased most dramatically the smallest profit of the low-profit plans. Reinsurance with a $150,000 attachment point increased this smallest profit by 47%. Fourth, although the reinsurance policy with a $150,000 attachment point increased substantially the smallest profit of the low-profit plan, the additional increases secured under more generous reinsurance policies (i.e., under reinsurance policies with lower attachment points) were relatively modest. To illustrate, relative to reinsurance with a $150,000 attachment point, reinsurance with a $75,000 attachment point increased the smallest profit of low-profit plans from -$10,808,000 to -$10,120,000, or by only 6.4%.[13] This finding suggests that it may be possible to capture a large portion of the potential benefits of reinsurance with policies that offer relatively modest levels of reinsurance.

The Effects of Reinsurance on Variability in Net Payments

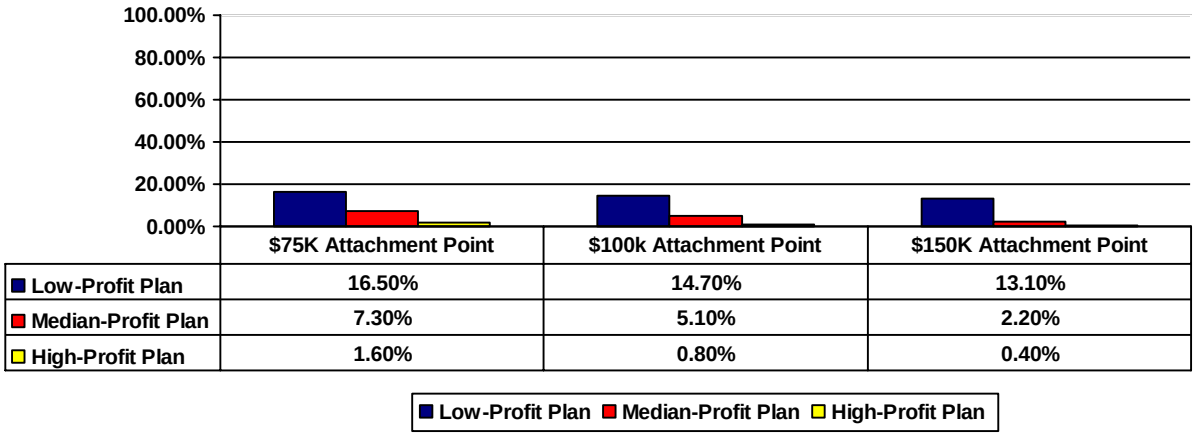
In addition to reducing the average and maximum financial losses for low-profit plans, reinsurance may limit incentives for favorable selection. When net payments differ substantially across children, plans can increase their earnings and reduce their financial losses by enrolling children for whom net payments are expected to be large and positive while avoiding children for whom net payments are expected to be very negative. Reinsurance can dampen a plan's incentive to engage in such favorable selection to the extent that it limits substantial variation in net payments.

Table 5 and Figure 3 reveal the extent to which reinsurance reduced the average variation in net payments for the three types of simulated plans in our study. We employed the mean absolute deviation (MAD) of a plan's net payments as our measure of variation.[14] The MAD is the average of the differences between a plan's net payments and its mean net payment, where all differences are expressed as absolute values. Table 5 identifies the nominal effects of reinsurance on net payment variation, relative to net payment variation in the absence of reinsurance. Figure 3 presents the corresponding proportionate effects of reinsurance.

Table 5. Average Variation in Net Payments With and Without Reinsurance.

Reinsurance Attachment Point	Low-Profit Plans	Median-Profit Plans	High-Profit Plans
No Reinsurance	$ 1,980	$ 1,313	$ 852
$150,000	$ 1,721	$ 1,284	$ 849
$100,000	$ 1,689	$ 1,246	$ 845
$ 75,000	$ 1,654	$ 1,217	$ 838

Figure 3. Percentage Reduction in Net Payment Variation Under Reinsurance Relative to No Reinsurance.



Four aspects of Table 5 and Figure 3 warrant emphasis. First, as expected, reinsurance systematically reduced the average variation in net payments. For all plan types, net payment variation declined as reinsurance protection increased. Second, the reduction in net payment variation was most pronounced for the low-profit plans and least pronounced for the high-profit plans. The more pronounced reduction in net payment variation for the low-profit plans arises in part because children with the highest expenditures were enrolled disproportionately in these plans. Third, reinsurance did not produce dramatic reductions in net payment variation. The largest reduction (for the low-profit plans under the reinsurance policy with a $75,000

attachment point) was 16.5%. Fourth, although modest reinsurance reduced net payment variation considerably for the low-profit plans, the corresponding reductions produced by more generous reinsurance protection were relatively small. This finding suggests, once again, that relatively modest levels of reinsurance may capture a large portion of the maximum potential benefits of reinsurance.

Conclusions

In summary, our study of the effects of reinsurance produced four major conclusions.

1. Reinsurance increased substantially the (very low) average profit of low-profit plans while reducing more modestly the (quite high) average profit of high-profit plans.
2. Reinsurance reduced the largest financial loss of low-profit and high-profit plans alike. The reduction was particularly pronounced for low-profit plans.
3. Reinsurance reduced modestly the variation in the profitability of serving different children, even after premiums were risk adjusted to reflect demographic characteristics and health status. The reductions were most pronounced for low-profit plans.
4. Although the effects of moderate levels of reinsurance were sometimes pronounced, the incremental effects of higher levels of reinsurance typically were relatively modest.

Despite the combined effects of reinsurance and health-based risk adjustment, the lowest profit plans still sustained losses from serving children in state-sponsored health insurance programs in our study. Thus, although reinsurance can reduce the magnitude of the financial losses that persist even after capitated payments are risk adjusted to account for demographic characteristics and health status, reinsurance typically will not eliminate these losses in a given year.[15] Similarly, reinsurance will not eliminate incentives for favorable selection. These conclusions are direct implications of the fact that reinsurance policies typically do not fully insure health plans against financial risk, so as to leave the plans with some financial incentive to operate efficiently.

While this research provides preliminary evidence regarding some potential benefits of reinsurance, substantial work remains to develop a more comprehensive understanding of all relevant benefits and costs of reinsurance. Most importantly, future research should examine explicitly the effects of reinsurance on the efficiency of plan operations. If reinsurance promotes

health care expenditures that exceed appropriate levels, this cost of reinsurance must be weighed carefully against the potential benefits of reinsurance identified in our study.[16]

Clearly, the benefits and costs of any reinsurance policy will vary with the parameters of the policy. Following the procedure described above, we simulated the effects of reinsurance policies that entailed no cost sharing. In these simulations, a plan was responsible for all of its health care expenditures on a child up to the stipulated attachment point, but had no responsibility for any expenditures above this point.[17] Not surprisingly, reinsurance with no cost sharing reduced the greatest financial loss and the average variation in net payments more substantially than did the reinsurance policies with 20% cost sharing analyzed above. In practice, though, reinsurance policies with no cost sharing provide no financial incentive for a plan to limit health care expenditures on a child once expenditures reach the attachment point. A systematic analysis of the optimal design of reinsurance policies awaits future research.[18]

Future research also should compare the effects of voluntary and mandatory reinsurance. In our study, reinsurance was mandatory, a common reinsurance policy was provided to all plans, and premiums were reduced symmetrically for all plans to offset the cost of the reinsurance. While this policy reduced the maximum financial loss incurred by low-profit and high-profit plans alike, it reduced the average profit of high-profit plans. Consequently, some high-profit plans might opt out of the reinsurance policy if they were permitted to do so.[19] The effects of voluntary reinsurance, like the effects of plan-specific reinsurance obtained through private negotiations between individual plans and private reinsurance providers, remain to be explored in detail.

In closing, we note briefly the four main findings from our study of how the effects of these reinsurance policies vary with plan size (i.e., the number of plan enrollees), holding case mix constant. First, and not surprisingly, reinsurance was found to have little effect on *average* plan profit, regardless of plan size. This finding reflects the fact that premiums were reduced to offset the state's expected reinsurance costs in our study. Therefore, when all plans draw enrollees from the same population, plans neither gain nor lose from reinsurance on average, regardless of their size. Second, reinsurance reduced substantially the *largest* financial loss incurred by plans of all sizes. The reduction in the largest financial loss was most pronounced for small plans that serve relatively few children.[20] Third, while moderate reinsurance reduced the largest plan loss substantially, the *incremental* loss reduction secured through expanded reinsurance protection was relatively modest.[21] Fourth, reinsurance reduced only modestly the

variation in the profitability of serving individual children that plans face on average.[22] This finding suggests that reinsurance may not dramatically reduce incentives for favorable selection when plans of different sizes draw similar enrollee pools from the same population.

Notes

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[1] The perceived risk can be particularly pronounced because public health insurance programs tend to enroll disproportionately children with special health care needs. Children with special health care needs are defined as children "who have or are at elevated risk for chronic physical, developmental, behavioral, or emotional conditions and who also require health and related services of a type or amount not usually required by children" (Maternal and Child Health Bureau, 1995). In 2001, an estimated 12.8% of children in the United States had a special health care need (Blumberg, 2003).

[2] The state is not identified here to help preserve confidentiality of key data.

[3] We discuss this important assumption below. Our analysis also assumes that plan behavior is not affected by the health-based risk adjustment that we simulate.

[4] The concluding discussion explains how the effects of reinsurance vary with plan size, holding case mix constant.

[5] This time period reflects the most recent year for which the relevant data were available.

[6] The CRGs are a categorical clinical system that classifies individuals according to their diagnosed health status. The CRGs include nine core health status groups: healthy, significant acute, minor chronic, multiple minor chronic pairs, single dominant or moderate chronic, multiple significant chronic pairs, chronic triplets, catastrophic, and metastatic malignancy (Neff et al., 2001). These categories can be collapsed into the following five groups for analytic and descriptive purposes: healthy, significant acute, mild chronic conditions, moderate chronic conditions, and malignant and catastrophic conditions. The CRGs used in our June 2001 – May 2002 sample reflect CRGs assigned in the preceding year, June 2000 – May 2001. The CRG assignment required that children over 1 year of age be enrolled for at least half of the relevant year and that children under 1 year of age be enrolled for at least three months.

[7] The claims and encounter datasets used in this analysis contain person-level data including ICD-9-CM codes assigned at the time of the health care encounters, Current Procedure Terminology (CPT) codes, revenue codes, and National Drug Codes (NDC). These datasets were examined following the *Final Protocol for Validating Encounter Data* suggested by the Center for Medicare and Medicaid Services, Department of Health and Human Services. At least 95% of the relevant fields in the datasets were populated with valid numbers. Moreover, an actuary review of the health care use rates confirmed our assessment that the use rates were reasonable for the Medicaid and SCHIP populations. Medical record

reviews revealed approximately a 10% underreporting of encounters in the encounter data relative to the medical record.

[8] A logarithmic transformation of health care expenditures was employed because of the (typical) skewness of these expenditures in our sample. We employed Duan (1983)'s nonparametric procedure to retransform the log scale results to the original scale of health care expenditures. The smearing estimator we employed used the average of the exponentiated residuals by the model covariates to provide consistent estimates in the presence of heteroscedasticity, which is a common problem in analyses of this sort (Duan et al., 1982; Manning et al., 1987; Manning, 1997; Mullahy, 1998).

[9] All sampling was conducted with replacement. The average profits for the three types of simulated plans are presented in Table 3 below.

[10] These percentages pertain to enrollees with an assigned CRG, and thus do not reflect possible differences in the health status of new enrollees.

[11] For simplicity, we assumed that plans' health care expenditures on individual children did not change as the terms of the prevailing reinsurance policy changed. We also abstracted from the loading costs and administrative costs that often accompany reinsurance in practice.

[12] The numbers in Table 3 and in some subsequent tables are rounded to the nearest thousand.

[13] This incremental 6.4% increase is achieved via a 51% increase (from $58.66 to $88.58) in the average reinsurance reimbursement per enrollee.

[14] Alternative measures of variation – including variance and standard deviation – produced conclusions analogous to those reported below.

[15] As additional data become available, our analysis should be extended to analyze relevant activity over time. A financial loss in a particular year may be more tolerable for a plan if the plan knows the loss is unlikely to persist in future years. In essence, ongoing operations can provide plans with some intertemporal insurance against persistent financial losses if realized case mix varies naturally over time.

[16] Future research also should account for the possible effects of risk adjustment on plan operations, and for other possible determinants of variation in expenditures across health plans, including differences in the quality of care deliver to enrollees and differences in plan efficiency.

[17] Such caps are common in practice. See, for example, Lutzky and Bovbjerg (2003) and Chollet (2004).

[18] Of course, such an analysis must consider reinsurance as one of many instruments that can be employed simultaneously to achieve desired goals. See, for example, Etheredge and Moore (2003).

[19] Other authors have noted that risk can be spread more broadly across plans when reinsurance is mandatory and provided by a single entity (e.g., the State). See, for example, Blumberg and Holahan (2004).

[20] The largest financial loss among the simulated small plans (each with 5,000 enrollees) in our study was reduced by approximately 61% (from $2.93 million to $1.14 million). The largest financial loss among

the simulated large plans (each with 150,000 enrollees) in our study was reduced by approximately 39% (from $9.78 million to $5.96 million).

[21] To illustrate, reinsurance with a $150,000 attachment point reduced the maximum financial loss incurred by a small plan by 61%. The corresponding reduction secured with a $75,000 attachment point was 66%, an incremental reduction of only five percentage points.

[22] Reinsurance with a $150,000 attachment point reduced the average variation in net payments by approximately 5% (relative to no reinsurance) for the small-, medium-, and large-sized simulated plans in our study.

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