Chapter 3. Results

For the literature review on economic incentives for providers, 26 articles were retained for full text review and 19 articles passed the inclusion criteria. All 19 articles were published after 1990. Fourteen of the articles were published since 1995.

The articles were categorized into three classes based on the nature of the economic incentive and study design. The first class includes those nine articles that directly address the impact of targeted economic incentives on provider behavior and represent the main body of articles for the structured review. These articles were subjected to an analysis of the comparability of the nature of the interventions, operational definitions, populations under study, and patterns of outcomes.

The second class includes relevant observational studies that inform the literature on incentives for prevention. The articles that were not included in the formal structural review are discussed in some detail.

The third class includes Medicare and Medicaid demonstration projects. The demonstration projects generally randomized patients to differing levels of covered preventive care benefits and created comparison groups between providers through differing compensation packages. Creating a separate classification for these studies allows us to avoid redundancy of articles between the provider and consumer economic incentives while recognizing the complexity of the interventions.

For the literature review on consumers, 84 articles were retained for full review, with 47 articles passing the inclusion criteria for use in the structured literature review. The consumer research covers a much longer period of time, including articles published from the early 1980s.

Simple vs. Complex Prevention

As discussed earlier, definitions for simple or complex preventive concerns rest on the behavior required of the consumer, not the specific preventive health target. Simple preventive concerns are those situations that involve discrete actions where the specific targeted behavior has an endpoint. Complex preventive concerns are those situations where the consumer's actions must be sustained over time. For example, while smoking cessation is generally conceived as requiring complex lifestyle changes, interventions using economic incentives to increase recruitment to, or decrease attrition from, smoking cessation programs are classified as simple preventive concerns for the purposes of this review. In this case, the behavior in question is attending a program of limited duration, rather than smoking cessation itself .

All studies for provider incentives addressed simple preventive care: six articles examined immunizations, two looked at cancer screening, one looked at prenatal care, one looked at well-child visits, and one examined cholesterol screening. (Numbers do not add to nine as two studies used more than one preventive care measure as an outcome.) Evidence Table 1 in Appendix F provides a list of the included provider studies.

A greater range in preventive concerns was addressed in the consumer literature. Twenty-four articles addressed simple preventive care: seven on immunization, two on cancer screening, two on prenatal care, three on attendance to educational sessions for STD/HIV prevention, one on recruitment for a smoking cessation program, and nine on preventive care followup; cholesterol and tuberculosis screening, cancer screening, and postpartum exams. Twenty-three articles addressed complex preventive care concerns: ten on smoking cessation, two on exercise,

seven on obesity and weight loss, and one each on breastfeeding, nutrition, CVD prevention, and cholesterol management. Evidence Tables 2 and 3 in Appendix F provide a list of the included consumer studies.

Key Question 1. How have "preventive care" and "economic incentive" been defined in the literature?

Provider. In general, definitions for neither term are specifically addressed in the literature.

All studies approached preventive care from the perspective of the study's targeted preventive care service. Both Fairbrother, Hanson, Friedman et al. and Fairbrother, Siegal, Friedman et al. explicitly based the operational definition of the immunization outcome on expert panel guidelines.[43, 44] Studies by Hillman, Ripley, Goldfarb et al. and Morrow, Gooding, and Clark referenced expert panel guidelines as justification for the chosen outcomes. [45-47] No study provided a conceptual discussion of prevention or the study's outcome measures with regard to the simplicity or complexity of the preventive processes under examination.

While intending to examine the effects of incentive interventions on preventive behavior changes, most studies used operational definitions of prevention that relied on measuring change by recorded activity rather than actual observed behavior changes. Recorded activity allowed for preventive services obtained from other sources as well as from the provider subject to the economic incentive. Thus, apparent increases in preventive services may have reflected improvement in chart documentation procedures rather than actual increases in inoculations. Only Fairbrother, Hanson, Friedman et al. and Fairbrother, Siegal, Friedman et al., included a bonus targeted at increasing inoculations given by a provider, or the provider's staff, as one intervention arm under investigation, and Grady, Lemkau, Lee et al. included a behavioral outcome of mammography referrals.[43, 44, 48]

No study based the outcome measure on evidence from the literature, nor discussed whether any relevant evidence literature was available to benchmark the preventive behavior of the provider participating in the study. Thus, it is not surprising no study reported examining providers' pre-test performance to verify the level of preventive care provided according to criteria for appropriate levels of preventive care as established by empirical evidence of expert panels. Without this examination, we are unable to assess the potential for ceiling effects.

Only Grady, Lemkau, Lee et al. included a conceptual discussion of economic incentives from the behavioral psychology theoretical perspective.[48] No report provided a definition or discussion of financial incentives as a map to locate the chosen intervention design for the study on such attributes as size, eligibility (threshold levels, individual performance, tournament style), or form (fixed or continuous payments).

Consumer. No study provided a conceptual discussion of prevention or health promotion for the study's outcome measures with regard to the simplicity or complexity of the preventive measures being examined. It appears consumer research is generally motivated by policy considerations such as responding to the federal Healthy People initiatives or achieving recommendations of national expert panels.

As seen in Evidence Table 2 in Appendix F, only seven of the 24 simple preventive care and 14 of the 23 complex studies mentioned a theoretical basis for economic incentives in their reporting, with little explicit connection between the theory and the design of the incentive. It appears the incentives themselves are also generally left unexamined, an issue we will explore in greater detail in the discussion on the nature of the interventions. At this point we simply note the

lack of a clear and commonly shared conceptual map, or set of maps, for what an incentive is, its intended purpose, and how it is hypothesized to impact the consumer.

As was discussed in the Methods chapter, given the lack of consensus and implied, rather than specifically reported, concepts and assumptions underlying the research, we created categorization schemes based on the themes which emerged from the analysis. These categorization schemes were used to assist in answering Key Questions 2-4.

Key Question 2. Do incentives work?

To answer this question, we first discuss observed study design issues, that is, who was being studied, both the intervention target and the patients involved, what was the nature of the interventions applied, and how was effectiveness measured. We then turn to what can and cannot be said, based on the patterns of outcomes.

Populations under study.

Provider.

Provider populations: Among incentives aimed at providers, all incentives were targeted to physicians (Evidence Table 4 in Appendix F), but it was not always clear from the reports whether the financial incentives were paid to the physician or the practice. No published studies targeted incentives to nursing personnel or other physician aides, although physicians could delegate many of the related tasks. The physicians have been located in northeastern section of the United States – Philadelphia,[45-47] New York,[43, 44, 47, 49] Maryland,[50] Connecticut, Delaware, New Hampshire, New Jersey, Pennsylvania,[47] Massachusetts,[47, 48] and Ohio,[48] or the UK[51]

Incented physicians included family practitioners,[43-46, 48] general practitioners,[46, 48, 51] internal medicine,[45, 48] or pediatricians.[43, 44, 46] Fox and Phau examined providers of obstetric services.[50] Morrow, Gooding, Clark and Kouides, Bennett, Lewis et al. cited otherwise unspecified primary care providers.[47, 49]

Further, the practice setting itself was often not clearly reported. With the exception of Fox and Phau, it appeared that all of the studies took place in non-academic solo and group practices.[50] However, "group" was frequently left undefined. Kouides, Bennett, Lewis et al. and Grady, Lemkau, Lee et al. provided statistics for group practice sizes, with the majority of group practices consisting of less than five physicians.[48, 49] Morrow, Gooding, and Clark did not provide evidence but suggested that most participating practices are solo or two-physician practices.[47] Those studies not reporting solo or group practice participation examined physicians providing Medicaid care, who often work in solo and small offices. Thus, we might speculate on the possibility that studies have directed target payments to individual physicians through solo and small group practices.

Patient populations: Incented physicians tended to emphasize vulnerable patient populations. Urban, Medicaid-eligible children accounted for three of the four US studies involving childhood immunization.[43, 44, 46] Medicaid-eligible women accounted for two of the nine studies.[45, 50] The remaining two US studies were with a general HMO population[47] and women over age 50 from Dayton, Massachusetts.

Consumer. Patient populations are given in Evidence Table 5 in Appendix F. Populations tended to fall into two broad categories that correlated with the simple/complex classification. Vulnerable populations of low SES, the first category, were the most frequent populations studied for simple preventive care, such as immunizations and cancer screening and followup. This constituted 16 of the 24 simple preventive studies but only four of the 23 complex studies. These populations included active drug users,[52-54] teen mothers,[55, 56] low-income children with mothers on WIC or AFDC,[57, 58] and patients of public clinics and safety-net hospitals.[59-63] These populations were also generally considered at high risk for the study's targeted health concern. Worksite employees and general population, generally healthy, middle-class populations for the second category, were most frequently the recruitment base for studies that promoted complex health promotion lifestyle changes.

Very few reports outlined a clear link between the design of the economic incentive and the specific population intended to receive the incentive. The study investigators may have put considerable effort into the design phase of the study, or have been very familiar with the study populations, but this does not come through in the reporting. The information that could be derived from complete reporting of the design process would be beneficial to future researchers.

Nature of the intervention.

Provider. In general, studies did not include justification for the specific design of the economic incentive.

Types of incentives: As shown in Evidence Table 6 in Appendix F, most explicit incentives were bonuses potentially payable to all qualifying physicians. The exceptions are the Hillman studies which paid bonuses in a tournament-style manner.[45, 46] That is, only the top performing providers are rewarded with bonus incentives. Providers would need to estimate their ability to win such tournaments.

Only a few studies provided data on the range and mean size of bonus payments. Kouides, Bennett, Lewis et al. reported an average $242 bonus.[49] This seems to be a very small amount compared to typical physician incomes. In this study physicians created the patient list to target for immunizations. This collaborative involvement in the study may have increased the salience and personal motivation of the provider to reach the immunization goal. Hillman et al. reported bonus averages and ranges that were slightly more significant—up to $4,682 for one study.[45, 46] The overall amounts are still small, and since bonuses were paid tournament style to only the top performing or improving sites, the marginal benefit of the bonus would need to be tempered by the physician's expectation of receiving the bonus. Grady, Lemkau, Lee et al. provided token amounts of $50 for achieving the target behavior goal.[48]

No study provided information on the frequency and timing of payments. Reports also did not include the investment costs the physician or provider may have faced to establish the clinical and office procedures necessary to support production and behavioral changes, or whether they had the time, staff, or office system supports available for such changes to be feasible. We cannot assess from the information provided how these factors, plus the anticipated length of time for the bonus program, would have influenced the physician's decision on whether the incentive was considered financially beneficial.

Incentive conditions: In general, incentives were based either on patient outcomes or physician performance of a behavioral goal (Evidence Table 6 in Appendix F). Six studies used performance bonuses that rewarded the physician for achieving a target outcome rate based on patient utilization, in these instances immunizations[43, 44, 46, 49, 51] and cancer screening.[45] Grady, Lemkau, Lee et al. applied a performance bonus that rewarded the physician for achieving a target behavior goal, a 50 percent mammography referral rate.[48] The Fairbrother studies also pitted the target outcome bonus against a per-input bonus, a more direct way of measuring physician behavior, which paid the physician for each additional shot administered and office visits that brought the child up to date in immunization coverage.[43, 44] Morrow, Gooding, Clark et al. examined the effect of adjusted capitation rates partially based on a practice achieving preventive care outcome rates.[47] Fox and Phau examined the effect of raised delivery and prenatal visit fees, an incentive based on physician behavior.[50]

Salience of the incentive: Only the Hillman studies attempted to directly assess awareness of the incentive program within a practice.[45, 46] Only 56 percent and 67 percent of sites, respectively, responding to a survey indicated they were aware of the incentive program. As the incentive apparently was communicated to providers through regular HMO communication practices, this design aspect may be more indicative of "real world" responses to incentive programs than the remainder of the studies that involved more direct communication of the experiment to potential participants. Communications from HMOs may be buried under the busyness of a physician's normal daily practice.

The total incentive size paid to any one provider would arguably also impact the salience of an incentive program. While several studies did provide some payout information, as noted above, no study provided an assessment of the relative impact of the incentive on the provider's overall income.

Expectation of payment: Expectation to receive the bonus is also likely to impact a provider's decision to change preventive care behaviors. Physicians may have higher expectations to earn incentive payments if such payments are based on their own behaviors, not utilization behavior of the patients. Expectations would be affected not only by how the criteria of success are determined, but also whether the incentive is potentially payable to all physicians if they meet the target levels, or if the incentive is distributed in a tournament style.

As was mentioned earlier, because reports did not include information on pre-test assessments of preventive care performance against set criteria, it is uncertain whether physicians would have had low or high expectations of earning the incentive payments, regardless of tournament style or the potential for all to qualify.

In short, estimating the chance of receiving the bonus would likely be very difficult for the provider. The provider may not have been aware of his or her starting position when estimating the likelihood of success. Some of the bonus structures were very complex. The provider would have little to no control over the patient's choices regarding whether or not to accept the incented service.

Other factors: Timing of payment and the interplay between financial incentives and performance feedback may potentially impact the effectiveness of the incentive and should be taken into consideration. The studies did not generally address the average time lag between the provider activities which influence the potential for receiving a bonus and the actual receipt of

the bonus. If everything else is constant, the longer the delay between the behavior and the reinforcement, the weaker the effect.

Performance incentives include an element of feedback. Feedback may be formal, through the use of reports, or informal, in that receipt of the incentive itself functions as feedback of performance levels. Feedback may also be private or public to all providers participating in the incentive program. As seen in Evidence Table 6 in Appendix F, some studies did include formal feedback reports. However, the studies often did not clarify whether such reports were private or public. Thus, it is difficult to assess the contribution of feedback to the effect of economic incentives. However, it should be noted Grady Lemkau, Lee et al. found a token bonus of $50, intended as a feedback mechanism, was not significant for changed behavior. [48]

Consumer. Few studies provided justification for the specific design of the chosen economic incentive, although Smith, Weinman, Johnson et al.[55] and Kamb, Rhodes, Hoxworth et al.[64] noted using focus groups to establish the form and size of the incentive, while Laken and Ager[65] cited advice from the study population. Interestingly, while a few articles do mention Prochaska's meta-theory as a basis for the design of educational or motivational counseling sessions, no study discussed the impact of the theory on the design of the incentive.

Although several studies did provide some descriptive information on the uptake and desirability of the study incentive, only nine studies could be said to include direct tests of the uptake of an incentive (Evidence Table 2 in Appendix F). Another ten studies set different forms of economic incentives against each other as a direct test of the desirability of incentive form.

Types of economic incentives: The 59 incentives offered in the studies were highly varied in type and size (Table 2). There were ten lotteries, seven gifts, 11 cash incentives, 15 coupons for free or reduced price goods or non-medical services, six free or reduced price medical services, and ten incentives involving negative reinforcement or the opportunity to avoid punishment.

All lotteries and raffles are included in the lottery category. Five of the ten lotteries were for cash prizes, ranging from $40 to $100. The remaining prizes included a microwave, dinner for two at a local restaurant, travel packages, and groceries. Few studies provided information regarding the expected value of the lottery per participant, leaving it difficult to compare the value against the incentive categories that did not involve uncertainty in receiving the incentive. In addition, lottery values depend on the cognitive processing of assessing expectations, which may or may not be 'accurate.' Lotteries were generally used as rewards for adhering, participating, and outcome categories.

Gifts were physical goods provided as incentives. Gifts ranged from a nutritional information package valued at $2 to inexpensive jewelry, baby blankets, and other infant products. Gifts within interventions for the two complex preventive concerns were accompanied by other intervention components such as lotteries, tournaments, and other educational components. Gifts were all given as rewards and evenly split between the adhering and participating categories.

Cash incentives ranged from $5 to return a tuberculosis skin test reading, to a potential $500 over ten months for smoking abstinence. Simple preventive incentives were $5, $10, or $15 per event. Complex preventive incentives ranged from $1 to $25 per payable event, payable from once per week to several months apart, with potential total payment per person, when the information was provided, of $50 to $500. Cash incentives were treated as rewards and were relatively evenly divided between the adhering, participating, and outcome categories.

Coupons included free or reduced-price coupons, vouchers, and gift certificates for non-medical goods and services. The coupon values were generally modest, from $2 to $15, when the values were provided. Coupons might be related to an encouraged healthy behavior, such as exercise passes, farmers markets, and condom purchase; to address barriers such as transportation; or were unrelated to the specific aim of the study, such as haircuts and infant formula. Given the flexible nature of this category, it is not surprising that it is well represented in virtually all categories, with coupons not used for only the outcome category, and more likely to be used for simple, rather than complex, preventive concerns.

Free or reduced cost medical services involved free influenza immunizations, reduced fees for clinic visits, and free or reduced price nicotine replacements. The studies providing this form of incentive viewed price as a barrier to care-seeking and healthy behavior. The values of incentives in this category were generally higher on a per event basis than the other incentive categories (assuming the expected value of an uncertain lottery is less than the face value), ranging from $10 to $25. All free or reduced medical service incentives were categorized as barrier removal and were evenly divided between the facilitating and adhering categories.

The last type of incentive included those interventions that intentionally incorporated a disincentive to exhibit behaviors counter to the desired behavior, including both punishments and negative reinforcement. Punishments were examined in three simple preventive concern studies, all related to vulnerable populations and the receipt of government subsidies. Birkhead LeBaron, Parsons et al. and Kerpelman, Connell, & Gunn required mothers to return to WIC offices more frequently to receive their benefits if the children were not up to date in immunization coverage.[57, 58] Kerpelman, Connell, & Gunn tested whether the threat of loss of AFDC benefits for non-immunized children would effectively prompt parents to immunize.[58] All three incentives were represented in the adhering category.

The remainder of the studies in this category involved the use of monetary contracts; the participant deposited his/her own money in a contract whereby the money was returned in increments if agreed upon goals were met. The money was forfeited if the goals were not met. Such contracts were often made in the presence of other participants, perhaps working in teams, and the kitty of forfeited money was split among those participants who qualified to participate in the kitty, often by meeting their own health behavior goals. Incentives in this group were evenly split between adhering and outcome categories. No study provided information on incentives per individual when there was potential variability, or in total for the study.

Incentive condition: Seventy-eight percent of incentives required a target behavior of the participant as a condition for the distribution of the incentive. The remainder required the participant to attain a particular outcome. Marcus et al. is unusual in that the free bus-passes were essentially bribes, distributed without any required behavior or outcome from the participant.[60] This may have caused some cognitive problems for some participants in that the gift may have created a sense of obligation. However, only 33 percent of the participants reported actually using the bus pass (see Evidence Table 2 in Appendix F).

Multiple components: Several studies included other intervention components that potentially confounded the impact of the incentive. Of interest is the inclusion of other social pressures. Two studies provided incentives not only for the participant, but also for the significant other who was supporting the participant's efforts to change behaviors.[66, 67] Another three studies introduced team competition into a worksite health promotion program, where cash

prizes were distributed to the teams who best met the health promotion goals.[68-70] The reports of these studies did not address the potential effects of these social pressures, whether the results would be positively or negatively affected by them.

Study outcome measures.

Provider. Outcomes were primarily measured as the percent of charts documenting compliance with the target outcome, with data collected from chart audits. A chart was generally defined as being in compliance if the preventive care service, such as immunization or mammography, was documented as having occurred whether or not the physician, or his/her office staff, directly provided the service. Grady, Lemkau, Lee et al. differed in that they also measured documented referral rates.[48] Denominators for the percentage calculations were based on patients who had visited the provider's office within a set period of time. However, providers who participated in the Kouides, Bennett, Louis et al. study created a target list of Medicare patients from their patient base.[49] This list then determined the denominator.

Consumer. All of the simple preventive care studies used hard outcome measures. Complex preventive care studies were perhaps necessarily forced to use self-report in some instances. Smoking cessation has fairly well established valid and reliable laboratory tests available to confirm self-reported abstinence, keeping overall costs of the study lower. While body mass index can be measured and attendance at exercise sessions counted, many relevant lifestyle behavior changes related to health promotion, such as exercise and eating patterns, cannot be directly observed by the investigator.

As mentioned before, unfortunately most studies did not include as primary outcome measures direct tests of the salience and uptake of the economic incentives themselves, as well as the hypothesized effect of the incentive on the preventive behavior. Health outcomes are indirect measures of incentives that are aimed at a behavior that is only one component of a complex chain of events that eventually expresses as obesity or high cholesterol. Enabling a behavior, or reducing an attitudinal barrier, may be a helpful but not necessarily sufficient condition for improved preventive health behaviors.

As shown in Evidence Table 2, generally only the structural barrier removal studies demonstrated direct effects aimed at the true preventive health goal. We see this in only simple preventive health behaviors.

Consistency of outcomes.

Provider. As shown in Table 3, outcome patterns were mixed. Target outcome performance bonuses showed positive results in three studies,[43, 44, 49] but no results in three studies.[45, 46, 51] The three studies showing positive results measured immunization compliance by chart documentation. Provision of the immunization services may have come from sources other than the study provider. Within the Fairbrother studies, outcome measures that directly addressed provider behavior, per-input bonuses, and percent of missed opportunities to provide immunizations, did not show positive results.[43,44] Thus it appears in these cases that the financial incentives were motivating providers to change chart documentation behaviors as opposed to increasing preventive services. In addition, the physicians participating in the Kouides study

were required to create the patient list for targeted immunizations.[49] This up-front involvement may have increased the awareness of the bonus for the physicians.

Morrow, Gooding, & Clark did show significant increases in the percent of charts in compliance with MMR immunization and cholesterol screening indicators.[47] However, the capitation rate adjustments were based on both utilization and improvements in preventive care practices. The analysis did not include controls such as possible rate adjustments due to utilization. The study period also covered a time period when the awareness of prevention and quality of care, in which prevention is included, was increasing in the general physician population. Thus, it is difficult to determine whether the financial incentive itself was the causative factor.

Practice settings: Several studies included practice-level variables in the analyses. Group practices appeared to have better results than solo practices. The Hillman and Ritchie studies found evidence that increases in preventive care were greater for group practices.[45, 46, 51] There is uncertainty regarding the effect of remuneration packages for physicians within group practices. Studies did not clearly report who was actually paid the incentives. No data was collected on physicians within group practices who may have been paid salary and whether they participated in the incentives.

Other factors: No other provider or patient characteristics included in the studies were found to be significant. Many factors of interest were not addressed in any study. These would include: how the readiness stage of a provider to change behavior may have affected the salience of the incentive program, the effects of non-economic barriers such as attitudes of the physicians regarding the perceived accuracy of the data, the effects of physician work-flow decisions when only a portion of the patient base may be affected by an MCO incentive program, the effect of the providers' level of knowledge and understanding of the preventive care guidelines, and what was necessary to reach incented target levels.

We also cannot speak to the effect practice area variations would have on effectiveness of incentives in other regions of the country or non-physician health care personnel.

Not all studies reported effect sizes or provided enough information to construct relative risk ratios. Attempts to contact lead authors to obtain such information were met with limited success. Based on what was provided in the articles, the effect size is moderate at best. Economic incentives were responsible for a seven percent increase in documentation of immunizations based on regression analysis in the Kouides, Bennett, Lewis et al. study.[49]

Given the mixed outcomes for the provider incentives, it can be informative to look at the explanations offered by the investigators for their findings (Table 4). Both Kouides, Bennett, Lewis et al. and Hillman, Ripley, Goldfarb et al. noted low power for detecting differences in absolute rates.[46, 49] However, Hillman also noted it was unlikely that the small effect size a higher powered study could provide would be unlikely to motivate MCOs to commit significant financial resources to target economic incentives.

Five studies specifically pointed to inadequate size and duration of the bonus. Bonuses were too small in either absolute size or relative to the physician's overall income.[43-46, 48]

Four studies cited national trends increasing preventive care in general.[45-47, 51] Ritchie, Bisset, Russell et al. noted jawboning of national preventive care goals had already begun to raise awareness and practice levels before the target payments were implemented.[51] Likewise, Hillman noted increases in both intervention and control groups mirrored secular national trends.[45, 46]

Several studies cited physician beliefs, attitudes, and inferences through social cognition processes. Morrow, Gooding, & Clark reported the potential factors of: peer pressure from physician committee or normalizing force of knowing how other offices perform; non-financial motivation of pride in job well-done; and fear of retribution for poor performance.[47] Likewise, Fairbrother's studies noted that physicians perceived that the incentive goals were not attainable.[43, 44] In particular, the physicians saw their patients as subject to lack of continuity of care and themselves as "sick doctors," which detracts from their ability to provide the preventive care. Since they were not the primary source for immunizations, they were less likely to take responsibility for patient immunizations. Lastly, Hillman's studies, noted a definite lack of awareness of the bonus on the part of the physician.[45, 46]

Consumer.

***Categories*:** (Table 5) The facilitating category, which included removal of structural barriers, showed significant positive findings. This group of studies demonstrated perhaps the tightest links between incentives, desired outcomes, and direct tests of the uptake of the incentives. However, Marcus' studies stand out in that only a minority of patients self-reported using the bus passes or were logged as turning in vouchers.[60, 61] It is possible the population involved had much deeper cognitive and affective barriers, such as denial in a frightening situation where cancer might be detected, and that the structural barrier incentives were not strong enough to overcome the personal barriers.

The studies on disincentives found effective interventions. Caution should be used in interpreting the findings of these studies, however. For the simple preventive concerns, the Birkhead, LeBaron, Parons et al. study took place immediately following a measles epidemic when public attention and concern was running high.[57] The findings of Kerpelman, Connell, & Gunn may be overestimations as parental permission was needed to review charts and some families may have left the AFDC program due to the policy of linking immunizations to benefits.[58]

As rewards, economic incentives for participating and adhering categories, whether for simple or complex preventive concerns, are, in general, effective in prompting people to change their behavior in order to attain the reward. Most studies matched a short-term incentive with a short-term behavioral change or outcome.

When looking at the outcome and penalty categories for complex preventive concerns, however, one begins to see a change. While many of the studies in the outcome and negative reinforcement categories showed positive effects in the short run, of the four studies that checked for long-term results, all the significantly improved measures had returned to original levels and non-significant findings.[66, 71-73]

In modifying behavior, economic incentives may have unintended consequences which offset the ultimate aim of the incentives. For example, Jeffery and French found cash incentives to participate in group exercise sessions did increase participation.[74] However, overall exercise effort, when compared to the control group, was not different. Barring the possibility of over-reporting of exercise due to social desirability, it would appear the participants exchanged the convenience of walking at their choice of location on their own schedules for the group activity in order to maximize the cash incentives.

There may be evidence of a differential in the outcomes of economic definitions categories, although the evidence is too thin to speak with confidence. A significant finding when the majority

of people do not actually collect or use the incentive suggests the possibility the impact of the incentive was informational rather than economic. Evidence Table 2 in Appendix F shows four studies that fit this case. Perhaps the incentive generated feelings of social support or cohesiveness, that they and their health are important, improving self-esteem or self-worth. Or perhaps the existence of the incentive sharpened the participant's attention to the health behavior in question.

Alternatively, a finding of not significant may have more to do with an incentive that is not large enough or meaningful enough to the target population than it does with the overall idea that economic incentives may or may not be effective.

Populations: As there is a definite correlation between vulnerable populations, low SES, and simple preventive care, it is difficult to infer whether the effects of incentives are consistent across populations. It would seem reasonable, as discussed above, to suggest that much more information is needed before any such inference could be made with confidence, as the nature of the intervention, type, duration, and frequency, would be dependent upon the target population.

Settings: As seen in Evidence Table 5 in Appendix F, the settings for the studies are quite diverse. It appears that the setting is less a concern than the general question of whether it is appropriate, to some consumers' minds, to offer economic incentives at all within the context of health care. Moran, Nelson, Wofford et al. provided anecdotal evidence from a few participants that questioned providing a lottery to encourage people to get a flu shot.[63]

Key Question 3. Is there evidence of a dose/response curve?

Provider. Given the paucity of evidence for the effectiveness of provider incentives, we can not address this question for provider incentives at this time.

Consumer. There is minimal evidence of a dose response within the consumer research. (Table 6) Of the few studies that offer a direct comparison between different forms of incentives, cash is king. Malotte, Hollingshead, & Rhodes; Kamb, Rhodes, Hoxworth et al., and Deren, Stephen, Davis et al. show that cash incentives were preferred over coupons.[52, 54, 64] However, generalizability of this group of studies is extremely limited as the participants were from highly vulnerable populations.

Cash incentives have the expected rank ordering. Malotte, Rhodes, Mais showed a $10 cash incentive was more effective than a $5 incentive.[53] Stitzer and Bigelow also showed a rank ordering of $1, $5, and $10 per day incentives for reducing daily cigarette smoking.[75] Hughes, Wadland, Fenwick et al. showed price elasticity was higher for $6 vs. $20 than $0 vs. $6, suggesting larger incentive increases had a stronger impact on the participants to reduce daily cigarette intake.[76] Malotte suggested the street value of a coupon is half-price off face value, perhaps suggesting another interpretation of the finding that cash is preferred to coupons with an equivalent face value.[53]

Although more open to interpretation, we might also suggest that coupons are preferred to gifts. Both studies that pitted a coupon incentive to a gift incentive found the coupon the more effective incentive.[55, 77] In addition, while coupon incentives were in general effective, with 12 of 15 studies showing positive results, only four of seven gift incentives had positive results, and two of the positive results were potentially confounded by other intervention components comprised of a lottery or competition.

Key Question 4. What is the evidence for cost-effectiveness of economic incentive interventions?

Those limited number of studies that did address cost-effectiveness tended to do so from the perspective of productive efficiency, i.e., examining the cost of achieving the determined preventive goal.

Provider. Among the provider studies, only one study addressed cost-effectiveness and calculated a marginal cost of $3 per additional immunization.[49] The study did not provide any other figures against which to weigh this cost.

Consumer. Only seven of the 47 studies included cost-effectiveness calculations for the study itself (Evidence Table 7). In five of the seven cases, a treatment arm that consisted of a similar intervention without the incentive itself was reported to be a more cost-effective approach. In the Freedman and Mitchell study, simply providing a return envelope cost $1.61 per completed and returned fecal occult blood test kit based on a 57 percent compliance rate.[59] A stamped, return envelope, increased the cost to $1.71 and improved compliance to 71 percent. Both were more cost-effective than the baseline condition which had a compliance rate of only 37 percent and costs per completed and returned fecal occult blood test of $2.24. Nexoe, Krogstrup, & Ronne found the cost per prevented influenza related death was $3,990 for those who received an invitation letter reminding the patient of the upcoming flu season, versus $17,860 for those who received the letter plus free flu shots.[78] Similarly, Yokley and Glenwick estimated the least cost intervention was also a personalized letter prompting parents to immunize their children, at $2.27 per target child who received immunizations.[62] Free day care and lottery incentives increased the cost by $4 to $5. Moran, Nelson, Wofford et al. found the cost per additional flu immunization was $3.45 for an educational brochure but $8.74 for the lottery incentive.[63] Lastly, in the mixed-incentive group, Gomel, Oldenburg, Simpson et al. found the incentive group to be the least cost effective.[69] The cost per "health risk unit" reduced at six months was $26.50 for risk factor education, $24.47 for behavioral counseling, and $49.80 for behavioral counseling and an incentive.

All of the calculations were relatively crude. No study included an attempt to generalize cost-effectiveness over time for the estimated potential population morbidity or mortality that would be affected by a policy decision to implement the economic incentive.

Other Perspectives

In this section we look at the limited pool of observational studies that have attempted to directly address whether preventive services are affected by economic incentives using econometric methods to analyze cross-sectional databases. We also look at what the Medicare/Medicaid demonstrations have to offer.

Econometric studies.

Incentives, prenatal care and birth weight. Two studies addressed the relationship between physician payment incentives and the use of prenatal care for Medicaid enrollees. Gray examined

the impact of increased Medicaid physician payment generosity and the use of prenatal care and birth outcomes for Medicaid enrollees.[79] Gray used individual birth data from the National Maternal and Infant Health Survey and matches the individual data to the state Medicaid payment rate. Gray identified the impact of the payment rate on outcome using a difference-in-difference approach—comparing expected differential outcomes between Medicaid and non-Medicaid enrollees as a function of the generosity of the Medicaid physician payment. This estimation strategy differences out unobserved, state specific effects that might be correlated with the payment rate. However, the difference-in-difference strategy will not correct for unobserved variables that impact the outcome of only one of the groups that might be correlated with the payment rate.

The increases in the payment rate did not significantly impact the use of prenatal care, but increased payment generosity is correlated with fewer low birth weight infants. These results are somewhat puzzling in that it does not identify a mechanism by which increased payments increase birth weight. That is, if increased physician payments are not increasing the use of prenatal care, then how is it that the payments are increasing birth weight? A possible answer is that increased payments are correlated with a more generous menu of financial support available to Medicaid enrollees. In this scenario, the physician payment effect is just an omitted variable bias associated with the researcher not observing other income transfers to the poor.

Oleske, Branca, Schmidt et al. examined the relationship between FFS and capitation payment to physicians in California's Medicaid program, Medi-Cal.[80] In the Medi-Cal program counties within California have different contract structures with the physicians and the authors use this difference to identify the impact of capitation payments on the use of prenatal care and birth outcomes. Similar to Gray, they found that capitation payments are not related to the use of prenatal care but lowered the likelihood of low birth weight babies.[79] Thus, like Gray, the causal mechanism by which capitation lowers low birth weight outcomes is unclear if it is not through the use of prenatal care. The lack of identifying a causal mechanism increases the likelihood that there might be some omitted variable that is correlated with payment structure and impacts birth outcomes. If the authors had used a difference-in-difference approach similar to Gray, that possibility would have been mitigated to some degree.

*NHS***.** Two econometric studies have examined the impact of incentives on preventive care within Britain's National Health Service (NHS). In 1990, the NHS introduced target-linked payments for pre-school/childhood immunization (as well as cervical cytology). GPs can earn up to £1,800 (in 1990) for achieving 90 percent immunization uptake. Lynch analyzed the uptake data in Greater Glasgow, Scotland, in an attempt to estimate the factors that determine physician group immunization uptake.[81] She found that 25 percent of the practices did not achieve the high uptake target. To understand the variance in practice immunization uptake, she regressed (in an OLS framework) the uptake rate on the percentage of the total compensation that the immunizations payments make along with other covariates. The idea is that physicians are more likely to focus on the target payments if they comprise a larger percentage of their income. Consistent with this hypothesis, she found a significant positive relationship between the importance of the immunization payment and the percentage of children immunized. This difference variable explains 28 percent of the variance in immunization rates. However, it is not clear in which direction the causation works here. For example, practices that specialize in pediatrics may have higher immunization rates simply because they focus on that type of care. These are also the same practices that are likely to rely more heavily on the target payments.

Hughes and Yule used aggregate time-series data on payments and care provision rates within the NHS for cervical cytology, maternity care, contraceptive advice, and vaccinations.[82] They found little relationship between the rate of use and the payment rates. This is not surprising, as they identified the parameters of interest of time-series variation. Their approach does not allow for the inclusion of most demand side and supply side variables, control variables that are likely to be important. Thus, it is difficult to put much weight on their results.

U.S. Survey Data. Balkrishnan, Hall, Mehrabi et al. examined the relationship between capitation and the number of preventive health counseling visits in the National Ambulatory Medical Care Survey (NAMCS).[83] The NAMCS samples approximately 1,200 physicians and the physicians in its sample return approximately an average of 24 patient encounter record forms. The authors regressed the patient specific payment type (FFS or capitation) on the variable on interest. Patients in capitation plans were more likely to receive health counseling and preventive care. However, the authors made no attempt to control for differential selection into physician contract types.[1] That said, for physicians that received a mix of FFS and capitation (more than 20 percent capitation patients) there was no difference in care between FFS and capitated patients, suggesting to us that physician selection effect may be important.

Wee, Phillips, Burstin et al. surveyed 4,473 patient charts from 169 physicians in the Boston area to examine the relationship between HEDIS measures and the reported compensation structure (salary versus productivity pay).[84] They hypothesized (without much discussion or reference to the economic literature on incentives) that physicians who are paid on a productivity basis are less likely to perform preventive services. They found that physicians with financial productivity incentives in their compensation are less likely to perform certain types of preventive care (Pap smears and cholesterol screening) but there is no difference in the rates of mammography and influenza vaccination (point estimates indicate that productivity compensated physicians are more likely to give influenza vaccines). Like Balkrishnan, Hall, Mehrabi et al. the authors made no attempt to correct for the endogeniety of the contract form.[83] For this reason, it is likely that their parameter estimates do not represent causal relationships.[83]

Medicare/Medicaid demonstrations. During the 1980s, the Health Care Financing Administration conducted several Medicare and Medicaid competitive demonstration projects in order to assess the impact of different competitive interventions on the cost and quality of care. Several of these projects studied the impact of the physician payment structure on the delivery of preventive services. Preventive care services such as immunization, cancer screening, or health promotion counseling were made free to the consumers, through the use of capitation rates or vouchers for FFS. The advantage of these demonstrations is that they can provide payment interventions on a large proportion of a physician's caseload thereby providing a change in an incentive structure that potentially has a large bite on the physician's income. A potential disadvantage of these studies is that the intervention may last only one year, thus physicians may be unwilling to reorganize their work practice when facing a change in payment structure with a short window.

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[1] See Ackerberg and Botticini (2002) "Endogenous Matching and the Empirical Determinants of Contract Form," *Journal of Political Economy* 110(3): 564-591, for a description of importance of selection into compensation contracts and potential corrections for the problems.

Carey, Weis, Homer et al. examined the impact of capitation on the delivery of preventive services in California and Missouri.[85] In this demonstration, all Medicaid eligible people in two counties (Santa Barbara and Jackson) were enrolled in a program that paid the physicians a capitation payment for specifically preventive services. The behavior of physicians in caring for Medicaid enrollees in these counties was then compared to their counterpart physicians in adjacent counties. Carey, Weis, and Homer found little significant difference between the performance of physicians in the demonstration project and in the FFS control group.[85]

Lave, Ives, Traven et al. reported in several articles the results of a Medicare demonstration project in rural Pennsylvania.[86-88] In this project, hospital-based physicians were paid a capitated payment for providing a series of preventive services (influenza vaccinations, health counseling, depression evaluation) while the rest of the physicians were paid for each service provided. Patients were then randomly assigned into each group or a control group. Patients in the treatment arms received vouchers for free preventive services. The authors found those in the treatment arms were more likely to receive influenza vaccinations.[86] They also found that while participation rates in the health screenings, nutritional counseling, smoking and alcohol cessation, and depression/dementia services were variable depending on the program and treatment arm, there were no differences in the consumers' use of medical care services or health outcomes between the treatment and control groups. The authors also found little difference in the performance of the physicians across preventive inventions.[87] However, because physicians were not randomized into each group. it is difficult to know if the lack of differences is the result of the correlation of the "type" of physician with the payment structure or that mean physician behavior is insensitive to the form of payment.

Ohmit, Furumoto, Dawson et al. examined the impact of free influenza vaccinations in Michigan as part of a community intervention program that included community promotion and outreach, and educational materials and cost reimbursement to the providers.[89] The behavior of the consumers was then compared with their counterpart consumers from a comparison county which was not involved in the demonstration. They found the community intervention program, including fully reimbursed shots for the providers, significantly increased the likelihood of consumers receiving an immunization.

Morrissey, Harris, Kincade-Norburn et al. examined the effects of financial and office systems on the level of preventive care as part of a demonstration project in North Carolina.[90] Patients were randomized within practices to a treatment or usual-care control group. Patients in the treatment arm were treated by physicians who were fully reimbursed for the preventive care and health promotion packages, and who received office system support for personal reminders of scheduled preventive care, clinic staff to carry out many of the preventive care procedures, and new charting forms for patient records. They found that while screening tests increased significantly, there was evidence of a lack of followup of abnormal findings. Also, there was little difference between the treatment and control groups in health-related quality of life measures at the two year study followup. Again, it was not possible to separate the impact of the financial incentive from the other intervention component of patient prompting and other office system improvement.

Table 2. Consumer incentive type

Incentive Type	Positive Findings to Total Studies						
	Lottery	**Gift**	**Cash**	**Coupon**	**Free Medical**	**Punishment**	**Totals**
Simple	2 of 5 (40%)	2 of 5 (40%)	5 of 5 (100%)	10 of 12 (83%)	3 of 4 (75%)	3 of 3 (100%)	25 of 34 (74%)
Complex	4 of 5 (80%)	2 of 2 (100%)	3 of 6 (50%)	2 of 3 (67%)	1 of 2 (50%) *	6 of 7 (86%)	18 of 25 (72%)
Totals	6 of 10 (60%)	4 of 7 (57%)	8 of 11 (73%)	12 of 15 (80%)	4 of 6 (67%)	9 of 10 (90%)	43 of 59 (73%)

* One non-significant study mismatched test for effect of incentive. No direct measure of uptake.

Coupon = coupons, vouchers, gift certificates, free or reduced non-medical services
Free = free or reduced medical services
Punishment:

Punishment for simple category was clearly punishment.
Punishment for complex category was monetary return contracts that included a reward element. Those that measured followup periods showed rebound back to non-significant levels.
Non-significant test was for smoking cessation. The rest were weight loss.

Table 3. Impact of provider incentives

Study Characteristics	Frequency of Interventions with Positive Effects	Frequency of Interventions with No Effects
Total studies	4	5
Performance bonus - target outcome	3	3
Bonus structure - Tournament	0	2
Bonus structure - All providers have potential to qualify	4	3
Bonus structure - Reward/punishment	0	1
Performance bonus - target behavior	0	3
Adjusted capitation rates	1	0
Raised fees	0	1
Subgroup analysis - Group practice vs. solo	3	0
Source of bonus - Paid by HMO	1	3
Source of bonus - Not paid by HMO	3	2
Prevention target - Immunizations	4	2
Prevention target - Other	1	3

Table 4. Potential explanations by category

Category	Number of Studies
Study design – Insufficient power	2
Study design – Inadequate size and duration of bonus	5
Study design – Historical trends	4
Salience - Physician beliefs and attitudes about the bonus	3
Salience - Lack of physician awareness	2

Table 5. Overall positive findings to total consumer studies

	Facilitating	Participating	Adhering	Outcome
Simple	6 of 6 (100%)	4 of 6 (67%)	9 of 12 (75%)	0 studies
Complex	1 of 1 (100%)	4 of 5 (80%)	5 of 8 (63%) *	10 of 12 (83%)

* One non-significant study mismatched test for effect of incentive. No direct measure of uptake.
Outcome studies - 8 of the 10 positive studies either did not check for long-term results or showed rebound to original levels and non-significant.

	Structural Barrier Removal	Attitude Barrier Removal	Reward	Punishment
Simple	6 of 6 (100%)	0 studies	10 of 14 (71%)	2 of 2 (100%)
Complex	2 of 3 (67%) *	1 of 2 (50%)	11 of 15 (73%)	5 of 6 (83%)

* One non-significant study mismatched test for effect of incentive. No direct measure of uptake.
Only 1 of the Attitude Barrier studies actually measured change in attitude - negative finding.
Four of the five positive findings for punishment showed rebound to original levels.
Complex reward changes to 12 of 18 (67%) and 9 of 13 (69%) if remove studies which included punishment

	Purchasing Behavior	Income Behavior
Simple	6 of 7 (86%)	13 of 17 (76%)
Complex	7 of 8 (88%)*	10 of 15 (67%)

* One non-significant study mismatched test for effect of incentive. No direct measure of uptake.
Complex income behavior drops to 8 of 19 (42%) and 6 of 15 (40%) with long term results.

Table 6. Consumer incentive type by significance

Non-Significant Findings Studies	Significant Findings Studies
Lotteries:	
$50/session + $2,000 travel package. For middle-class people to attend group exercise program.[91] (complex)	$100/month; a 1 in 10 chance to win over 3 years. For low SES and middle-class people to return monthly nutrition newsletter postcards.[74] (complex)
Microwave. For people who showed for community program cholesterol retest.[73] (simple)	Three travel packages: one week in Hawaii, weekend in San Juan, weekend at local hotel. For self-help smoking members of GHCPS.[72] (complex)*
Dinner for two. For car dealership employees attending off-hour smoking cessation class.[92] (simple)	Five $100 cash prizes; 5 in 29 chance if all participants make goal. For health fair participants with high cholesterol.[93] (complex) **
$100 cash. For low SES women returning for post-partum check.[65] (simple)	Two $40 cash for meeting three-month goal; 1 in 4 chance at $1,000 competitive lottery. For employees of ambulance services.[69] (complex)*
	$25, $50, and $100 cash prizes. For immunizing parents of children/patients at public clinic.[62] (simple)
	Three $50 grocery gift certificates. For low SES urban community health center.[63] (simple)
Gifts:	
Nutritional information package. For community women attending mammography.[94] (simple)	Nutritional information package. For community women attending mammography.[95] (simple)
Jewelry. For low SES women attending post-partum check.[55] (simple)	Ceramic coffee mug (also lottery). For smoking members of GHCPS in self-help program.[72] (complex)*
Baby blanket. For low SES women attending prenatal checks.[77] (simple)	Turkey buffet and pooled kitty to winning worksites for competitive smoking cessation program. For employees of state government department.[71] (complex)**
	Gerry Cuddler. For low SES women attending post-partum check.[56] (simple)
Cash:	
$50 payment. For middle-class worksite employees for cigarette abstinence.[96] (complex)	$5 cash payment. For active drug users to return for TB skin test reading.[53] (simple)
Potential of up to $266 over 18 months; $1 to $3 per exercise session. For middle-class people to attend group exercise program.[97] (complex)	$10 cash payment. For active drug users to return for TB skin test reading.[53] (simple)
$12.50 to $25 per week for 20 weeks. For middle-class people to lose weight.[98] (complex)	$10 cash payment. For active drug users to return for TB skin test reading.[54] (simple)
	Two $15 payments. For low SES people to attend STD prevention education.[64] (simple)
	Three cash payments totaling $35. For active drug users to attend AIDS prevention education.[52] (simple)
	$5 to $15 per participant for competitive team members. For employees of diverse firms for smoking cessation.[70] (complex)*
	$1 to $10 per day for six weeks. For mostly hospital workers for decreased smoking.[75] (complex)**
	$50 for participation, $15/month for abstinence, $1,980 competitive kitty. For employees of aerospace firms for smoking cessation.[68] (complex)*
	$50/month for smoking abstinence, maximum ten months. For low SES pregnant women.[67] (complex)***
Coupons:	
Fitness center passes. For lower SES people for attending motivational counseling for exercise program.[99] (complex)	Free postage. For lower SES people to return completed FOBT.[59] (simple)

Non-Significant Findings Studies	Significant Findings Studies
Bus passes. For lower SES women returning for abnormal pap.[100] (simple)	Bus passes. For lower SES women returning for abnormal pap.[60] (simple)
$5 department store gift certificate. For lower SES women returning for post-partum check.[65] (simple)	75% off coupons for box of condoms. For young adults for STD prevention.[101] (simple)
	Coupon for infant formula. For low SES women to attend post-partum check.[55] (simple)
	Free taxicab fare. For low SES women to attend prenatal visit.[77] (simple)
	$10 of free bus passes or fast food coupons. For active drug users to return for TB skin test reading.[54] (simple)
	$10 grocery gift certificate. For active drug users to return for TB skin test reading.[54] (simple)
	$20 in coupons for farmer's market fresh produce. For low SES women to improve nutrition.[102] (complex)**
	Two $15 coupons for goods or services. For low SES people to attend STD prevention education.[64] (simple)
	Free evening day care. For immunizing parents of children/patients at public clinic.[62] (simple)
	Three grocery gift certificates totaling $35. For active drug users to attend AIDS prevention education.[52] (simple)
	Multiple kinds, of high frequency and moderate to high value. For low SES women to breast feed.[66] (complex)***
Free/Reduced Medical:	
Free nicotine patches - did not test for uptake, only effect on cessation.[103] (complex)	Free or reduced price of $6 or $20 (vs. $24) per pack of nicotine gum. For smoking rural family practice patients.[76] (complex)
Voucher for reduced clinic visit. For low SES women for abnormal pap.[100] (simple)	Voucher for reduced clinic visit. For low SES women for abnormal pap.[61] (simple)
	Free flu shots. New Zealand[104] (simple)
	Free flu shots. Denmark[78] (simple)
Punishment	
Return contracted amount, minimum $5 per paycheck. For worksite employees for smoking abstinence.[105] (complex)	Return contracted amount, minimum $5 per paycheck. For worksite employees for meeting weight loss goals.[105] (complex)**
	Return $20 per session for ten sessions. For overweight people to attend meet weight loss goals.[106] (complex)**
	Return $20 per session for ten sessions. For overweight people to attend weight loss sessions.[106] (complex)**
	Return $30 per every five pound reduction, up to $150. For overweight people to meet weight loss goals.[107] (complex)**
	Return $1, $5, or $10 per session for 30 sessions. For overweight people to meet weight loss goals.[108] (complex)**
	Return $5 per session, 14 sessions; forfeit money split. For mostly female employees of a hospital to attend weight loss sessions.[109] (complex)
	Return to WIC offices monthly (not bimonthly) for vouchers. For low SES parents of non-immunized children.[57] (simple)
	Return to WIC offices monthly (not quarterly) for vouchers. For low SES parents of non-immunized children.[110] (simple)
	Lose AFDC benefits. For low SES parents of non-immunized children.[58] (simple)

* Studies showed rebound of outcomes back to pre-test levels
** Studies did not follow up participants for long-term effects
*** Incentives also paid to participant's chosen Significant Other