

The Use of Financial Incentives to Prevent Undesirable Behaviors

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Abstract

Behaviors that are putting people's health and well-being at risk are widespread in the developing world and some of them, like smoking and unhealthy diets, are on the rise. Some of these behaviors can be prohibited or prevented by taxation. But financial incentives such as conditional cash transfers are also increasingly proposed and tested to discourage such behaviors, in domains as varied as HIV/AIDS, drugs, alcohol, smoking, obesity, or early marriage prevention. This paper presents the theoretical justification for using such incentives, distinguishing between the price, income effects, and the nudge effects.

The growing literature about the effectiveness of financial incentives to prevent undesirable behaviors is reviewed in detail for each type of harmful behavior. Finally, the paper discusses the long-term sustainability of such incentives, a key issue if they are to be scaled up beyond pilot programs and research projects. The current evidence on whether such incentives have an impact after they are discontinued is mixed. Some design features, like lotteries or commitment devices, could induce savings as well as increase effectiveness, therefore improving sustainability.

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Section 1: Introduction

All over the world, individuals engage in behaviors that are detrimental for themselves and society. People smoke, use illicit drugs, drink too much alcohol, eat unhealthy food or adopt sedentary lifestyles, have risky sexual encounters or push their daughters to marry too young. As a consequence, they endanger their health and well-being, reduce their own life expectancy, and often impose consequences on others. These harmful behaviors are prevalent in developing countries, and some constitute growing threats for the health of their populations (de Walque, 2013). Despite recent progress in prevention and treatment, the HIV/AIDS epidemic - one of the most devastating consequences of risky sex - remains a heavy burden in Sub-Saharan Africa, especially in its southern cone; early marriages and teenage pregnancies continue to jeopardize the health of mothers and children in many countries. Drug and alcohol abuse have been relatively stable over the past decade, but smoking and obesity linked to unhealthy diets are on the rise in many developing countries and have the potential to substantially increase mortality and morbidity.

Conditional cash transfer programs and other similar financial incentives have become an increasingly popular approach for incentivizing socially desirable behavioral change. The principle of conditionality – making payments contingent, for example, on a minimal level of schooling attendance or preventative care use – distinguishes conditional cash transfer programs from more traditional means tested social programs. The evaluation of conditional cash transfer programs has shown that they can be effective at raising consumption, education (Fiszbein and Schady 2009), and preventative health care (Lagarde, Haines, Palmer 2007), as well as actual health outcomes (Gertler 2004; Fernald, Gertler and Neufeld 2008; de Walque, Fernald, Gertler and Hidrobo 2017).

Those incentive programs are justified by and thought to operate through the following mechanisms. First, by distributing cash, they might remove resource constraints that may hinder the adoption of desirable behaviors by poor households. Second, by subsidizing those desirable behaviors, they might resolve an externality for example when parents do not fully internalize the benefits to their children or to society of education or health care. Finally, they might help overcome issues of bounded reality when the individuals fail to fully understand the benefits of those behaviors.

Incentives such as conditional cash transfers are traditionally conditioned on positive behaviors which are encouraged and are usually relatively easy to accomplish, observe, monitor and verify: school enrollment and attendance, visits to clinics, delivery in facilities, etc.

In addition to encouraging desirable behaviors, it might be optimal for society to discourage undesirable behaviors. Some of these harmful activities are often complex and may require changing multiple behaviors, reversing habit formation and addictive behaviors. A few of these behaviors are so harmful to society that they are prohibited (e.g. physical violence, robbery), but in some instances prohibition might be difficult or even counterproductive. A famous example is the prohibition of alcohol in the United States, which was introduced by the 18th Amendment to the Constitution in 1920. While it led to a decrease in alcohol consumption and in the incidence of cirrhosis of the liver, it also led to an increase of smuggling and associated criminality and was eventually lifted (Dills and Miron, 2004; Dills and others, 2005; Miron and Zwiebel, 1991). The effectiveness of the prohibition of illicit drugs, or in some countries, of prostitution, is also largely debated.

When the behavior is not prohibited, prices and tax increases can be used as direct ways to influence them. Tobacco and alcohol taxation are widespread and have been quite effective at

reducing consumption, especially in the case of smoking (Chaloupka and others 2000; Chaloupka, Grossman and Saffer 2002; Booth and others 2008). But other behaviors, such as risky sex or illicit drug use are often difficult to observe or monitor, either because they are illegal or because they are socially stigmatized, and are therefore difficult to tax and regulate.

A tax hike directly increases the price of the harmful product or behavior, but other incentives can work in the other direction and financially encourage the corresponding safe behavior, indirectly raising the opportunity cost of the risky behavior.

Many of these financial incentives have been proposed and tested in high income countries (Sutherland, Christianson and Leatherman 2008), except for incentives for safe sex and HIV prevention which have been mainly evaluated in Africa where HIV/AIDS prevalence is highest. Given the rise of smoking and obesity rates in many middle- and low-income countries, it is useful to consider how financial incentives for preventing behaviors which are risky to one's health could be further applied and tested in developing countries.

This paper will first develop in section 2 the theoretical foundations for the use of financial incentives to prevent undesirable behaviors. Section 3 will review several examples of incentives which have been used and evaluated to prevent undesirable behaviors, with a focus on unsafe sex and HIV prevention, smoking, alcohol and drug abuse, unhealthy diet and obesity and finally behaviors which are not directly related to a health risk, such as early marriage. This review will cover evidence from low- and middle-income countries when available, but also from high income countries. Section 4 will discuss issues which are common to these types of incentives focusing on their sustainability and how different designs can influence cost-effectiveness. Section 5 concludes.

Section 2: Theoretical foundations

A well informed, rational and forward-looking individual would be expected not to engage in an undesirable and potentially harmful behavior. However, people smoke, drink alcohol, consume illicit drugs, overeat and fail to exercise, engage in unprotected sex, force their daughters to marry early or to undergo female genital mutilation. Three explanations are usually offered for the prevalence of such behaviors.

First, when they engage in such behaviors, people only take into account their actions' positive and negative consequences which affect them individually. When they light a cigarette, smokers might factor in the consequences of tobacco consumption on their own health, but they might not consider the impact of second-hand smoking on others. Someone not using a condom in a risky sexual encounter is not only at risk of being infected himself or herself by HIV or another sexually transmitted infection (STI) but might in turn infect subsequent partners. In economic parlance, their behaviors create a negative externality which they are not internalizing.

Resource constraints might also explain some undesirable behaviors. For example, poverty might limit the choice of food available and lead to unhealthy diet and obesity. There is also evidence that women who have experienced economic shocks are more likely to engage in risky or transactional sex (Robinson and Yeh, 2011; de Walque, Gong and Dow, 2014). Similarly, poverty might lead parents to marry their daughters early (Nanda and others 2016).

Finally, the assumptions of full information and rational decision-making might not be valid. If individuals lack the information about the negative consequences of dangerous behaviors, information campaigns are usually launched to disseminate prevention messages. The

widespread anti-tobacco campaigns in the 1950s and the 1960s and the HIV information and education campaigns are good examples. But even when individuals are fully informed of the negative consequences for themselves of these behaviors they might nevertheless engage in them because their decision process is not fully rational. Some of the behaviors considered are addictive and impair individuals' judgment. For example, alcohol creates addiction and can also lead intoxicated people to engage in unsafe sex.

Moreover, for some of the harmful behaviors considered, such as smoking and unsafe sex, the benefit (lighting a cigarette, the sexual encounter) of the action is immediate while its negative consequences are far in the future. Most smokers do not experience severe health consequences before they are in their 50s or 60s. HIV positive individuals can live for about 10 years without any symptoms before suffering from AIDS. Individuals who value highly the present and heavily discount the future will therefore not put a heavy weight on the future negative impacts of the actions they are enjoying in the present. Rational decisions can also be limited by impulsivity or lack of self-control or habits and social norms. These limitations to rational decision-making can be included under the category of "bounded rationality".

Financial incentives can influence undesirable behaviors through three mechanisms which are linked to the three reasons explaining their prevalence described above: externalities, resource constraints and bounded rationality.

The price effect might allow the negative externality to be internalized

Neoclassical economics predicts that the incentives will influence behavior in part via a price effect. For examples, taxes on cigarettes and alcohol will increase their price and reduce their consumption, benefiting society by reducing second-hand smoking or car accidents caused

by intoxication. Conditioning a monetary reward on a negative test for sexually transmitted infections increases the implicit “price” of risky sex, since there is now a potential loss of cash associated with risky behaviors. If individuals’ decisions on sexual behavior ignore the health externality of risky sexual behavior, such a cash transfer program can be justified by the negative externalities generated by a higher number of HIV positive individuals within a society. That is the transfer can be viewed as a Pigouvian subsidy aimed at correcting the externality.

The income effect from the incentive might relax the resource constraints

When the financial incentives come in the form of a monetary transfer, they will relax the individual’s budget constraint. This income effect is not obvious for some behaviors which are costly to the individuals such as smoking, alcohol or drug consumption. In those cases, people would actually save by quitting the behavior. But a cash transfer could for example help households buy healthier food or pay for gym membership. In the case of unsafe sex, the direction of the income effect might vary with gender. For some lower income women, the transfer could indeed ameliorate immediate economic pressures to engage in transactional sex. For men, the prevalent hypothesis is that higher income will lead to more transactional sex, which over time might possibly mute the incentive effects on male sexual behaviors.

The incentives might help individuals overcome bounded rationality

Because of different forms of bounded rationality, some individuals may not be able to carefully weigh the positive and negative consequences of their behaviors. Financial incentives can then operate as “nudges” (Thaler and Sunstein 2008). For individuals who are present-focused and heavily discount the future, the prospect of an AIDS diagnosis many years in the future may not be considered a high cost. But with a cash transfer system testing individuals for

STIs and offering them cash rewards at frequent intervals when they test negative, the price of risky sex would be incurred within months instead, and individuals with a high discount rate may then perceive an increased (discounted) price of risky sex, and adapt their behaviors to this shortening of the time horizon. Incentives might also provide individuals with an excuse for deviating from potentially harmful social norms to act on their underlying preferences for less risky behavior.

Section 3: Evidence from evaluations of financial incentives used to prevent undesirable behaviors

This section reviews the evidence generated from different experiments which have used financial incentives as a mechanism to prevent harmful behaviors. Many of these behaviors such as unsafe sex, alcohol and drug consumption, unhealthy diet and lack of exercise leading to obesity first pose a health risk to the individuals and society as whole (Sutherland, Christianson and Leatherman, 2008), but can also have socio-economic consequences, while others such as early marriage and teenage pregnancy pose both a health and a socio-economic risk.

Safe sex and HIV prevention

The evidence on the efficacy of financial incentives for STI or HIV prevention is still unfolding. In Malawi, small financial incentives have been shown to increase the uptake of HIV testing and counseling (Thornton, 2008), but this aims more to encourage a desirable behavior than an undesirable behavior. Another study set in Malawi evaluated unconditional and conditional cash transfers for adolescent girls in which the cash transfer, when conditional, was

conditioned on school attendance but which, in addition to increased enrollment and attendance also led to a reduction in HIV and HSV-2 incidence (Baird and others 2012). At follow-up, HIV prevalence among program beneficiaries was 60% lower than the control group (1.2% vs. 3.0%). Similarly, the prevalence of HSV-2 (herpes simplex virus – type 2, which is the common cause of genital herpes) was more than 75% lower in the combined treatment group (0.7% vs. 3.0%). No significant differences were observed between those offered conditional and unconditional payments. Moreover, cash payments offered to the girls who had already dropped out of school at the beginning of the trial made no difference on their risk of HIV or HSV-2 infection. The same program also led to a modification of self-reported sexual behaviors with adolescent girls reporting younger partners (Baird and others 2010).

In Kenya, a national unconditional cash transfer program for orphans and vulnerable children reduced the age of sexual debut among young people ages 15–25 years and reduced the likelihood of pregnancy among women ages 12–24 years by 5 percentage points (Handa and others 2014; Handa and others 2015). Also in Kenya, Duflo, Dupas, and Kremer (2015) found in a randomized control experiment that an education subsidy program had no impact on the HSV-2 infection rate. However, an education subsidy combined with HIV/AIDS prevention education focusing on abstinence until marriage resulted in a significant reduction in the HSV-2 infection rate.

A propensity-score-matched case-control study of child-focused state cash transfers in South Africa found a reduction in transactional sex and age-disparate sex (Cluver and others 2013). Results from two South African randomized controlled trials of cash transfers conditional on schooling obtained mixed results. An individually randomized study of young women conditioned on school attendance observed no impact on HIV incidence, even though the young women who

received cash transfers reported engaging in significantly fewer risk behaviors (Pettifor and others 2015). Another study found that cash incentives conditional on schooling led to a 30 percent reduction in HSV-2 incidence, but could not establish the impact of those incentives on HIV incidence (Abdool Karim and others 2015). Both studies might not have had enough statistical power to detect impacts on HIV incidence.

Because in these experiments the cash transfers were either unconditional or conditional on school attendance but not on sexually transmitted infection (STI) status, it is likely that the mechanism was not directly a price effect affecting the cost of unsafe sex, but rather an income effect putting girls in a better position to refuse or better negotiate risky sexual encounters or an “incapacitation” effect whereby the cash transfers keep the girls in school and therefore limit their exposure to risky environments.

Other studies evaluated conditional cash transfers in which the condition is directly attached to negative test results for sexually transmitted infections. In Malawi, Kohler and Thornton (2011) evaluated an intervention offering a single cash reward in one year’s time for individuals who remained HIV negative. They found no measurable effect on HIV status, but the number of sero-conversions in the sample was very small and statistical power was therefore low. The RESPECT study (de Walque and others 2012; de Walque, Dow and Nathan 2014; de Walque and others 2016) evaluated a randomized intervention that used economic incentives to reduce risky sexual behavior among young people aged 18-30 and their spouses in rural Tanzania. The objective was to prevent HIV and other sexually-transmitted infections by linking cash rewards (\$20 or \$10 dollars) to negative STI test results assessed every four months. The study tested the hypothesis that a system of frequent feedback and positive reinforcement using cash as a primary incentive to reduce risky sexual behavior could be used to promote safer sexual

activity among young people at risk of HIV infection. Results of the randomized controlled trial after one year showed a significant reduction in STI incidence in the group that was eligible for the \$20 payments every four months, but no such reduction was found for the group receiving the \$10 payments. Further, while the impact of the incentives did not vary between males and females, the impact was larger among poorer households and in rural areas. The study was not powered to measure impact on HIV incidence.

Björkman Nyqvist and others (forthcoming) assessed the effect on HIV incidence of a lottery program in Lesotho with low expected payments but a chance to win a high prize conditional on receiving negative test results for STIs. Instead of receiving cash if they tested negative, participants received a lottery ticket allowing them to participate in a lottery held at the village level. In expected value, the payment per testing round was about three times lower than in the Tanzania experiment discussed above. The intervention resulted in a 21.4 percent reduction in HIV incidence over two years.

Given the central role commercial sex work often plays in HIV transmission, it is useful to consider the use of such incentives among sex workers. Cooper and others (2017) report on the acceptability of a conditional cash transfer program for remaining STI negative among female sex workers in Dar-es-Salaam, Tanzania. Galárraga and others (2017) tested similar conditional economic incentives among male sex workers in Mexico City. They found statistically significant positive impacts on clinic visits and condom use, but no reduction in the number of partners or incident STIs.

Smoking, Alcohol and Illicit Drugs

In their review of tobacco taxation in developing countries, Chaloupka and others (2000) conclude that increases in cigarette and other tobacco taxes would substantially reduce both smoking prevalence and the consumption of tobacco products. Studies about alcohol taxation are mainly focused on developed countries (Chaloupka and others, 2002; Booth and others, 2008) and note that price elasticities vary by product and that substitution effects can be observed with consumers switching from one type of drink to another in response to tax and price changes (Gruenewald and others, 2006; Ramful and Zhao, 2008; Müller and others, 2010). The literature also stresses that there are different price- elasticities for different groups of individuals. For example, in the U.S., the evidence is mixed on whether heavy drinkers are more responsive or not to tax increases (Manning and others, 1995; Williams and others, 2005; Nelson, 2008). This is a particularly relevant issue for alcohol, since heavy drinking is the main public health concern while moderate alcohol consumption may not necessarily represent a significant health risk.

Besides taxation, positive financial incentives have also been used to discourage smoking. Donatelle et al (2000) used social support and financial incentives to encourage pregnant smokers to quit during their pregnancies. They offered \$50 per month for each month of smoking abstinence (up to a maximum 10-month period, which included two months of postpartum). Verified abstinence was required, and the biochemically-confirmed quit rates within the treatment group were higher both at 8 months and 2 months postpartum. Stitzer (1983) evaluated different levels of cash payment, providing a payment of \$1, \$5, or \$10 per day for 10 days to the three treatment groups (the control group received no cash). The study found that carbon monoxide levels decreased in an orderly fashion as pay increased. However, another

study by Windsor and others (1988) which provided cash payments of \$25 at 6 weeks and 6 months as a reward for smoking abstinence found no difference in quit rates between the control and treatment groups. Other early studies experimenting with prizes, vouchers, and in-kind gifts of free nicotine patches obtained mixed results and often the positive results disappeared after 6 months. In their systematic review, Cahill, Hartman-Boyce and Perera (2015) conclude that incentives appear to boost cessation rates while they are in place, but that few programs managed to yield sustained effects. However, Volpp and others (2009) found that while an incentive program's effects on smoking cessation also diminished after withdrawal of the incentives, significant effects did remain 3-6 months later. Similarly, Etter and Schmid (2016) observed that financial incentives increased long-term smoking cessation rates among low-income smokers in Switzerland up to 12 months after the incentives were discontinued.

Giné, Karlan and Zinman (2010) evaluated a voluntary commitment contract to help smokers quit smoking in the Philippines. A smoker signing the contract pledged his own money that he would be negative in a urine test detecting nicotine and cotinine six months later. The participants who were randomly offered the commitment contract were 3.4 to 5.7 percentage points more likely to pass a urine test for short-term smoking cessation than the control group. This effect remained in surprise tests at 12 months, indicating that the commitment device led to lasting smoking cessation. White, Dow and Rungruanghiranya (2016) tested commitment contracts combined with team incentives in rural Thailand. The incentives increased tobacco abstinence, but their effects tapered off after they were discontinued.

Halpern and others (2015) compared four different types of smoking cessation incentives among employees of a large U.S. firm. Two incentive schemes used simple reward mechanisms while two combined commitment devices with personal deposits with rewards. In addition, two

of the study arms relied only on individual incentives while the two others used group incentives. The authors concluded that reward-based programs were much more commonly accepted (90%) than deposit-based programs (13.7%), leading to higher rates of sustained smoking abstinence, and that group-oriented incentive programs were no more effective than individual-oriented programs.

In developed countries, there is a long history of experiments in contingency management interventions, which, like conditional cash transfers, rely on the mechanism of conditionality to encourage behaviors that are viewed to be in one's long-term interests (or those of society), and to discourage those behaviors that may be ultimately detrimental to one's own health and well-being but might not be easily perceived or experienced as such in the short term. The essential principles of contingency management, as described by Petry (2000, 2001), are to reinforce the treatment goals by carefully monitoring the target behavior, providing tangible, positive reinforcement of the target behavior, and removing the positive reinforcement when the target behavior does not take place.

As with conditional cash transfers, contingency management interventions have been tied to participation and the uptake of services in several domains, although risk behaviors are the important determinant for participant selection, rather than income constraints. Contingency management has been shown to improve drug abuse outcomes (Rawson and others, 2002) and uptake rates of counseling sessions (Petry and others, 2001b); attendance at weight loss sessions; attendance at HIV drop-in center activities (Petry and others, 2001a) and antiviral medication adherence (Rosen and others, 2007); and attendance in smoking cessation clinics (e.g., see Higgins and others, 1994; Petry, 2000; and Emont and Cummings, 1992). Of particular interest, however, is the use of contingency management to elicit a complex behavioral change –

generally, to discourage an unhealthy behavior by positively reinforcing the cessation of that activity (e.g. drug or alcohol abuse, smoking) (Kane and others, 2004). This complexity may require changing multiple behaviors, reversing habit formation and addictive behaviors, and judging uncertainty, such as the likelihood that a behavior will indeed cause a negative test. This type of approach has been studied by clinical psychologists as a therapeutic approach to discourage unhealthy behavioral practices, especially those that may be linked to addiction or other destructive behaviors that are deeply engrained and/ or habit-forming. Contingency management interventions provide “reinforcers” (e.g. incentives or rewards) contingent on an individual’s abstinence from a target drug or behavior. The reinforcement device, often cash payments, vouchers, or prizes, is contingent upon an objective measure of a predetermined therapeutic target. An “objective” measure often means a biochemical measure such as urine toxicology testing or the measurement of breath alcohol or carbon monoxide levels, instead of self-reported compliance which cannot be verified. Given that contingency management has mainly been experimented in high income countries, the monetary value of the incentives is relatively low compared to incomes and is not very likely to operate through the income effect, but rather through the price effect or as a nudge helping to overcome bounded rationality.

The use of contingency management has been most intensively studied as an approach for treating substance abuse. A seminal study by Higgins and others (1994) demonstrated that incentives paid contingent on submitting cocaine-free urine specimens significantly improved treatment outcomes in ambulatory cocaine-dependent patients. Over 50 percent in the treatment condition achieved at least two months of cocaine abstinence versus only 15 percent of the controls. Silverman and others (1996) showed that 47 percent of cocaine abusing methadone patients assigned to the contingency management group achieved more than 7 weeks of

continuous abstinence, compared to only 6 percent of patients in the control group who achieved more than two weeks of abstinence. Similar results have been found for treating opioid dependency (Petry, 2000). While contingency management has also been shown efficacious in treating alcohol abuse (Petry and others, 2000), the studies are fewer because of the difficulties associated with objectively verifying abstinence. Breath, urine, and blood tests can detect alcohol use only up to four to eight hours, which means that effective monitoring would have to take place two or three times a day (Stitzer and Petry, 2006). In an experiment combining incentives for alcohol and cannabis cessation among adolescents, Stanger and others (2017) found that abstinence incentives made no differences at the extensive margin (complete abstinence), but made a difference at the intensive margin by increasing the number of days without alcohol or cannabis.

The contingency management literature, overall, offers useful insights into aspects of the conditionality that appear to elicit the desired behavior change. However, those studies have remained largely experimental and have not been brought to scale (Petry, 2000; Kane and others, 2004). Furthermore, the small sample sizes of study groups – generally involving groups of 20 to 100, and rarely more than 500 – have made it difficult to detect effects that are statistically significant, much less estimate effect sizes accurately.

Obesity

Taxes on unhealthy food are relatively recent, and the evidence is more limited, especially from developing countries. Three recent literature reviews focus on the links among food prices, taxes, and obesity. Powell and Chaloupka (2009) review 196 articles; they conclude that there is limited evidence that weight outcomes could be improved by using fiscal policies, and that substantial price changes are needed to improve these outcomes significantly. Faulkner

and others (2011) find that the evidence supports the existence of an effect of food prices on weight outcomes, but that those price effects are small. Mytton, Clarke, and Rayner (2012) advocate taxes on unhealthy food, but they estimate the tax needs to be at least 20 percent to have a significant impact on health. Overall, taxing unhealthy food is more problematic than taxing alcohol and tobacco because while those two products are not necessary for survival, food is a necessity and in many contexts the cheapest food is not the healthiest.

The use of financial incentives to discourage obesity has also gained in popularity, but the evidence regarding efficacy is decidedly more mixed (see e.g. Follick and others., 1984; Jeffery and others, 1978; and Jeffery and others, 1984). For example, Volpp and others (2008) found significant weight loss from a lottery-based incentive program, but it was not sustained 4 months after the program's end; similarly, John and others (2011) observed that matched commitment contracts led to significant weight loss after 36 weeks, but again it was not sustained during a 32-week post-incentive period. A systematic review of randomized controlled trials of treatments for obesity (Paul-Ebhohimhen and Avenell, 2007) showed no significant effect of the use of financial incentives on weight loss or maintenance at 12 months and 18 months. However, further sub-analysis indicated that large transfers (greater than 1.2% of personal disposable income) had greater impact, as did incentives for behavioral change rather than weight loss, per se, and rewards based on group performance rather than individual results.

One recent example emphasizing behavioral change is the study by Loewenstein, Price and Volpp (2016) conducted in U.S. elementary schools testing whether providing short-run incentives could create habit formation in matters of diet composition in children. Over a 3- or 5-week period, students received an incentive in the form of redeemable tokens for eating a serving of fruits or vegetables during lunch. Relative to an average baseline rate of 39%, providing small

incentives doubled the fraction of children eating at least one serving of fruits or vegetables. Two months after the end of the intervention, the consumption rate at schools remained 21% above baseline for the 3-week treatment and 44% above baseline for the 5-week treatment.

Early Marriage

Child and early marriage have severe adverse implication for girls' health, well-being and education and development potential. This phenomenon is particularly prevalent in South Asia. For example, in 2013 in India, 47% of women aged 20 to 24 were married before age 18 (Nanda and others 2016).

Evidence from the evaluation of the long-term effects of program incentivizing girls to go to and remain in school (a conditional cash transfer in Pakistan and a stipend offering free education for girls in secondary schools in Bangladesh) suggests that schooling incentives can also lead young women to marry later (Alam, Baez and Del Carpio 2011; Hahn and others 2017).

Nanda and others (2016) evaluate a program implemented in the state of Haryana in India, which explicitly conditioned a cash transfer on delaying marriage until at least age 18. Households living below the poverty line or belonging to disadvantaged castes who had a daughter born between 1994 and 1998 were eligible for a two-step cash transfer: 500 rupees within 15 days of delivering the girl and a savings bond of \$2,500 rupees bought by the government in the girl's name within three months of her birth. The bond was anticipated to grow to around 25,000 rupees (about \$384) and could be redeemed at age 18 if the girl was not married. The authors use a quasi-experimental design and instrumental variables to evaluate the program's impact. They find no impact of the program on marriage before age 18. Somewhat surprisingly, they found among a small sample that beneficiaries were more likely to marry

during their 18th year compared to non-beneficiary girls. These exploratory results might suggest that beneficiary households might have waited to receive the benefit, used it to finance the dowry and marriage expenses and then marry off their daughters after they turned 18. The program increased school participation, but not beyond the 8th grade.

Clearly the evidence about such long-term incentives conditioned on not marrying before a certain age is very limited and further studies are needed. However, they present two interesting features worth exploring. First, they go beyond the prevention of behaviors which present a direct health risk. Early marriage is a health risk for the girls, but its negative consequences for well-being go well beyond health. Second, while most incentives to prevent undesirable behaviors operate in the short term and might need to be repeated frequently to be effective, the mechanism tested in India is designed for the long-term. Such design could therefore be used to prevent the occurrence of a behavior before a specified age, either because, like with marriage, the behavior is only detrimental before a certain age or because the behavior is unlikely to happen after a certain age. For example, an incentive to prevent smoking initiation could offer a reward for youth who do not smoke by a specified age, probably between 18 and 25, given that smoking initiation is not frequent beyond that age range. Similarly, an incentive to prevent female genital mutilation could condition a reward on not having been mutilated by a certain age beyond which the practice is not common in the specific cultural context.

Section 4: Sustainability and designs

One very legitimate question about financial incentives to prevent undesirable behaviors is how sustainable they are in the long-term. In other words, will the beneficiaries need to be incentivized life-long or for a long period to choose the safe behavior?

Several competing hypotheses can be formulated when considering the potential long-term effects of time-limited incentives. For behaviors which individuals may not have tried until encouraged to by the incentives (e.g., use of condoms), it is possible that the incentives will induce learning and reinforcement that could result in permanent positive behavior changes even after withdrawal of the incentives. Another possibility is that positive effects would disappear after the incentives are discontinued, implying that long-term impacts can only be attained with frequent incentives.

Alternatively, psychologists have emphasized the potentially pernicious effects of extrinsic monetary incentives in destroying the intrinsic desire to engage in positive behaviors. Cameron and others (2001) review the literature on the possible destruction of intrinsic incentives that would lead to negative effects in the long term and conclude that while this might occur for some high-interest tasks, in general incentives do not have pervasive adverse effects.

Many of the evaluations reviewed in section 3 have explicitly addressed the sustainability issue by adding a post-intervention survey after the incentives were withdrawn. Among the HIV prevention incentives, the results are mixed. On the one hand, an evaluation of the medium-term impacts of the Malawi cash transfer for schooling intervention found that two years after it stopped most of the impacts reducing HIV risk were no longer present (Baird and others 2015). The increase in condom use reported among male sex workers in Mexico City was also short-

lived (Galárraga and others 2017). But on the other hand, in both the Tanzania (cash transfers conditioned on remaining STI negative) and the Lesotho (lottery incentives for being STI free) studies, the effects were shown to be sustained in one-year post-intervention follow-up studies, even though the sustained effects were only found among men in Tanzania (Björkman Nyqvist and others 2018; de Walque, Dow and Nathan 2014).

For smoking cessation incentives, Cahill, Hartman-Boyce and Perera (2015) conclude that they seem to increase quitting rates while they are in place, but that fewer programs managed to yield sustained effects. Nevertheless, Volpp and others (2009), Etter and Schmid (2016), Giné, Karlan and Ziman (2010) and Halpern and others (2015) all report sustained effects 6 months or 12 months after the incentives were withdrawn. Loewenstein, Price and Volpp (2016) also found that incentives for a healthy diet among elementary school children could have sustained impacts in the short term (5 weeks) after their withdrawal.

Overall the evidence on the sustainability of the incentives is mixed and the jury is still out. Most of the evaluations that found impacts after incentives have been discontinued did not go beyond a 12 months post-intervention follow-up. However, it is worth noting that none of the studies reported negative effects in the long term that could be explained by the destruction of intrinsic motivation.

Taxes or rewards?

The design of the incentives could also affect their sustainability. Obviously taxing harmful behaviors will bring revenue to the government and is likely to be more cost-effective than financial rewards given to discourage them. Taxes on tobacco and alcohol (and less frequently on unhealthy food) have been called “sin taxes” and presented as “win-win” measures

that benefit both public health and the government budget. However, the enforcement of such taxes might be complicated and costly, especially when cross-border purchases and smuggling are potentially important. For example, a recent attempt by Denmark to tax fat food products increased prices by 9 percent, but that attempt failed to have public health impacts, in part because of cross-border shopping by consumers in neighboring Germany (Mytton, Clarke, and Rayner 2012). Especially for taxes on alcohol and unhealthy food, another issue is the substitutability across products, allowing consumers to switch from one taxed product to another untaxed, unless taxation is uniform. Finally, taxes on tobacco, alcohol and unhealthy food are usually assumed to be regressive because these products are disproportionately consumed by the poor. This is generally correct, but it is worth balancing that consideration with the fact that the public health effects of such tax measures are likely to be progressive because they will be more likely to benefit the poor (Mytton, Clarke, and Rayner 2012).

Beyond the issue of whether they are progressive or regressive, the choice between positive (financial rewards) and negative (taxes) incentives to prevent undesirable behaviors might also be seen as an issue of fairness. Some people might argue that paying people to quit a behavior that is harmful to them and society is not fair for people who never engaged in this behavior in the first place: why would a smoker be paid an incentive for quitting, when someone who never smoked never received anything? This argument would favor taxation and would cast doubt about the political acceptability of financial incentives to prevent harmful behaviors on a large scale.

Many undesirable behaviors, however, are not easily taxable either because they are illegal (e.g. illicit drugs) or because they are difficult to observe or monitor (e.g. unsafe sex).

It is also worth considering how the design of financial incentives could contribute to their sustainability. This could be because specific design features would make them more effective and/or cheaper to implement and scale up. Two types of designs are particularly interesting to discuss: lottery incentives and commitment devices.

Lottery Incentives

Instead of offering cash payments to eligible participants satisfying the conditions, lottery incentives give lottery tickets allowing to be entered in a lottery drawing with a chance to earn a prize. Usually the prizes would be of higher nominal value than typical cash payments, but in expected value – i.e. taking into account the chances of winning - they could be lower and therefore lead to savings in the reward amounts to be disbursed. Further, when the condition for receiving a reward relies on medical or chemical tests (e.g. an STI, drug, alcohol or tobacco test), procuring and administering those tests constitute a substantial fraction of the program costs. Using a lottery design that first runs a random selection for testing (i.e. the lottery) among all participants and then confirms those participants selected for the tests as lottery winners if they test negative offers substantial savings. Such designs are currently used in ongoing impact evaluations of incentives for HIV prevention among adolescent girls in Swaziland and female sex workers in Tanzania.

Beyond cost savings, lottery incentives might also be more effective. Introducing a gamble into an otherwise standard financial incentive program has two potential benefits. First, with lotteries, the program becomes relatively more attractive to individuals that are willing to take monetary risks. If the willingness to take monetary risks is correlated with other risky behavior, such as smoking, taking drugs or engaging in risky sex, then lottery incentives may better target those at higher risk of engaging in the undesirable behavior. Second, there is growing evidence

from psychology and behavioral economics that people tend to overestimate small percentages, and therefore prefer a small chance at a large reward to a small reward for sure (Kahneman and Tversky, 1979, Kahneman, 2011, Barberis, 2013). If so the perceived return from participating in a lottery is higher than the return from an incentive program that pays the expected return with certainty, or in other words lotteries may provide stronger incentives for behavioral change compared to a traditional CCT holding the budget constant.

In their evaluation of lottery incentives for HIV prevention in Lesotho, Björkman Nyqvist and others (forthcoming) explored whether individuals with preferences for risk are more likely to respond to a prevention scheme with a high but uncertain return conditional on behavioral change. Participants' preference for risk was measured using a hypothetical risk aversion question in the baseline questionnaire: 65% of the participants reported they would prefer a fixed amount of money below the expected value of a lottery instead of taking part in the lottery (risk-averse), while 35% are risk-loving. At baseline, risk-averse and risk-loving individuals had similar demographic and socioeconomic characteristics, but risk-loving participants were less likely to report that they practiced safe sex and more likely to be HIV or STI positive. The impact evaluation results further suggested that risk-loving individuals responded differently than risk-averse individuals to the lottery incentives. Over two years, HIV incidence was 10.5 percentage points higher for risk-loving compared to risk-averse individuals in the control group. HIV incidence among risk-lovers was however 11 percentage points lower in the intervention relative to the control group. The treatment effect for risk-averse participants was insignificant and the point estimate close to zero, so that it is possible that the observed decrease in HIV incidence in the intervention compared to the control group was driven solely by the changed behavior of risk-loving individuals.

While the evidence from the Lesotho experiment is suggestive that lottery incentives might perform better than standard conditional cash transfers, this experiment did not directly compare cash and lottery incentives. In an experiment evaluating incentives for employees to fill their health risk assessment, Haisley and others (2012) directly compare different types of incentives in the same setting and show that lottery-incentives (combined with group incentives) were more effective than cash incentives to incentivize employees to complete their assessments.

Commitment devices

The principles behind commitment devices are very similar to those at play with conditional cash transfers and contingency management, with the difference that individuals pledge their own money upfront, as a deposit, and only get it back if they satisfy the condition. From a sustainability point of view, this presents the advantage that the program is, to a large extent, self-funded by the participants who pledge their own money.

A commitment device is an arrangement entered into by an agent which restricts his or her future choice set by making certain choices more expensive while also satisfying two conditions: (a) the agent would, on the margin, pay something in the present to make those choices more expensive, even if he or she received no other benefit for the payment; and (b) the arrangement does not have a strategic purpose with respect to others (Bryan, Karlan and Nelson, 2010). Commitment devices are a clear acknowledgement of bounded rationality in the behavioral economics framework. Tirole and Bénabou (2004) develop a theory of internal commitments based on self-reputation over one's willpower, which transforms lapses into precedents that undermine future self-restraint.

The voluntary commitment contract to help smoking cessation in the Philippines designed by Giné, Karlan and Zinman (2010) is a good example. Smokers signing the contract pledged their own money that they would be negative in a urine test detecting nicotine and cotinine six months later. After the commitment period, the participants who passed the urine test got their money back (no interest accrued on the account). If they failed the test, the bank donated the money to charity. The participants who were randomly offered the commitment contract were more likely to pass the test for short-term smoking cessation than the control group. These results are consistent with the findings from Gruber and Mullainathan (2005) suggesting that tobacco taxation might make smokers happier as they value it as an effective commitment device.

Commitment devices have also been tested to encourage weight loss in the U.S.-- the evidence is somewhat mixed. On the one hand, Jeffery and others (1978) established that commitment devices contingent on weight loss or calorie counts significantly increased the weight losses compared to the control group and a group with the condition linked to attendance to counseling sessions. On the other hand, Follick and others (1984) studied the effects of a commitment device designed to decrease attrition in a worksite weight-loss intervention. They showed that the commitment device had an impact on attendance to the sessions, but not on weight loss, but it is important to note that the commitment device was only linked to attendance, not on weight loss.

In their review of incentives for smoking cessation, Cahill and Perera (2011) note that commitment devices or deposit-refund trials can suffer from relatively low rates of uptake, but that those who do sign up and contribute their own money may achieve higher quit rates than reward-only participants. This is consistent with evidence from Halpern and others (2015) who

concluded that reward-based programs for smoking cessation were much more commonly accepted (90%) than deposit-based programs (13.7%), but that among those who accepted the commitment device the rate of abstinence at 6 months was 13.2 percentage points higher.

Other features of the incentive designs, such as their frequency and their amount can have an influence on their effectiveness and sustainability. Frequent incentives will serve as frequent reminders and reinforcers and might also bring closer to the present the cost of the harmful behavior, especially for individuals with high discount rates. But as in the example of the bond issued at the birth of a girl but redeemable if the girl reaches age 18 without being married (Nanda and others 2016), it might also make sense to use incentives programmed in the future to achieve long-term outcomes.

Obviously larger amounts would be expected to be more effective, but less sustainable. However, if the incentives function more as a nudge helping to overcome bounded rationality than through the price or the income effect, then relatively small amounts might be sufficient. On this question, the evidence is relatively mixed. For example, among the studies evaluating incentives for HIV prevention, in the evaluation of schooling incentives in Malawi (Baird and others 2010 and 2012), the amount of the incentives did not seem to matter, but in the two experiments conditioning rewards on negative STI tests in Tanzania and Lesotho (de Walque and others 2012 and 2014 and Björkman Nyqvist and others forthcoming) the reward with the highest value was more likely to have a larger impact than the lower value reward. Finally, group incentives have sometimes been tested to prevent undesirable behaviors (see for example Haisley and others 2012 and Halpern and others 2015). While at first sight they might not seem to be very relevant because the decision to engage in those behaviors is primarily an individual one,

given that some of these behaviors are influenced by social norms and peer-pressure, there might be a role for group incentives which should be further piloted and evaluated.

To conclude with the discussion on sustainability and design, it is important to note that, especially in the domain of HIV prevention, but also for the prevention of early marriage, some of the programs that contributed to reducing HIV infections and/or risky sexual behaviors were unconditional cash transfers or conditional cash transfers focused primarily on education (Baird and others 2010 and 2012; Cluver and others 2013; Handa and others 2014; Abdool Karim and others 2015) and not directly conditioned on not engaging in the undesirable behavior. They were broad safety net programs aiming at a large spectrum of objectives including poverty reduction and schooling promotion which brought additional benefits by reducing risky sexual behaviors most likely operating through an income effect. Their cost-effectiveness should therefore be evaluated with this broad set of objectives in mind. In the same line of thought, specific incentives focusing and conditioned on preventing undesirable behaviors could be combined and built within a broader safety net program.

Section 5: Conclusion

Behaviors that are putting people's health and well-being at risk are widespread in the developing world and some of them, like smoking and unhealthy diets, are on the rise. Some of these behaviors can be prohibited or discouraged by taxation. But financial incentives such as conditional cash transfers are also increasingly proposed and tested to discourage such behaviors, in domains as varied as HIV/AIDS, drug, alcohol, smoking, obesity or early marriage prevention.

This paper reviewed the theoretical underpinnings for using such incentives. Depending on their design, the behavior and the population targeted, those incentives can operate through a

price effect, potentially correcting an externality, through an income effect when the behavior is the consequence of a resource constraint or as a nudge when the incentives work to counteract the effects of bounded rationality.

The growing literature about the effectiveness of financial incentives to prevent undesirable behaviors is further reviewed, looking in turn to HIV/AIDS prevention and safe sex, smoking, illicit drugs and alcohol, obesity and early marriage.

Long-term sustainability of such incentives is an obvious question, especially if they are to be scaled up beyond pilot programs and research projects. The current evidence on whether such incentives have an impact after they are discontinued is mixed. In some cases, taxation would be a more effective and sustainable option. However, some design features like lotteries or commitment devices where the participants' own money is pledged could induce savings as well as increase effectiveness, therefore improving sustainability. Further, some of these incentives, rather than being stand-alone programs, could be added and built in on the existing platform of safety net programs.

Many of the financial incentives to prevent harmful behaviors have been piloted and evaluated in high income countries except for incentives for safe sex and HIV prevention which have been mainly evaluated in Africa because the threat of HIV/AIDS is highest there. Given the rise of smoking and obesity rates in many middle- and low-income countries, it is useful to consider how financial incentives for preventing behaviors which are risky to one's health and well-being could be further applied and tested in developing countries.

Finally, the majority of studies included in this review are small scale. While their results are important in showing that the idea of using financial incentives can be a useful tool for

preventing undesirable behaviors, these types of approaches would need to be replicated and implemented on a larger scale before it could be concluded that such incentive programs, for which administrative and often laboratory capacity requirements are significant, offer an efficient, scalable and sustainable prevention strategy.

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