Use of Sliding Scale Premiums in Subsidized Insurance Programs, The
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In an effort to reduce the level of uninsurance and improve access to care, several states have recently
established subsidized health insurance programs to help low-income uninsured persons. These include
state-funded programs, such as Washington state's Basic Health Plan (BHP) and Minnesota's MinnesotaCare.
They also include programs that rely on federal and state funds under Medicaid Section 1115 demonstration
projects, such as Hawaii's QUEST and Tennessee's TennCare programs (Wooldridge et al., 1996, Rajan, et al.

If programs are designed soundly and if many participate, health insurance subsidy programs for the
low-income could be an important way to lower the uninsurance rate. Among the nearly 40 million Americans
who are uninsured, a large segment are low-income: About one-third of the nonelderly uninsured have
incomes below 100 percent of poverty, and another third have incomes between 100 and 200 percent of

Many of the state-subsidized health insurance programs currently operating require that some of the
participants share in the cost of their insurance. Often this cost sharing is in the form of premiums, which are
administered on a sliding scale based on income, in which participants with higher incomes pay a higher share
of the total premium cost. Some programs also charge beneficiaries limited copayments or deductibles.

By imposing beneficiary cost sharing, the new programs represent a departure from the Medicaid program—the
joint federal and state health program for the low-income, aged, and disabled—which provides insurance free
to participants.2 Requiring beneficiary cost sharing is a key feature of the state subsidy programs, with the
idea being that these programs will serve as a "bridge" between Medicaid—in which cost-sharing is virtually
nonexistent—and private health insurance, where beneficiary cost-sharing is common. Charging participants a
share of the premium also reduces the public costs of the program.

While subsidized health insurance programs have the potential to help reduce the number of the uninsured, at
present only limited information exists about these programs. Even less information has been available on how
to develop premiums to secure desired program participation. Early program experience has indicated that
premium schedules must be designed carefully to meet targeted enrollment and to stay within budget. In
Hawaii's QUEST program, for example, enrollment was higher than expected and the state increased premiums
and tightened eligibility to lower program costs. By contrast, Washington state found participation too low and
reduced premiums to bolster enrollment in its BHP program.

Using data from four state programs—BHP, TennCare, QUEST, and MinnesotaCare—we take an early look at
subsidized insurance programs that use sliding scale premiums. We begin by discussing the conceptual issues
surrounding premiums in subsidized insurance programs for low- and moderate-income persons, including the
design of premium schedules. Then we describe the premium structure and experience of our four study
states—Hawaii, Minnesota, Tennessee and Washington. Included in this are preliminary estimates of the
relationship between program participation rates and different premium levels.

To our knowledge this is the first time a study has investigated this relationship.3 As such our analyses begins
to fill an information gap. However, given the newness of these programs and the limited nature of available
data, our analyses are simple and should be viewed as providing an early look at how premium levels might
affect participation rates in a subsidized health insurance program.

A. CONCEPTUAL ISSUES
In designing a subsidized health insurance program the first issue that should be considered is whether to charge a premium: what are the pros and cons? If premiums are to be used, the next consideration is how to structure a premium schedule. We discuss these and other issues in the next section.

**Sliding-Scale Premiums: Pros and Cons.** Employing sliding-scale premiums as a way to impose beneficiary cost-sharing serves several purposes. It helps to target the program benefits to the neediest: the poorest get the highest subsidies, whereas those with higher incomes pay more. A sliding-scale premium structure may also help relieve the "Medicaid notch" problem: Some policy analysts believe that there is an incentive for some people to stay on welfare to in order retain health insurance (Ellwood and Adams, 1990; Moffitt and Wolfe, 1993). At present, if welfare recipients' incomes rise a little too high, they completely lose their Medicaid insurance. A sliding scale insurance program could help such individuals get off welfare by offering them affordable insurance with a gradually rising price. This would work only if the subsidies are phased out slowly.

Another important feature of premiums is that by imposing enrollee cost sharing, it makes the program seem less like just another "welfare" program. Erasing the welfare stigma from a program may be important to both clients and politicians.

Premiums also have important fiscal effects. They reduce the public costs of the program since the beneficiaries shoulder some of the expense. Premiums can also act as an incentive to encourage cost conscious purchasing by consumers. Many of the existing subsidized programs, for example, require participants to choose among a set of managed care plans. If the cost of the plans in a given program varies, premiums could be adjusted to reflect the price difference: If a participant selects a more costly plan their premium is higher whereas if they select a lower cost plan, their premium would be lower. Having a range of premiums to select from will encourage prudent buying among program participants. While premiums have many virtues, they also have some negative attributes. Perhaps most important, requiring premiums will lower participation rates. This is likely to be particularly true for the very poor—for example, persons with income below poverty. They may simply lack the disposable income, after paying for food, rent and other basic needs, to pay health insurance premiums, no matter how low the premium. Even at moderate income levels, people may feel that insurance is not worth the cost of the premiums, particularly if they are relatively healthy. To many families of four earning $20,000 per year (about 130 percent of poverty), annual insurance premiums of $600 (3 percent of their income) may seem unaffordable, even though the insurance is highly subsidized.

Another potential problem with a premium-based program is that because participants have to share in the costs, the less healthy—the ones that most need medical care—may be more likely to enroll than the relatively healthy. This problem is commonly referred to as "adverse selection." If adverse selection occurs it will result in enrollees that have higher-than-average medical needs, leading to higher medical expenditures per beneficiary. Over the long run, adverse selection can cause premiums—or public subsidies—to spiral upward.

Evidence on whether adverse selection has taken place among existing subsidy programs is limited. An early study of Washington state's program, Basic Health Plan, failed to find evidence of adverse selection (Diehr, et al. 1993). The authors reported no significant differences in the health status of those who bought into BHP and similar nonparticipants. The BHP, however, had a preexisting condition exclusion clause such that certain medical conditions which existed prior to joining were not covered for a period of time. This restriction may have contributed to the reported lack of adverse selection.

Another downside to charging premiums is that they increase the administrative costs and administrative complexity the program. To run a premium program, states need to develop procedures to notify applicants about their premium levels, to bill them and to collect premiums. In addition, states need to be able to terminate a person from the program for not paying their premium. While these are standard operations in private health insurance (e.g., for nongroup private insurance), they are not for many state governments. As discussed later in the paper, during the early days of Tennessee's TennCare (which has a subsidized insurance component), the state encountered serious administrative problems in premium collection. Other programs, though, have had fewer troubles in this area.

**Copayments.** Copayments are another form of beneficiary cost-sharing. The purpose of copayments is to encourage judicious use of services, and in turn, help control program expenditures. Some of state subsidized programs—for example, TennCare—impose copayments. The copayments are typically nominal, for example, $5 to $10 per doctor's visit and $2 to $5 for a prescription. States have been particularly interested in selectively raising copayments for inappropriate emergency room use.

Research has shown that copayments do constrain utilization of health services. The RAND health insurance experiment, for example, tested variations in copayments and deductibles, primarily in fee-for-service insurance programs, and found that total medical expenditures fell as the out-of-pocket shares of costs grew (Newhouse, et al., 1993). In general, the analyses did not indicate that the reductions in health care use had significant effects on participants' health status. However, low-income groups had a greater reduction in utilization than their higher income counterparts, presumably because they had a harder time contributing copayments and, thus, received less care.

Indeed, a small survey of TennCare participants found that about one-fifth of those who were subject to copayments (which are imposed on persons above poverty) reported that they were unable to make their copayments for prescriptions and that about two-thirds reported going without care because of inability to meet the deductible or copayment (cited by Bonnyman, 1996).

**Substitution of Private Health Insurance.** An important consideration for policy makers contemplating
Florida's once-planned expansion program, the Florida Health Security Plan, contemplated a dollar subsidy plans out of reach for the poorest. Most state programs have used the percentage subsidy approach, although the bottom of the income distribution. At the same time, the dollar subsidy may effectively place high cost thus provides a much stronger incentive for participants to select the lower cost plan, particularly for those at the top of the income scale for those eligible, a participant pays half of the total cost while the government would pay the balance.

### Type of Subsidy: Dollar versus Percentage.

Since many of the current subsidized insurance programs offer benefits through managed care plans, another important issue in the design of a premium schedule is how to handle price differentials among the competing plans. To accommodate price differences, a state could offer either a percentage subsidy or a dollar subsidy. Under a percentage subsidy, enrollees—at the same income level—pay the same percentage of the full premium regardless of plan selected. In contrast, under a dollar subsidy, enrollees—again, at the same income level—get the same dollar contribution—regardless of which plan is selected. If the participant chooses a plan less costly than the state's dollar subsidy level, then nothing must be paid out-of-pocket.

The impact of the percentage and dollar subsidies on participants' cost-sharing is different. As an example, assume that a state offers two health plans with different prices. The full premium of the more expensive plan is $30 higher per month than the lower cost plan. If the state uses a percentage subsidy, the participant pays the state's dollar subsidy level, then nothing must be paid out-of-pocket. The dollar subsidy thus provides a much stronger incentive for participants to select the lower cost plan, particularly for those at the bottom of the income distribution. At the same time, the dollar subsidy may effectively place high cost plans out of reach for the poorest. Most state programs have used the percentage subsidy approach, although Florida's once-planned expansion program, the Florida Health Security Plan, contemplated a dollar subsidy.
Premiums and Household Size. Another issue in designing a premium structure is how to adjust the schedule for family size. A common method is that households with income at a given percent of poverty pay a fixed percentage of the full premium, regardless of the number of people covered. This equal percentage subsidy approach is intuitively appealing, but creates equity problems between individuals and families. Children’s medical care is, on average, much less expensive than it is for adults and full premiums for children are typically half to two-thirds those of adults. However, the differences in insurance costs do not match the economies of scale that are built into the federal poverty guidelines, which leads to inequities. For example, the poverty guidelines suggest that a family of four requires about twice as much income as a single person, while insurance coverage for a family of four would be about three times as much as a single person. Thus, families may pay a higher share of their income for insurance than similarly poor individuals.

Figure 2 presents a hypothetical illustration of what can happen if the same percentage subsidy is provided regardless of household size. The example assumes all households receive the same percentage subsidy for a given income level. As the curves illustrate, a family of four would pay a higher share of their income (at all income levels) as compared to an individual. Premiums for family of four with an income of 150 percent of poverty, for example, would account for 9.2 percent of the family’s income. By contrast, for an individual, also at 150 percent of income, premiums would account for only 6.2 percent of income.

To prevent this inequity, a state could subsidize families more than they subsidize individuals by setting family premium shares lower, so that families pay a similar share of income as an equally poor individual. As discussed in the next section, some states have adopted such an approach and have separate premiums schedules for families and for individuals.

B. EXPERIENCES IN HAWAII, MINNESOTA, TENNESSEE AND WASHINGTON

In this section we provide a brief description of the subsidized insurance programs in our four study states—Hawaii, Minnesota, Tennessee and Washington. We focus our discussion on the program as they were in 1995, the same year as participation data we received from the states.

Tennessee. In 1994, Tennessee implemented one of the most expansive subsidy programs in the nation as part of its Section 1115 Medicaid demonstration project called TennCare (Wooldridge, et al. 1996). At the beginning, all uninsured Tennesseans, regardless of income were eligible to participate and allowed to select a managed care plan. Uninsured enrollees had to demonstrate that they had no coverage prior to the date of application. Extending the full acute care Medicaid service package to persons participating in the subsidy program. TennCare provided sliding scale subsidies to enrollees between 100 and 400 percent of poverty; those above 400 percent of poverty could join but received no subsidy. In addition, TennCare recipients above poverty were subject to deductibles and copayments.

Due to program budget constraints, in late 1994 TennCare stopped enrolling most uninsured people. They did continue to cover persons under regular Medicaid eligibility rules and those who were uninsurable due to special medical conditions. Those uninsured persons who were already enrolled in the program were allowed to continue participating in TennCare. In 1996 TennCare had more than 330,000 enrollees who were not eligible for Medicaid under standard rules, although not all of them paid premiums.

At the beginning, TennCare program encountered some major problems in administering the subsidy component of the demonstration. Because of its mail application system, applicants for the subsidy program usually did not know how much their premiums would be until after they were enrolled in a plan. Further, the state failed to send out premium billing notices for several months after the program started. When the state eventually tried to rectify this, including billing for back-owed premiums, many participants were unable or unwilling to pay, so the state dropped more than 80,000 participants for nonpayment during 1995.

Hawaii. Another Section 1115 project started in 1994 was Hawaii’s QUEST program. Like TennCare, QUEST includes a subsidized insurance program. Through managed care plans, QUEST offers subsidized insurance to nondisabled, nonelderly people with incomes up to 300 percent of poverty who were not covered by the state’s employer-mandated private health insurance (Wooldridge et al, 1996). Also like TennCare, persons enrolled in the QUEST subsidy program are provided the full Medicaid benefit package, excluding long-term care.

In 1994-95, those between 133 and 300 percent of poverty paid sliding scale premiums and were subject to nominal copayments. Due to fiscal problems and a class action lawsuit, though, Hawaii undertook a series of changes to reduce QUEST caseloads and expenditures. In the latter half of 1995, the state raised premiums. Then, in 1996 it imposed an assets test, charged full premiums to those above 100 percent of poverty and placed a limited moratorium on enrolling new applicants. In 1996, QUEST covered over 50,000 that were not covered under regular Medicaid rules.

Washington State. Basic Health Plan (BHP) is a state-funded subsidized insurance program that began in 1989 and was given permanent statewide status in 1993. Unlike TennCare and QUEST, BHP is completely separate from the state’s Medicaid program. In addition, the BHP offers a more restrictive benefit package (as compared to Medicaid), akin to private health insurance.

In BHP sliding scale premiums apply at all income ranges. Those with no income are charged $10 per month for an individual or $20 for a family. The subsidies end at 200 percent of poverty, although people with higher incomes can join. In early 1996, the state reduced premium levels in a successful attempt to boost...
participation levels. Later in 1996, the state capped the number of adults allowed to join because the program reached its funding limits. In 1996, BHP had about 130,000 subsidized beneficiaries.

**Minnesota.** Like BHP, MinnesotaCare is a state-funded insurance program that was created in 1992 and serves uninsured families with children below 275 percent of poverty, as well as single adults and childless families with incomes up to 135 percent of poverty. To enroll, participants have to have been uninsured at least four months and can not have had access to employer-paid (defined as the employer pays more than half the premium) insurance within the last 18 months.

Similar to BHP, MinnesotaCare offers a narrow benefit package, limited principally to primary care with some inpatient care coverage. MinnesotaCare remains separate from Medicaid, though some populations (principally, pregnant women and children) can enroll in either Medicaid or MinnesotaCare. Premiums are based on a sliding scale, except that children under 150 percent of poverty (who are not otherwise Medicaid eligible) pay a flat $4 per month. Adults are charged premiums when their incomes exceed the maximum Medicaid income level. In 1995, MinnesotaCare operated as a fee-for-service insurance program, but shifted to capitated managed care the following year. As of 1996, more than 90,000 people were enrolled in MinnesotaCare.

**Premium Structures.** Table 1 gives 1995 premium levels as a percent of poverty for each the four programs—QUEST, MinnesotaCare, TennCare, and BHP. For each program, premium levels are shown for an individual (left panel) and for a family of four (right panel). In addition, to giving the premium payment per month, we also show the payment as a percent of the total premium cost and as a percent of income. Again, these statistics are given for an individual and for a family of four. A graph of the premium payment as a function of percent of poverty for an individual and for a family of four is shown as Figures 3a and 3b, respectively.

Both Table 1 and the figures illustrate that each program employed a sliding scale premium structure in which beneficiary cost sharing rose with income. This was true for both individuals and families. For example, an individual whose income was 150 percent poverty paid $13 per month to participate in QUEST whereas an individual with income of 300 percent of poverty paid $188. Both Tennessee and Hawaii imposed no premiums on participants with incomes below poverty. By contrast, Washington and Minnesota charged modest premiums for persons in this income group.

At the high end of the income eligibility range, the states phased out their subsidies. At what income level subsidies disappeared, however, varied by state. Hawaii did not permit those with incomes above 300 percent of poverty to participate at all. Similarly MinnesotaCare did not allow families with incomes above 275 percent of poverty and childless adults with incomes above 135 percent of poverty to participate. (Minnesota was the only state that made an eligibility distinction between those with and without children.) By comparison, both Tennessee and Washington allowed uninsured people with incomes beyond the subsidy limit to participate, but they have to bear the full premium cost.

While monthly premiums for families increased with income just like for individuals, premiums were higher for families as compared to individuals. For example, a family of four with income equal to 200 percent of poverty paid a $137 monthly premium to participate in TennCare whereas an individual with the same income paid $55.

Where the programs did differ was whether premium subsidy levels varied by household size.

Tennessee and Hawaii provided similar percentage subsidies for individuals and for families. For example, in QUEST a family of four with an income at 150 percent of poverty paid 7 percent of the full premium cost as did individuals at 150 percent of poverty. By contrast, Minnesota and Washington state provided a more generous subsidy to families with children compared to individuals.

The effect of a same percentage subsidy was most noticeable for Hawaii. Hawaii used a flat premium per person that provided no family- or child-related discounts. At the maximum individual premium of about $188 per month, a family of four with an income of 300 percent of poverty enrolled in QUEST would be charged a monthly premium of $752 per month, nearly 20 percent of their income.

**Premiums as a Share of Income.** Table 1 also lists premiums as a share of income. This ratio essentially relates the financial burden the program imposes on participants. Figure 4a show premiums as share of income by income category for individuals and Figure 4b shows the same information for a family of four.

The figures reveal that the states were quite progressive up to 200 percent of poverty: People at 200 percent of poverty paid a higher share of their income for premiums than those at 100 or 150 percent of poverty. Above 200 percent of poverty, the progressivity of programs premiums varied. For example, in TennCare, premiums flattened out at roughly 5 percent of income for a regular, "low deductible" plan for persons with incomes above 200 percent of poverty.

**The Relationship of Premiums and Participation.** One of the most important questions surrounding
To make preliminary participation estimates we employed a simple approach: We received data from the four states (Hawaii, Minnesota, Tennessee, and Washington) on the number of program enrollees by poverty bracket for those paying a premium at some point during 1995. To estimate the number of people eligible—which we defined as the uninsured population who met the 1995 income criteria set by each program—we used Current Population Survey (CPS) data and calculated the number of uninsured by poverty bracket in each state. Our methods and its caveats are detailed in the attached appendix. Using the CPS for this exercise has shortcomings, including limited cell sizes when states are divided by poverty range; these are also discussed in the appendix.

Then, using the four states' premium schedules, we computed median premium levels paid in each income bracket. For consistency, we computed the monthly cost of a premium for two people in a two-person family, an adult and a child. Finally, we used grouped regression analysis to estimate the correlation between premium levels (measured as a percent of income) and calculated program participation rates among the uninsured.

Table 2 shows the estimates for Hawaii, Minnesota and Washington. We have stratified that results by program type and income as a percent of poverty, which varies from program to program reflecting the different eligibility criteria. The first column shows median income as a percent of income and, the second the estimate number of uninsured based on CPS data. The third column relates the estimated participation rates derived as described above.

As can be seen, the pattern is clear: As premiums consume an increasing share of income, participation declines. In Hawaii, for example, we calculated that among two-person households with income between 175 and 200 percent of poverty, about 45 percent of the eligible population would participate in QUEST. By contrast, among two-person households with income between 275 and 300 percent of poverty, participation were calculated at less than 3 percent.

Figure 5 graphs the relationship between premium levels (expressed as a percent of income) and participation rates among the uninsured after pooling the data for the three states. The graph shows both the data points for the three states and a curve summarizing the average relationship between the three states' premiums and program participation rates.

As shown, when premiums are 1 percent of income, the summary curve indicates that a majority (57 percent) of the uninsured would participate. When premiums rise to 3 percent of income, about a third (35 percent) are predicated to join. At 5 percent of income, only a sixth (18 percent) are expected to participate. These participation levels are lower than recent estimates of Medicaid participation rates. For example, Winterbottom, et al. (1995) estimated that about 74 percent of those eligible for Medicaid nationwide participate, while Summer, et al. (1997) estimated that, among children under 11 without other health insurance, an average of about 66 percent participate in Medicaid. However, since Medicaid is essentially free to participants, it is not surprising that Medicaid participation rates are higher.

Although the downward sloping pattern was consistent among the three states, the data shown in Table 2 and Figure 5 indicate that there are differences among the estimated participation rates for each of the three programs. Possible reasons include variations in the generosity of the benefit package offered by the program. For example, Tennessee and Hawaii offer the full acute care benefit package to subsidy enrollees. By contrast, BHP and MinnesotaCare enrollees receive a much narrower range of benefits.

Another explanation for the variation is that the states may employ different strategies to market the program, some being more successful than others. A final possibility for the differences by state is that there may be sampling error in the CPS, which differs by state; the relatively small sizes of the cells by state can contribute to apparent differences across states.

These analyses are simple and should be viewed as preliminary. Given the limited nature of the data and the uniqueness of each of the programs we studied, it was not possible to develop a comprehensive behavioral model of the many factors likely to affect an individual's decision to participate in an insurance subsidy program. Instead, the data allow us to only draw inferences about the correlation between the beneficiary's financial burden and program participation for the three state programs we studied.

While these findings provide some insights into the relationship of premium levels and participation in subsidy programs for low- and moderate-income families, analysts should be cautious in applying these estimates for new programs or proposed policy changes. Unique aspects of any program, both in design and implementation, would probably lead to participation levels that differ from the estimates shown here. In addition, other factors such as behavioral responses of both employees and employers to the subsidy program could further affect participation rates.

C. DISCUSSION AND CONCLUSIONS

State policy makers continue to seek ways to provide affordable health insurance coverage to the more than 40 million Americans who remain uninsured. Some of the strategies rely on expanding the Medicaid program. Some rely on insurance reforms and purchasing initiatives. Policy makers have also proposed vouchers or tax credits for purchasing private health insurance.

In this paper we focused on one coverage strategy—state-administered subsidy programs. While at present state subsidy programs are small—a 1996 survey reported that only about one million low-income people were insured by such programs—they hold considerable promise as a way to reach more of the uninsured (Lipson et al. 1997) estimated that, among children under 11 without other health insurance, an average of about 66 percent participate in Medicaid. However, since Medicaid is essentially free to participants, it is not surprising that Medicaid participation rates are higher.
and Schrodel, 1996). Moreover, subsidy programs—particularly those targeted at children—are included among the many incremental health reforms currently being debated by state and federal policy makers.

Sliding scale subsidy programs have several appealing attributes: They can be targeted to those most in need. By charging participants a premium, it helps to finance the program, thereby lowering the public costs of broadening coverage. Premiums can also help encourage prudent buying among participants. Another attribute is that because participants pay a share of the program costs, the welfare stigma of the program may be reduced.

While premiums have many virtues, establishing a premium schedule that works is not a simple task. To design a sound and successful program, a balance among several factors—including, affordability, equity of premiums and program budget—must be struck. There is no “optimal” level of premiums; there is an inherent tension between reducing the public costs of the program by raising premiums and reducing the number of uninsured by lowering premiums. The premium levels will, in large part, be dictated by how much the government is willing to spend to subsidize the insurance of low-income persons.

While our study suggests that some low-income people are amenable to paying premiums, the data also revealed that their willingness to pay is limited. Using a hypothetical example, a family of two at 200 percent of poverty (about $21,000 per year) might have a full insurance premium of roughly 14 percent of family income. If the government subsidized half of the premium for a family at this income level, the family would still need to pay about 7 percent of its income to buy coverage. At this level, our analyses indicate that less than 10 percent of those eligible would participate.

As policy makers contemplate using subsidy programs as a way to develop affordable health insurance, they need to carefully consider how to design the premium schedule so they achieve desired program enrollment and, at the same time, stay within the program budget. Factors other than price, including the benefit package, outreach and the availability of employer coverage, will also affect participation levels. No matter how carefully designed at first, administrators of subsidized programs ought to expect that they would need to periodically revise premium schedules and other program features, based on their actual experiences, as well as changing budgetary and policy priorities.

REFERENCES


APPENDIX - ESTIMATION OF PARTICIPATION FUNCTIONS

Below, we first describe our methods for estimating the participation function, including the final pooled model. Then we discuss alternative model specifications and approaches. Finally, several caveats to our analysis are addressed.

**Methods.** Estimating the summary function among those eligible involved several steps. Counts of the number of paying participants by income category were provided by the states. We generated estimates of those eligible, defined as the number of uninsured people in each state by poverty bracket, using data from a three-year merged file of the March 1991 through 1993 Current Population Surveys (CPS). Then we calculated the ratio between participants (supplied by state) and eligibles (as estimated using the CPS). Thus, we assumed that only the uninsured are eligible to participate; persons who are privately insured or on Medicaid are assumed not eligible.

As to the CPS data, we used estimates of the nonelderly civilian uninsured in 25 percent of poverty brackets (e.g., 0 to 24.9 percent, 25 to 49.5 percent, up to 300 percent of poverty) in each state. The CPS data were edited by the Urban Institute's TRIM2 program. This three-year data set corresponds to 1990-92 insurance status (Winterbottom, et al. 1995). These data were then updated to 1994 by first using the percentage change in the number of uninsured in each bracket based on the region of country, using the 1995 CPS, edited by TRIM2. The regional adjustment was used because a single year of the CPS has high standard errors; the regional estimates are less subject to sampling error. Final adjustments to 1995 levels were made by adjusting for overall population growth in each state in 1995.

Using the participation counts provided by the states as numerators and estimates of the number of uninsured as denominators, participation rates were computed for each poverty bracket in each state. Because of the very limited sample size in any poverty bracket cell, there is sampling error in any point estimate of participation for any given state. However, the general results for each state were consistent and always seemed plausible: participation declined as price increased and participation rates did not exceed 100 percent (see Table 2).

Using the premium schedules for each state, we computed the premium that would be charged to cover two people (an adult and a child) in a two person family at the median of the income bracket. It is worth noting that in Washington state's program children under 200 percent of poverty in 1995 were eligible for Medicaid and not charged any premiums, so the two person premium essentially corresponds with that for an adult in a two person family. Based on the computed premium and the poverty guidelines, we could compute the premium as a share of family income for two people. These served as prices that could be associated with participation.

**Participation Equation.** The final equation we used to summarize our data points was:

\[
\ln[p/(1 - p)] = \beta 0 + \beta p + \xi ,
\]

where \(p\) is the participation rate in each cell, \(P\) is the premium for two people as a percent of family income, the \(\beta\)'s are the estimated coefficients and \(\xi\) is the error term. The dependent variable is the log odds of the participation rate (or probability of participation). In essence, the equation calculates a simple correlation between premium level and participation. Alternative specifications are discussed below. Using the logistic transform constrained estimates between 0 and 100 percent. While this looks like a logistic regression equation, it was employed as a grouped linear regression equation, in which we computed the log odds for each participation rate and weighted the data based on the number of participants in each cell. Each cell represents hundreds or thousands of observations, which is consistent with the grouped data provided to us by the states. To be conservative, we normalized the weights to average 1.0. A plausible argument could be made that the weights did not need to be normalized since each cell actually represents hundreds or thousands of cases. If we did not normalize the weights but left them as numbers of individuals, the coefficients would be the same, but the standard errors would be smaller by several degrees of magnitude.

The equation was run for each state and also pooled across states. For our best estimate, we decided to pool observations from Hawaii, Minnesota and Washington, excluding Tennessee. We did not include Tennessee because in the early days of TennCare—as described in the text—participation counts included tens of thousands of people who were eventually dropped from the program for nonpayment of premiums. Thus, 1995 TennCare data include people who did not actually pay premiums. Our final equation is shown in Table A-1.

**Alternative Specifications.** Given the nature of the data available to us, there were no statistical controls for benefit package, individual characteristics, employer responses and the like. Although the data are limited, we tested a number of alternative equations. One of the most important issues is the relationship of income to participation. Theory yields conflicting expectations about the impact of income on participation. One supposes that richer families should demand more insurance because they have greater assets to protect and more disposable income to buy insurance. On the other hand, since the programs are public assistance programs, they might be viewed as less desirable and richer people might participate less because of the stigma associated with a government program. In addition, it was also plausible that income and price might have interactive effects, so that there are different participation curves for different income levels. To test for these possible effects, we tried models that used the covariates as shown in Table A-2. Income was operationalized as the midpoint of the percent of poverty in each income bracket.
As seen in the table, the alternative specifications did not significantly improve model fit and we decided to feature the most parsimonious model (#1). In model #2, we added income as percent of poverty: the coefficient for income was positive, but not significant (p = .20), although premiums as a percent of income remained significant. Model #3 included an interaction term and all terms became non-significant, because of multicollinearity. In models #4 through 6 we specified premium levels in dollar terms, rather than as a percent of income. Specifying premiums in dollar terms would mean that the dollar level is all that counts, not the premium relative to income. Income improved model fit in these specifications, although the final model (#6) still had a slightly lower adjusted R² than model #1. In general, no model improved substantially over the simple model #1.

Although income is not a separate term in our simple model, income still plays an important role, since the premium is measured as a function of both the dollar price and the consumer's income. That is, the same dollar premium would be effectively less expensive to a family at 300 percent of poverty than a family at 100 percent of poverty. Faced with the same dollar premium, a consumer with more income would be more likely to buy the insurance.

Finally, we tried specifying premiums as the log of premiums as a percent of poverty. A log transform might fit if the drop off in participation was very steep initially then flattened off. Again, the model fit was not as strong, so we rejected this variant.

**Caveats.** These analyses are not the optimal way to measure the effect of premiums on participation. The best method would be to conduct an experiment by randomly assigning people of varying income levels to different premium levels and then measuring participation levels. This was not feasible. In these states, those with lower incomes also had lower premiums, although the structure of the premiums varied from state to state. Even in a non-experimental mode, a stronger study would involve consistent estimates of participation and eligibility with a sufficiently large sample in the desired income ranges in each state. Unfortunately, no such data base is available at present. The CPS recently modified procedures to ask about state-specific programs like TennCare, QUEST or BHP, but these data were not available for this analysis and would still have serious limits due to small sample sizes. Further, CPS estimates of Medicaid participation have been flawed because many people fail to recall that they participated in the program. TRIM2 compensates for this by adjusting CPS data to match administrative Medicaid targets. If survey estimates of premium program participation were adjusted to administrative targets, the net result would be conceptually similar to the procedure that we undertook in this analysis, but done at a micro-level, rather than an aggregate level.

Beyond these basic design issues, there are other important caveats. First, our model was quite simple. Other factors, including family size and composition, health status, employment status, value of the benefit package, administrative procedures, etc. would also likely influence participation (Diehr, et al. 1996 discuss a number of factors that were relevant in Washington). We do not account for such factors. To the extent that analysts want estimates that relate premium levels to participation, without regard to the other factors, our model is sufficient.

Another caveat is that the counts of participants and of eligibles derive from different data sources: administrative data for participants and CPS survey data for eligibles. Accounting of income might be different in administrative procedures, as compared to the CPS. In addition, administrative participation is measured as the number of people participating in a given month, while the CPS uninsured concept corresponds to people uninsured for the preceding year. Since the programs often required that participants meet a test of uninsurance (e.g., uninsurance for some time period), this discrepancy might not be too severe. To the extent that people with private insurance drop coverage to participate in public programs, we may underestimate the pool of those potentially eligible. However, our choice of the denominator is dictated by the programs' designs to serve the uninsured. Lastly, we divided CPS data into relatively fine cells, dividing states by poverty ranges and estimating the number of uninsured. The limited cell sizes mean that, even using three year pooled CPS data, we have small cell sizes and high standard errors. We used regression methods and pooled data from the states, in the hopes that this would smooth out errors in any given point estimate.

We fully acknowledge preliminary nature of the data and analyses provided here. However, we believe that these analyses begins to fill an information gap on the relationship between premium levels and participation rates in a subsidy program for the low-income.

**NOTES**

1. MinnesotaCare is a state-funded program, but the state now receives Medicaid federal financial participation (FFP) for children and pregnant women enrolled in MinnesotaCare. Some children in BHP are also supported by Medicaid under a Section 1902(r)(2) eligibility expansion.

2. Premium subsidies can take many forms: individual vouchers, or tax credits, and employer subsidies are just a few examples. In this study we restrict our analyses to beneficiary premiums.

3. While previous research has investigated the effects of cost sharing on the demand for health insurance, the studies have focused on privately insured individuals or the elderly (Rice and Morrison, 1994; Thomas, 1994).

4. Tennessee also used deductibles.

5. An exception occurs if the state offers a family-type premium that does not increase for additional family members beyond some base size, such as five. In these cases, relatively large families may find that premiums
comprise a smaller share of their income than families or three or four people.

6. In early 1997, the state announced plans to reopen TennCare to uninsured children of the working poor.

7. Under a 1902(r)(2) amendment, children under 200 percent of poverty enrolled in BHP are covered under Medicaid and receive the full Medicaid package. In addition, they are not charged a BHP premium. Further, pregnant women under 185 percent of poverty are enrolled in Medicaid.

8. Children under 200 percent of poverty and a few other groups are not charged premiums.

9. Hawaii is the only state that has an employer mandate, so many families who seek QUEST coverage may be partial families, such as the uninsured dependents of workers. Because of this, the actual premium burdens in Hawaii may not be as severe as described here.

10. TennCare offered low and high deductible plans for those above 200 percent of poverty. The low deductible plan had higher premiums, but lower deductibles than the other plan. Tennessee used income-graduated copayments. Between 100 and 200 percent of poverty, the copayment rate rose from 0 to 10 percent. Above 200 percent of poverty, there was a 10 percent copayment.

11. We received data from Tennessee, but decided to exclude them. This is because TennCare applicants typically did not know the price they would have to pay for insurance and a large share of them were dropped from the program for nonpayment of premiums later in 1995. Thus, the data from Tennessee do not necessarily reflect people's "willingness to pay" nor does it indicate the incomes of those who actually did pay. Data collected after the state removed the non-payers would not be appropriate since the state had stopped enrolling any more uninsured beneficiaries by then. Despite these problems, the data from Tennessee also showed that participation declines as premiums rise.

12. It is worth noting that the income ranges shown in Table 2 vary from state to state, because of differences in states premium structures and types of data provided by the states. Thus, while Table 2 makes it look as though Minnesota has far more uninsured people than Washington, the uninsured rates and population size for the two states are similar. The discrepancy is because the Minnesota data are for a different, somewhat higher, income range than the Washington data. Another peculiarity in Table 2 is that, for Washington state, between the 25-49 and 50-74 percent of poverty brackets, the premium level drops as a share of income. The reason is that Washington had a flat minimum premium level at lower income levels, which comprised a higher share of income for the poorer of the two groups. After that range it was more progressive.

13. The TRIM2 program makes a number of editing adjustments in the CPS data. A particularly important one is that it adjusts Medicaid participation levels in each state to correspond with administrative data, since Medicaid is generally under reported. This effectively reduces the number of uninsured people, compared to unadjusted estimates.

14. If we had measures of the uninsured from the period when the programs existed, we would estimate the participation rate as: participants divided by (uninsured + participants). Since our estimates of the uninsured come from an earlier time and use regional updates, it is more reasonable to estimate participation rates as participants divided by the uninsured.

15. The data provided by states did not include the number of participants in each family or family size, so we could not directly compute price for the mix of persons covered. As we discuss earlier in the paper, there are differences in the premium as a share of income for individuals and families. We chose a two person unit as a reasonable and consistent compromise between assumptions of individuals and families and between adults and children.

16. Although the CPS insurance concept is designed to describe uninsurance over the entire preceding year, Swartz (1986) has argued that because of the way people interpret the questions, it more closely corresponds with current uninsurance.

---

**TABLES AND CHARTS**
Fig. 1 Premium Structure Types

a. Straight Line Premium Schedule

- Full Cost of Premium
- Amount Paid by Beneficiary

b. Kinked Line Premium Schedule

- Progressive in this Range
- Subsidies end in this range, so premium is constant

Fig. 1 Premium Structure Types (Cont'd.)

c. Stairstep Premium Schedule
Fig. 2. Use of Equal Percentage Subsidies for Families and Individuals

A Family of Four Would Pay a Higher Share of Its Income Than an Equally Poor Individual

<table>
<thead>
<tr>
<th>% of Poverty</th>
<th>Premium Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%</td>
<td>5%</td>
</tr>
<tr>
<td>100%</td>
<td>20%</td>
</tr>
<tr>
<td>150%</td>
<td>50%</td>
</tr>
<tr>
<td>200%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Fig. 3 Monthly Premiums by Poverty Level, 1995

a. Individual

- Hawaii
- Washington
- Minnesota
- Tennessee

b. Family of Four

- Hawaii
- Washington
- Minnesota
- Tennessee

Premium ($/mo) vs. Percent of Poverty
Fig. 4 Premiums as a Share of Income, 1995

a. Individual

b. Family of Four

Note: The lines do not go 0 percent of poverty because of problems in dividing by zero.
Fig. 5 Estimated Participation Function, Based on Three States, 1995

Table 1. Premium Levels for Participants in Hawaii, Tennessee, Minnesota and Washington

<table>
<thead>
<tr>
<th>Income as Percent of Poverty</th>
<th>Hawaii QUEST - Early 1995*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td>Payment per Month</td>
</tr>
<tr>
<td>0%</td>
<td>$0</td>
</tr>
<tr>
<td>50%</td>
<td>$0</td>
</tr>
<tr>
<td>100%</td>
<td>$13</td>
</tr>
<tr>
<td>150%</td>
<td>$38</td>
</tr>
<tr>
<td>200%</td>
<td>$113</td>
</tr>
<tr>
<td>250%</td>
<td>$188</td>
</tr>
</tbody>
</table>

* No cost-sharing at or below 133% of poverty or for pregnant women and children under 105% of poverty.

** Assumes a premium of $188 per person, single or family. Every additional person is added at the rate of a single person, up to a family size of 5. The premium shares are based on the percentage of poverty, but the actual costs vary with the island and the plan selected by the client. Includes medical and dental costs.
Table 2. Premium Levels, Number of Uninsured and Estimated Participation Rates in Hawaii, Minnesota and Washington, 1995.

<table>
<thead>
<tr>
<th>Income Range as % of Poverty</th>
<th>Median Premium for Two as % of Income</th>
<th>Estimated Number of Uninsured* (in 1000s)</th>
<th>Estimated Participation as % of Uninsured**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hawaii QUEST - Early 1995</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>133-149%</td>
<td>1.4%</td>
<td>4.6</td>
<td>42.0%</td>
</tr>
<tr>
<td>150-174%</td>
<td>2.4%</td>
<td>4.7</td>
<td>46.9%</td>
</tr>
<tr>
<td>175-199%</td>
<td>3.5%</td>
<td>3.0</td>
<td>45.3%</td>
</tr>
<tr>
<td>200-224%</td>
<td>5.3%</td>
<td>2.6</td>
<td>32.7%</td>
</tr>
<tr>
<td>225-249%</td>
<td>6.9%</td>
<td>3.4</td>
<td>10.5%</td>
</tr>
<tr>
<td>250-274%</td>
<td>11.9%</td>
<td>1.4</td>
<td>10.4%</td>
</tr>
<tr>
<td>275-300%</td>
<td>13.6%</td>
<td>2.1</td>
<td>2.8%</td>
</tr>
<tr>
<td><strong>MinnesotaCare - Late 1995</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100-124%</td>
<td>2.3%</td>
<td>42.5</td>
<td>44.8%</td>
</tr>
<tr>
<td>125-149%</td>
<td>3.1%</td>
<td>35.9</td>
<td>54.7%</td>
</tr>
<tr>
<td>150-174%</td>
<td>3.8%</td>
<td>43.4</td>
<td>28.6%</td>
</tr>
<tr>
<td>175-199%</td>
<td>4.8%</td>
<td>35.7</td>
<td>21.2%</td>
</tr>
<tr>
<td>200-224%</td>
<td>5.9%</td>
<td>42.5</td>
<td>7.8%</td>
</tr>
<tr>
<td>225-249%</td>
<td>7.4%</td>
<td>27.8</td>
<td>5.1%</td>
</tr>
<tr>
<td>250-275%</td>
<td>8.8%</td>
<td>14.3</td>
<td>2.9%</td>
</tr>
<tr>
<td><strong>Washington BHP - Late 1995</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-49%</td>
<td>3.2%</td>
<td>11.6</td>
<td>31.9%</td>
</tr>
<tr>
<td>50-74%</td>
<td>1.9%</td>
<td>32.4</td>
<td>21.4%</td>
</tr>
<tr>
<td>75-99%</td>
<td>3.1%</td>
<td>26.7</td>
<td>33.3%</td>
</tr>
<tr>
<td>100-124%</td>
<td>3.0%</td>
<td>36.9</td>
<td>23.6%</td>
</tr>
<tr>
<td>125-149%</td>
<td>3.7%</td>
<td>27.6</td>
<td>23.8%</td>
</tr>
<tr>
<td>150-174%</td>
<td>4.4%</td>
<td>41.0</td>
<td>11.3%</td>
</tr>
<tr>
<td>174-200%</td>
<td>5.1%</td>
<td>46.8</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

* Based on data from the Current Population Survey (CPS, see Appendix)
** Based on state data and CPS estimates (see Appendix)
Table A-1. Estimated Regression Model, Based on Data from Hawaii, Minnesota and Washington, 1995

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Err.</th>
<th>t</th>
<th>Signif.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium as a Percent of Income</td>
<td>-0.4555</td>
<td>0.0112</td>
<td>-4.056</td>
<td>0.0007</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.7239</td>
<td>0.401</td>
<td>1.803</td>
<td>0.0872</td>
</tr>
<tr>
<td>Adjusted R squared</td>
<td>0.436</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model F</td>
<td>16.45</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 21

Weighted based on participation, normalized so that each cell has an average weight of 1.00

Dependent Variable: \( \ln[p/(1 - p)] \)
where \( p \) = Probability of Participation Among the Uninsured
Table A-2. Alternative Models of Relation of Premiums and Participation in Hawaii, Minnesota and Washington, 1995

<table>
<thead>
<tr>
<th>Using Premiums as % of Income</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.7239</td>
<td>0.4633</td>
<td>-0.3678</td>
</tr>
<tr>
<td>Premiums as % of Income</td>
<td>-0.4555</td>
<td>-0.6353</td>
<td>-0.3343</td>
</tr>
<tr>
<td>Income as % of Poverty</td>
<td>0.0065</td>
<td>0.0106</td>
<td>-0.0015</td>
</tr>
<tr>
<td>Interaction Premium &amp; Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.436</td>
<td>0.458</td>
<td>0.442</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Using Premiums in $ per Month</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-0.1444</td>
<td>-1.0356</td>
<td>-0.6301</td>
</tr>
<tr>
<td>Premiums in $</td>
<td>-0.0161</td>
<td>-0.0294</td>
<td>-0.1002</td>
</tr>
<tr>
<td>Income as % of Poverty</td>
<td>0.0108</td>
<td>1.612</td>
<td>0.0192</td>
</tr>
<tr>
<td>Interaction Premium &amp; Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.333</td>
<td>0.384</td>
<td>0.425</td>
</tr>
</tbody>
</table>

Other Publications by the Authors
- Leighton Ku
- Teresa A. Coughlin

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