Valuing Protection against Health-Related Financial Risks

Dean Jamison and Jonathan Skinner

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Dean Jamison
UCSF
djamison@uw.edu

Jonathan Skinner
Dartmouth
jon.skinner@dartmouth.edu

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Abstract

There is interest in both developing and developed countries towards expanding health insurance coverage to improve the distribution of health outcomes in a population and to reduce the financial risk facing vulnerable populations. Yet conventional economic evaluation of health interventions and policies have focused (almost) exclusively on measuring health outcomes, with less attention to net benefits arising from the reduction of financial risk. Some studies suggest that accounting for the reduction in financial risk of health insurance yields large benefits, while others find that enrollees benefit by less than 50 cents per dollar of additional coverage. In this paper, we use approaches from the finance and economics literatures to provide a framework for evaluating the overall value of health insurance by focusing on 3 dimensions of insurance's net social benefit: It pools the risk of unexpected medical expenditures between healthy and sick households, facilitates the smoothing of consumption over time, and can (but does not always) facilitate the redistribution of income from high to low income recipients. We argue that the benefit of health insurance coverage can be still be substantial, depending both on what are the options for uncompensated care prior to the health insurance expansion, and the design of the new insurance plan.

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Introduction

In developing and developed countries alike, there is a wide belief that health insurance has tremendous value, a belief that underscores the World Bank's goal of universal health insurance across all countries by 2030.[1] In valuing the benefits of health insurance, most analyses, not surprisingly, focus primarily on the resulting benefits in health. Yet increasingly, researchers are beginning to understand that the burden of disease includes major shocks to the financial well-being of the household, both because of lost earning capacity, and out of pocket health care expenditures (Gertler and Gruber, 2002; Flores and O'Donnell, 2016; van Doorlsaer et al., 2010, 2013; Wagstaff, 2010; Wagstaff and van Doorslaer, 2003). The financial benefits of health insurance have been recognized for many years; indeed, when President Lyndon Johnson in the U.S. enacted the Medicare program to cover the elderly, in 1965, he declared "No longer will illness crush and destroy the savings that [older Americans] have so carefully put away over a lifetime so that they might enjoy dignity in their later years." (Baicker and Levy, 2012).

Despite the general recognition that health insurance is valuable for more than "buying health" (as in Nyman, 1999), valuing the financial benefits of health insurance have proven to be challenging. Most earlier studies found large benefits associated with the introduction of health insurance. For example, Verguet et al. (2014), using an "extended cost effectiveness analysis" (ECEA) framework, estimated the value of a universal public insurance program for tuberculosis treatment, and found substantial benefits, particularly to the lowest quintile of the income distribution, arising from both risk pooling and transfers. McClellan and Skinner (2006) used a simple model of insurance risk to estimate that the financial benefits of Medicare were as much as 88 cents per dollar of insurance coverage. In this view, health insurance should be viewed in

[1] http://www.worldbank.org/en/topic/universalhealthcoverage

an even more favorable light as a key mechanism for both reducing uncertainty among low-income recipients, and reducing the shock of serious illness (as in Gertler and Gruber, 2002). The Figure illustrates the consequences of high levels of out-of-pocket payments and lack of insurance, and points to the pathways leading to these adverse outcomes.[2]

A newer set of studies, however, has cast doubt on favorable conclusions of the earlier studies. In Finkelstein et al. (2016), the authors used data from the U.S. Oregon Medicaid randomized expansion program to measure the value to recipients of receiving Medicaid coverage (e.g., Finkelstein et al., 2012). Using two approaches to valuing Medicaid for lower-income recipients, they found benefits to recipients of just 40 to 60 cents per dollar of increased government spending, suggesting that the government transfers might have been better used through conventional income transfer programs such as the Earned Income Tax Credit. In a completely different setting, Finkelstein et al. (2017) used discontinuities in the Massachusetts insurance exchange to estimate the value of coverage to those without insurance; again they found estimates substantially less than $1 in value per dollar of spending. Intuitively, these studies argue that the primary beneficiaries were health care providers, who had previously provided uncompensated care, but who now were being reimbursed through the Medicaid program.

In this paper, we attempt to reconcile these disparate findings by focusing on precisely why health insurance provides value to individuals and society more generally. We use an intertemporal model of consumption and health to consider three general categories of benefits arising from health insurance. First, as is well understood, it pools the risk of unexpected medical expenditures between healthy and sick households. Second, it facilitates the smoothing

[2] Of course, these benefits are also associated with potential costs of providing insurance, which are addressed below.

of consumption over time; health shocks often come towards the end of life, and so paying early-on through payroll contributions, for example, help to lessen the shock of having to scale back on consumption later in life if health costs are unexpectedly high. Finally, it can (but may not always) facilitate the redistribution of income from high to low income recipients, and by doing so can make previously unattainable health care affordable (Nyman, 1999, 2003).[3]

We develop a simple two-period model that illustrates these different effects, and describe how circumstances in both the design of the proposed insurance policy, and characteristics of the existing health care system, can affect estimates of how much health insurance is valued by recipients, and by society as a whole. One way to characterize the overall effects of insurance expansion is: It's complicated. This argues in favor, therefore, of a benefit-cost approach (as in Robinson and Hammitt, 2017), as well as a better understanding of health systems financing and how changes in their reimbursement rates affect treatment patterns and quality across all their patients.

In the next section, we outline our model of health insurance benefits; we then use it to attempt to reconcile very different results in the literature. We then consider policy implications, and conclude in the final section.

The Model

We begin with a simple two-period model based on McClellan and Skinner (2006), in which individuals consume non-medical goods in both periods, but are subject to poor health in the second, and thus must divide resources in the second period between out-of-pocket medical spending and non-medical consumption. Given the intrinsic uncertainty about future health, we

[3] For example, Nyman (1999) demonstrates that health insurance can provide access to "frontier" health care technology (see Chandra and Skinner, 2012).

characterize expected utility for individual or household j, W_j, as being the expected value of lifetime utility:

$$(1) \qquad W_j = E\left\{U(C_{1j}) + \frac{1}{1+\delta}\left[\pi_b(H_{b2j})V(C_{2j}, H_{b2j}) + \pi_g(H_{g2j})V(C_{2j}, H_{g2j})\right]\right\}$$

where δ is the time preference rate, π_b is the probability of bad health, π_g the probability of good health (and each depend potentially on the extent of health care spending in those states of the world), and $\pi_g + \pi_b < 1$, reflecting the risk of death during period 2. The variable H_{ij} represents resources devoted to health care for individual j; these in turn comprise out-of-pocket expenses, insurance payments (including government transfers), and what we will call "uncompensated care" Γ, a term to be defined in more detail below. Assuming a constant copayment rate for health care φ that can range between 0 and 1, the budget constraint is rearranged to express C_{i2} (i = g,b) as

$$(2a) \qquad C_{g2j} = [Y_{1j} - C_{1j} - P_1(Y_{1j})](1+r) + Y_{2j} - P_2(Y_{2j}) - (1-\varphi)[H_{g2j} - \Gamma_g(Y_{2j})]$$

$$(2b) \qquad C_{b2j} = [Y_{1j} - C_{1j} - P_1(Y_{1j})](1+r) + Y_{2j} - P_2(Y_{2j}) - (1-\varphi)[H_{b2j} - \Gamma_b(Y_{2j})]$$

$$(2c) \qquad \sum_j [P_1(Y_{1j})(1+r) + P_2(Y_{2j}) - \varphi(\pi_b H_{b2j} + \pi_g H_{g2j})] = 0$$

The first two budget constraints express second-period consumption as a function of whether the individual ends up in a good or bad state of the world. The value of insurance beyond its effect on health (through H_2) is to raise the level of C_1 and most importantly, C_{2b} as well as C_{2g}. In this simple framework, individuals pay into an insurance program in both periods, P(Y), where the amount one pays (e.g., through a payroll tax) may depend on current income. In return, the government provides insurance, measured by φ, that guards against health costs. Insurance may also lead individuals to avoid suboptimal levels of care by, for example, encouraging prevention or early treatment. For high levels of φ, however, there will also exist the problem of moral

hazard; that is, there will be too much health care consumed beyond that which might be otherwise optimal. The third budget constraint (2c) ensures that the premiums raised through taxes or other sources pay for the health care provided.

Uncompensated care is provided by the health system either for free or at with a large discount, and is shown by Γ, which in turn depends on the severity of the disease, and one's income level. For the moment, assume that Γ is zero in all cases, and that health care spending in either the good or bad state is insensitive to the insurance payment rate φ. Then the intertemporal first-order conditions can be written (suppressing the jth index for the moment) as

$$U'(C_1) = \frac{1+r}{1+\delta}\left\{\pi_b U'(C_{b2}) + \pi_g U'(C_{g2})\right\} \tag{3}$$

This will hold whether there is insurance or not—the greater the risk of future health expenditures, the lower will be the resulting C_{b2}, and the more will be the compensating savings, effected by lowering C_1, as a result.

In a world of perfect insurance where φ = 1 (full coverage) and insurance is both purchased, and used, only in Period 2 (so $P_1 = 0$), then, as is well understood, there will be complete risk-pooling, so that

$$U'(C_{b2}) = U'(C_{g2}) = U'(C_1)\left[\frac{(1+\delta)(\pi_b + \pi_g)}{1+r}\right] \tag{4}$$

Equation (4) illustrates the sense in which there is risk-pooling; that there is no further way to transfer consumption resources between the good and bad state to improve the individual's utility.[4] Thus when the marginal utilities are equal, overall utility may still differ (no one likes to

[4] Nor does this mean consumption in the two states will always be equal. If there is state-dependent utility in which the marginal utility of consumption rises or falls with health (e.g., Finkelstein et al., 2016), consumption may rise or fall in the bad state of the world. In this simple two-period model, consumption will generally be equal in period 2 because it's the last period and there is no bequest motive.

be sick), but there is no further gain to transferring financial resources across states. Indeed, one may want to stop short of full insurance coverage to reduce the potential for moral hazard by subsidizing health care utilization.

Equation (4) also illustrates the potential value arising from intertemporal consumption smoothing. In the world without insurance, described by Equation (3), when the good or bad health state is only revealed in the second period, individual either save too little (in the case of bad health) or too much (in the case of good health); given the risk-pooling in period 2, in the absence of other sources of uncertainty such as income variability, the first-order conditions over time are satisfied; precautionary saving against the future contingency is no longer required. Paying some of the insurance spending up front, where $P_1 > 0$, also helps to smooth consumption by providing an annuity rate-of-return (as in public health insurance's availability regardless of lifespan), as well as guarding against inadequate saving for future health payments because of hyperbolic discounting (e.g., Laibson, 1997).

The third aspect of health insurance is its redistributive component. In this case, we consider two individuals with high (j = h) and low (j = l) income, and with $P_t(Y_t)$ premiums that reflect their different income status. If we were to consider a simple social welfare function $\Theta(W_h, W_l)$ where $\Theta' > 0 \, and \, \Theta'' < 0$, then the social benefit of a publicly provided insurance plan becomes larger given that, in general, low-income people face more risk from uninsured health care costs, and so the benefits of health insurance for this group weighs even larger in a social welfare setting (e.g., McClellan and Skinner, 2006). For all of these reasons, it is therefore the case that we might expect to see more than 1 dollar in benefits occurring for every one dollar in health insurance spending.

However, there are two additional factors that complicate benefit-cost evaluations of health insurance. The first is moral hazard, of course, that because health care services are subsidized, they will consume beyond the point of social optimality. When there is a social welfare function of the type specified above, or even commodity egalitarianism that favors health care, we may want to subsidize health care for the poor, but probably not so much for the rich. Even taking account of these moral hazard effects, however, McClellan and Skinner (2006) found large benefits of as much as $1.88 per one dollar of Medicare expansion.[5]

To this point, we have assumed that there is no uncompensated care; $\Gamma_k = 0$. It is therefore not surprising that health insurance coverage should be of great value. But what if there is an informal system of uncompensated care that the expanded insurance coverage then replaces, so that $\Gamma_k > 0$. Focusing for the moment on the individual in poor health and a lower income, where uncompensated care will matter the most, we can take a first-order approximation of Equation (2b) characterizing the impact on lifetime consumption (accumulated to the second period) of a replacement of uncompensated care without any insurance ($\varphi = 0,\ \Gamma_b > 0$) to a system in which health insurance replaces uncompensated care ($\varphi > 0,\ \Gamma_b = 0$):

$$\Delta C_j \equiv \left\{\Delta C_{1j}(1+r) + \Delta C_{b2j}\right\} = \left[\varphi(H_{b2j} - \Gamma_{bj}) - (\Delta P_{1j}(1+r) + \Delta P_{2j})\right] - (1-\varphi)\Delta H_{b2j} \tag{5}$$

This equation shows that the overall accumulated change in consumption on the left-hand side is equal to first the reduction in health spending (in excess of the uncompensated care) caused by the step-up in insurance coverage, minus any additional taxes or fees now assessed on group j for the additional care, minus any increased utilization of health care.

[5] As well, Finkelstein et al. (2016) suggested that moral hazard played only a small part in their low valuation of health care benefits.

Some sense for the magnitude of these changes can be found in the Oregon Medicaid study; individuals without health insurance spent an average of about \$570 out-of-pocket $(H_{b2j} - \Gamma_{bj})$ while receiving \$2,700 in overall health care ((H_{b2j}) ; thus \$2,130 was uncompensated care (Γ_{bj}) (Finkelstein et al., 2016; p. 19). Moving to Medicaid coverage was estimated to have increased health spending to \$3,600 ($\Delta H_{2b} = \$900$) and we assume that $\varphi = 1$ under Medicaid. Thus the change in non-medical consumption ends up being, in this case, simply the reduction in out-of-pocket spending, or \$570.

In a benefit-cost framework, we can express the net social benefit for this poor-health group j as:[6]

$$\textit{Net Social Benefit}_j = \left\{\Theta_{bhj}\Delta H_{2j} + \Theta_{bcj}\Delta C_j\right\} - \{\varphi(H_{2j} + \Delta H_j)\} \quad (6)$$

where Θ_{bhj} is the marginal value of the incremental health utilization, and Θ_{bcj} is the social , Even if $\Theta_{bhj} = 2.0$ (so every dollar of health spending improves social welfare by \$2), and Θ_{bcj} = 1.50 (so every dollar of non-medical consumption consumed by this group in the bad state of health is worth \$1.50 to society), we would still find a net social benefit of this expansion for this group to be -\$945 (equal to \$855 + \$1800 - \$3600), or a net social loss (see also Finkelstein et al., 2016, 2017 for similar calculations); presumably the benefits would be far less for higher income households who are likely subsidizing the new health insurance benefits.[7] Including the distortional social costs of higher taxes would tilt the benefit-cost analysis further into negative territory (e.g., Shepard et al., 2017).

[6] This can be expressed for other groups in a straightforward way.

[7] The exception would be lower middle-class households who are less likely to receive uncompensated care; see Hermann et al. (2012).

To this point, we have not attempted to trace out the social value arising from the influx of health insurance revenue now covering the $2,130 in formerly uncompensated benefits. The key question is: who benefits from this reduction in uncompensated care? Put differently, expanding coverage requires a change in the function P(Y), and if health insurance benefits households who formerly cared for their family member, but where they can now afford formal health care, then P(Y) for lower incomes shifts in; if conversely the benefits accrue to those who formerly implicitly paid more through (e.g.) private health payments or taxes to provide otherwise uncompensated care, then they should be the primary beneficiaries.

We don't have a definitive answer to this question, although Hadley et al. (2008) argued that the costs of most U.S. uncompensated benefits were born by the government, in part through subsidies to hospitals serving low-income individuals. More recent evidence from the U.S. is provided in a recent study by Cooper et al. (2017), who describe the outcomes associated with the unexpected and largely exogenous increase in Medicare reimbursements for some, but not all hospitals in a region. They found no evidence of the windfall resulting in lower commercial rates, nor did they detect an improvement in quality of care as measured by risk-adjusted survival rates after major medical events. They did, however, measure an increase in payroll, and most notably an increase of 80% in CEO salaries. While this was an experiment related to Medicare, and not Medicaid, and limited to the U.S., the results suggest that the reduction in uncompensated care either is distributed across the income distribution (to employees in the health care sector), or could potentially be dissipated by inefficient use of health care resources.

In developing countries, there is even less information regarding uncompensated care. Given the greater prevalence of government-supported clinics, there is likely to be far less uncompensated care that arises from (e.g.) transfers from private payments to provide services

for the indigent. Yet similar effects as detailed in Cooper et al. (2017) are likely; a bolus of new revenue is likely to be reflected in a larger workforce, more services, and perhaps higher wages. Thus the benefit-cost analysis, or extended cost-effectiveness analysis, must, by necessity, delve into these sometimes complicated questions that range from measuring uncompensated care in developing economies, to the impact of higher physician and nursing pay on quality and work hours.

Policy Implications

What are the lessons for the implementation of universal health insurance? First, as has been well understood since President Johnson in 1965, health insurance does not only improve health, but also reduces financial risk, and any benefit-cost analysis should reflect such benefits. Indeed, the financial benefits of health insurance are often easier to measure than any short-term benefits (King et al., 2009; Finkelstein and McKnight, 2008; Finkelstein et al., 2012). But as this theoretical model emphasizes, in benefit-cost or CEA analysis, tracing out the benefits of health insurance is not simple, as it has potentially wide-ranging effects on both prices and quantities in the health care sector. For example, a commonly used first approximation to the incremental value of health insurance coverage is summarized by the gap between the marginal utility of household consumption in the healthy state versus the marginal utility in the bad or unhealthy state of the world as in Equation (3), converted into a money-equivalent measure (e.g., Chetty and Looney, 2006; Chetty, 2009; also see Gertler and Gruber, 2002).

Yet how do we value transfers if in fact they in part benefit providers? In developing economies, there are often good reasons to funnel more public resources towards the health care sector, leading to higher wages and presumably better (or more) services. Higher wages may not be valued as much for already highly compensated specialists, for example, but – depending on

the tax structure used to finance insurance – could improve the distribution of income if enough lower-paid health workers gain some of the benefits.

A third concern is how to value health insurance from the perspective of the beneficiaries. Revealed preference arising from discontinuous jumps in premium prices for example suggests that lower income individuals may value insurance at only a fraction of the cost (Finkelstein et al., 2017). This could reflect the prevalence of uncompensated care, as above, but it could also reflect systematic biases towards spending money now on non-medical goods versus some future benefit that may or may not accrue. In this case, the possibility of present-bias and other behavioral factors should be considered; at the same time, the design of health insurance plans should account for, and perhaps even harness human biases (Skinner and Volpp, 2017).

Finally, the benefits of health insurance depend critically on what type of coverage is being expanded. Insuring against low-risk but catastrophic outcomes, especially those that strike people in lower income groups, can easily be justified by their impact on risk-pooling. A different example is to guarantee coverage for at least one medical visit per year for elderly people. In this case, its impact on risk-pooling is minimal; it's a common and inexpensive utilization measure. Any financial benefits of this type of primary care coverage would have to be gained either from genuine improvements in health status, or because of consumption smoothing -- for example when elderly people have run through their assets, not expecting to live so long – or because of a desire for transferring income to low-income individuals.

A more difficult case is one that will increasingly be addressed in developing countries, which is insurance against chronic illness. In this case, the benefits – insuring against the

increasing risk of requiring long-term care as families become more fragmented, insuring against its high and persistent cost, and providing an annuity for assistance most likely used later in life – are considerable. But with higher-income people living longer, the potential for even regressive income distributional consequences are always present, as are moral hazard and efficiency costs inherent in funding such a benefit. Perhaps for this reason, long-term care insurance is contentious even in quite wealthy countries, for example in the Netherlands where spending on long-term care has grown to over 4% of GDP.[8]

Conclusions

There is considerable interest in expanding the use of health insurance to cover increasingly large fractions of the world's populations. Yet there is considerable confusion about how best to measure the value (and perhaps even the costs) of such expansions. In this paper, we have focused on how best to value the financial benefits, in terms of pooling risk, intertemporal consumption smoothing, and income transfers, of any health insurance program.

Perhaps not surprisingly, we find that measuring insurance benefits are complicated, but critical to judging the value of greater insurance protection. As a larger share of government budgets are devoted to providing national insurance coverage, the use of randomized trials and other types of studies will be increasingly important to ensure that the expansions deliver sufficient value given their large costs. At the same time, as health insurance programs deliver benefits as well to providers, understanding how greater public funding of the health care system affects its ability to provide high-quality services becomes even more important.

[8] http://www.oecd.org/els/health-systems/long-term-care.htm

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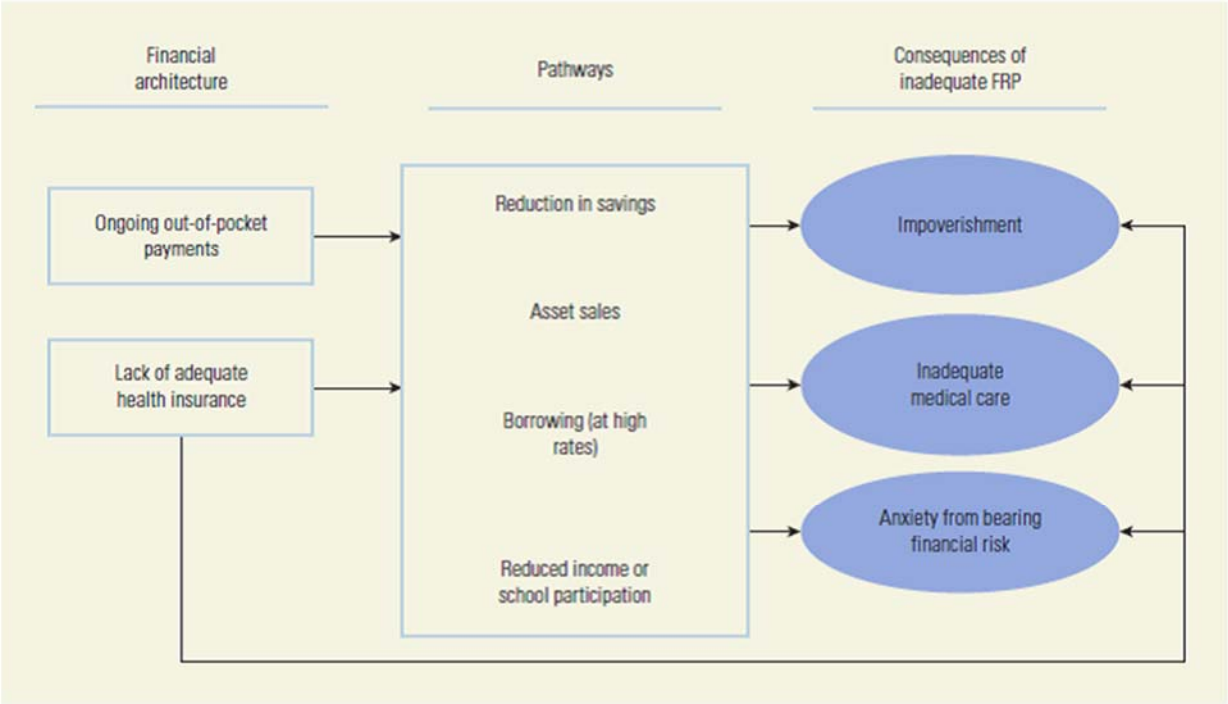

Note: FRP = financial risk protection.

Figure 1: Financial risk protection aspects of health insurance. Source: