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Better together?
Group incentives and the demand for prevention

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Better together?
Group incentives and the demand for prevention*

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We study the power of combining small financial incentives and social dynamics. In a field experiment in El Salvador, we compare the impact of group incentives to equivalent individual ones to increase uptake of a health check-up. Despite the uncertainty about others' behavior, group incentives are at least as effective as individual ones, thanks to increased communication and collective action between members as well as peer pressure to a lesser extent. Because payment is only made if all members comply, collective incentives prove more cost-effective and appear valuable strategies to overcome financial and behavioral barriers that limit investment in health.

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1. Introduction

Every year, millions of people in low- and middle-income countries die of diseases that could be prevented by the use of simple products or by early screening and treatment.[2] Low demand of preventive care is partly due to the direct and indirect costs that individuals face to access services (Thornton 2008, Banerjee, Duflo et al. 2010). It may also be driven by behavioral factors, such as inaccurate beliefs about the benefits of prevention (Baicker, Mullainathan et al. 2015), or self-control problems which prevent people from following through with their intentions (O'Donoghue and Rabin 2001). While financial incentives that reward individuals for adopting specific behaviors have been an effective tool to overcome some of these barriers, behavioral barriers often persist for many (Thornton 2008, Banerjee, Duflo et al. 2010, Okeke and Abubakar 2020, Banerjee, Chandrasekhar et al. 2021). Meanwhile, recognizing that social forces can be motivating drivers for individuals, a growing interest has emerged to understand how interventions can use social interactions to encourage the adoption of healthy behaviors (Karing 2018, Breza and Chandrasekhar 2019).

In this paper, we study whether incentives conditional on group behavior (hereafter "group incentives") can leverage social effects and enhance the impact of monetary incentives to encourage the demand for preventive care. Incentivizing groups rather than individuals could present two benefits. First, group incentives could leverage a range of social dynamics, helping individuals overcome behavioral obstacles that are not addressed by individual incentives. For example, some members of the group might remind or nudge others to go. Group members could also make plans to go together, adding the benefits of planning and social accountability (Rogers, Milkman et al. 2015). Second, group incentives may be a cheaper alternative to equivalent individual ones because group conditionality means that individuals who adopt the desired behavior are not paid if they belong to a group where not everyone complies. Despite these potential advantages, group incentives have seldom been used to encourage investment in health.[3] This reluctance could be due to two potential

[2] Insecticide-treated bed nets and water chlorination dramatically reduce the incidence of infectious diseases such as malaria or diarrhea, while non-communicable diseases such as diabetes, hypertension, and even certain cancers can be easily treated or managed if they are detected early through preventive screening.

[3] To our knowledge, only a few examples of studies in the health literature have tested group incentives to encourage the adoption of healthy behaviors over a given period, such as smoking cessation or exercising (Haisley, Volpp et al. 2012,

sources of uncertainty which lower the expected value of a reward in group incentives. First, the uncertainty about whether other group members will comply with the targeted behavior is likely to reduce the expected value of the incentive. Second, there might be some delay in payment of the incentive if a complying individual must wait until the last member of her group uses the targeted service to receive a reward. Overall, whether the benefits of social dynamics can outweigh the lower expected value of the incentive, and for whom, is an open empirical question.

To study the effect of group incentives, we partner with a micro-finance institution (MFI) in El Salvador that promotes preventive check-ups to improve the detection and monitoring of risk factors for cardiovascular diseases (CVDs). We enroll 400 existing loan groups of relatively small size (between 3 and 7 members) and provide a voucher to all group members for a free preventive check-up, which includes a blood test and a medical consultation. Loan groups are randomized into treatment arms to receive no incentive (control), incentives linked to individual behavior (individual incentives), or incentives tied to the behavior of all group members (group incentives). Importantly, all incentives are financially equivalent, worth USD5 in expectation to individuals. In addition, we implement two different designs for group and individual incentives. In the first design (*cash reward*), the individual (group) incentive is a small monetary reward paid after the individual (all group members) completes the preventive check-up. With this design, individual and group incentives differ not only in terms of the conditionality but also in the timing of their payment. Specifically, in the group variant, the first member of a group who completes their check-up must wait until the last group member completes theirs to earn the reward. To compare group incentives to pecuniary equivalent individual incentives with the same payment timing, we implement a second design (*lottery*), where all individuals (groups) are informed that at the end of the study period, some individuals (groups) will be randomly chosen and earn a large prize provided they (all members of the group) had completed the preventive check-up. We carefully design the incentives to ensure that, from an individual standpoint, the expected reward is the same across all treatment arms (USD5). Using administrative data from the voucher system, we have precise information on the timing of the

Kullgren, Troxel et al. 2013, White, Dow et al. 2013, Patel, Asch et al. 2016, White, Lowenstein et al. 2020), but not to encourage the uptake of preventive care services.

visits to the laboratory and to the clinic, and we follow up with participants after one to three months using phone surveys, given the pandemic-related constraints in 2020.

We first look at the overall effect of incentives on uptake of the preventive check-up. Despite the uncertainty of the reward, group incentives work as well as, if not better than individual incentives. In the control group with no reward, only 15.5% of individuals complete the free preventive check-up. Incentives more than double this level of demand, increasing the take-up rate by 17 percentage points (pp) (108% increase) with individual conditionalities and 22 pp (140% increase) with group conditionalities. When incentives take the form of *cash rewards*, individual and group incentives have a similar effect, suggesting that the social effects of group incentives compensate for the delayed payment due to the collective conditionality. When incentives are *lotteries* and the timing of the payment is the same whether the conditionality is individual and collective, group incentives outperform individual ones, increasing the demand by 22.8 versus 12 pp (147% vs. 77% increase).

Taking advantage of the two-step process involved in the check-up we study, we evaluate if incentives increase the demand for prevention by encouraging more individuals to start the check-up process or by reducing the diagnosis drop-out —the share of those doing the blood test but not picking up their results at the clinic, which represents 25% of individuals in the control group. We find suggestive evidence that group and individual incentives act differently. Group incentives double the proportion of starters (those who do the lab test), while individual incentives only increase it by 65%. The difference is particularly marked for lotteries. Meanwhile, individual cash rewards, the only incentives paid immediately after the consultation, virtually eliminate the diagnosis dropout. Other incentives reduce it too, but not as much. Under the assumption that anyone who does the blood test (where no incentive is received) values receiving their results, the dropout seems driven by people who update upwards the perceived costs of the visit.

Next, we find that individual incentives, not group ones, are more effective for individuals with higher health needs. Specifically, the impact of individual incentives is concentrated among individuals with higher baseline CVD risk and those who have done preventive visits before. The lack of targeting effect of group incentives is consistent with their universal conditionality, which encourages everyone to do the check-up, regardless of individual perceived needs.

We identify communication and collective action as the key social dynamics through which group incentives operate. Communication between group members about the preventive check-ups is both more prevalent and more effective with group incentives, i.e. leading to more knowledge about peer behaviors. Communication likely acts as a form of monitoring that reduces information asymmetry and uncertainty about others' behaviors. But the greater impact of group incentives also suggests that it helps disseminate information about and increase interest in the check-up. Collective action is also more prevalent with group incentives, with evidence of coordination with fellow group members to attend the lab or the clinic. This again may be a form of monitoring, but also planning and social accountability which help individuals follow through on their intentions. We find some suggestive evidence that peer pressure may also be one of the social dynamics at play, though it is not very prevalent or strong. We also rule out that group incentives work by reducing social stigma, diminishing the influence of unhealthy social norms, harnessing social connections or helping impatient individuals. Overall, this evidence demonstrates that group incentives trigger simple but effective social dynamics that act as targeted interventions (e.g., planning, motivational chats, social commitment), which not only increase the perceived value of the preventive visit but also help individuals overcome behavioral barriers.

Finally, we show that group incentives are more cost-effective than individual ones to increase the detection of new risk factors. Using the random allocation to incentives as an instrument, we show that the preventive check-up does not lead to significant behavioral changes but increases the detection of new risk factors for CVDs by 47pp. Since group incentives are only paid when *all* members complete the check-up, on average, group incentives are more cost-effective than individual ones, at USD23.8 versus USD32 per new diagnosis. Assuming that all individuals have the same probability of managing their diagnosed risk factors effectively, all financial incentives appear as cost-effective interventions to improve health outcomes, at USD48 per disability-adjusted life-year (DALY) averted for group incentives and USD608 for individual incentives.

Our paper contributes to three strands of literature. First, it adds to the empirical literature studying the effects of group incentives. Despite their potential effectiveness and ubiquity in the workplace, economists have seldom explored the impact of group incentives. Most economic studies have focused issues of free-riding in team production and have not compared individual and group incentives (Burgess, Propper et al. 2010, Bandiera, Barankay et al. 2013, Friebel, Heinz et al. 2017). A few studies in the health literature have tested the effects of group incentives to encourage the adoption of healthy behaviors over a period of time, such as exercising (Haisley, Volpp et al. 2012, Kullgren, Troxel et al. 2013, Patel, Asch et al. 2016) or smoking cessation (White, Dow et al. 2013, White, Lowenstein et al. 2020). Our study adds to this literature in several ways. While group incentives studied in health focused on behavior change over a period of time, we look at a discrete decision to invest in preventive care. Given the burden of CVD diseases, and the absence of salient symptoms for a long time, this decision is critical for starting treatment early and preventing deaths. Next, we explore and identify several social dynamics through which group incentives operate. Our results suggest that group incentives help address behavioral barriers that limit the demand for prevention in ways that simple financial incentives cannot. We also study the cost-effectiveness of group incentives and thereby demonstrates its potential interest. Finally, similarly to studies (and applications) of team production, but unlike most examples in health, we study the potential benefits of group incentives in a context where members share existing social links. Whilst this may limit the external validity of the results to exogenously formed groups, the ubiquity of small social networks in low- and middle-income countries provides many opportunities to introduce strategies that harness group dynamics (Díaz-Martin, Gopalan et al. 2022).

Second, we contribute to the literature studying the role of social dynamics on individuals' behaviors. Seminal studies in the US have shown that the adoption of health behaviors such as smoking (Christakis and Fowler 2008) or alcohol consumption (Rosenquist, Murabito et al. 2010) diffuse in social networks. Some studies in low-income settings have shown the role of social learning and peer effects to acquire information or adopt new technologies (Kremer and Miguel 2007, Oster and Thornton 2012, Dupas 2014). Our study is also closely related to the empirical study of interventions that can harness the power of social networks to encourage desirable behaviors, such as increasing savings (Kast, Meier et al. 2018, Breza and Chandrasekhar 2019) or adopting new technologies in agriculture (Beaman, BenYishay et al. 2021) or health (Karing 2018, Karing and Naguib 2018). In this study, we focus on a new strategy –group incentives, to harness social dynamics to encourage investment in health. The range of social interactions we identify not only reduce information asymmetry within groups to limit uncertainty and increase the expected value of group incentives, but they also contribute to addressing barriers that limit the demand for prevention. As group incentives create room for social utility as a driving force for individual behavior, we show that it comes at the expense of efficiently targeting individuals with higher private benefits.

Finally, we contribute to the literature on the demand for healthcare in low-income settings. Several experimental studies have looked at the effect of small price changes (Ashraf, Berry et al. 2010, Okeke, Adepiti et al. 2013, Cohen, Dupas et al. 2015, Dupas, Hoffmann et al. 2016) and subsidies (Banerjee, Duflo et al. 2010, Okeke and Abubakar 2020, Banerjee, Chandrasekhar et al. 2021) on the demand for preventive health products and services.[4] Our paper speaks more directly to the literature looking at the effects of incentives on the demand for testing, a key pre-condition to a successful treatment for many conditions. Experimental studies in low-income settings have examined how price (Okeke, Adepiti et al. 2013, Cohen, Dupas et al. 2015, Li, Meng et al. 2020), information avoidance (Li, Meng et al. 2020) or access to treatment (Okeke, Adepiti et al. 2013, Wilson 2016) influence the demand for disease screening. Other studies have explored how simple interventions such as small financial incentives (Thornton 2008) or SMS messages (Wagstaff, van Doorslaer et al. 2019) can reduce the diagnosis “dropout”, i.e. the failure of tested individuals to collect their test results. In this study, we examine the impact of financial incentives on *both* initial screening take-up and diagnostic dropout. Our study also relates to the work of Goldberg, Macis et al. (2023) who showed how peer knowledge can be leveraged to increase referral for testing of symptomatic individuals. Here, we study another strategy (group incentives) to leverage peer influence and its associated social dynamics, in the context of asymptomatic non-communicable diseases.

2. Background

2.1. CVDs and preventive care

In 2019, an estimated 17.9 million people died from CVDs, representing 32% of all global deaths and surpassing deaths due to infectious diseases, nutritional deficiencies, and maternal and perinatal

[4] For a review of this literature, see Dupas and Miguel (2017).

conditions combined (Murray, Aravkin et al. 2020). Three quarters of these deaths occurred in low- and middle-income countries. Because people often fail to access services to detect the risk factors for CVDs or detect them in the early stages of the disease, people in low- and middle-income countries die at younger ages from CVDs, often in their most productive years.

The main pathological process behind the development of CVDs, called atherosclerosis, is influenced by several risk factors: tobacco use, an unhealthy diet, and physical inactivity, which together result in obesity, elevated blood pressure (hypertension), abnormal blood lipids (dyslipidemia), and elevated blood glucose (diabetes). Continuous exposure to these risk factors causes CVD to become worse. This can then result in the narrowing of blood vessels and obstruction of blood flow to vital organs, such as the heart and the brain, causing, respectively, heart attacks or strokes, which often leads to death or severe disability.

Despite the fact that CVD caused deaths are widespread, many can be prevented through timely and sustained lifestyle interventions and, when needed, the use of effective drug treatment to manage diagnosed risk factors such as hypertension, high cholesterol, or diabetes (World Health Organization 2007). Evidence-based recommendations on how to manage individuals with asymptomatic CVD depend on their estimated total CVD risk, defined as their probability of experiencing a CVD event over a given period—typically 10 years. Identifying an individual's CVD risk requires detecting risk factors, but because these risk factors (and atherosclerosis) can remain asymptomatic for a long time (Bovet, Chiolero et al. 2015), many people remain undiagnosed and untreated, particularly in disadvantaged groups and in low- and middle-income countries (Chow, Teo et al. 2013, Ataklte, Erqou et al. 2015). For this reason, the World Health Organization (WHO) recommends opportunistic and routine screening by health care providers, especially in the presence of known risk factors (e.g., obesity). Once risk factors are detected, regular monitoring is necessary. For lower-risk individuals, it is recommended that they are monitored on an annual basis, while higher-risk individuals should have routine appointments every three months.

2.2. Study setting

This study was conducted in El Salvador, a lower-middle-income country in Central America, where deaths from CVDs account for about a third of mortality (Barceló, Gregg et al. 2011). Efforts in recent decades to reduce mortality from CVDs have remained ineffective (Ordunez, Prieto-Lara et al. 2015), mainly because of the combination of the high incidence of CVD risk factors[5] and low access to preventive services, particularly among the poorest segments of the population, which limits both early detection and effective monitoring (World Health Organization 2018). In El Salvador, 70% of the population receive health services from the public sector. To enhance access to these health services, including better monitoring and detection of non-communicable diseases, the government introduced a major reform in 2009 that increased coverage through a network of primary care units and abolished user fees at the point of care. Nevertheless, indirect costs and quality issues—long waiting times, medication shortages—remain considerable barriers in the public sector (Carrillo, García et al. 2020, Sánchez, Anaya et al. 2020).

This study was developed in collaboration with ASEI, a MFI that operates in El Salvador and provides loans to more than 23,000 local micro-entrepreneurs through a network of 11 agencies in urban and rural areas. Having identified hypertension, diabetes, and obesity as some of the main health problems of its clients, ASEI encouraged them to invest in preventive care. In 2014, the MFI organized a text messaging campaign raising awareness about CVD risks and encouraging routine preventive medical visits. In 2018 and 2019, it opened a clinic next to its agencies in San Salvador and Soyapango, giving the opportunity to all clients to receive free consultations with a medical doctor. As consultations at the clinics remained low, we partnered with ASEI to explore new ways to encourage the demand for preventive CVD check-ups.

3. Experimental setting and design

3.1. Experimental setting

The recruitment for the study was conducted between September 2019 and January 2020 at the agency of ASEI in Soyapango. To be offered a group credit, at least three individuals must approach the MFI together and undergo a financial screening.[6] If their application is successful, the group

[5] Estimates suggest that in 2015 almost 40% of adults suffered from hypertension, 25% were obese, and 12% had diabetes (Ministerio de Salud/Instituto Nacional 2015).

[6] ASEI offers two types of group credits, called Grupos Solidarios (GS) and Bancos Comunales (BC), which differ in group size, maximum loan amount, and monitoring requirements. BC target poorer individuals and must include a minimum of seven members, while GS include

receives the loan on the condition that all group members be present on the day of disbursement and all remain jointly liable for repaying the credit, in weekly installments. Groups applying to both types of loans were eligible to participate in the study as long as at least three individual members of the group were willing to participate. There was no restriction of age or health status, and groups were invited to participate in the study on the day of their loan disbursement.

Once a group agreed to take part in the study, enumerators administered a baseline survey to each member individually. The survey covered demographics and socio-economic characteristics, basic health measures (heigh, weight, and blood pressure taken as the average of three separate measures), individual preferences (risk and time), relationships with other members of the group, and questions about known diagnoses of the main CVD risk factors (hypertension, diabetes, obesity, and high cholesterol). We combined demographic (gender and age) and health characteristics (obesity, blood pressure, diabetes) to estimate an individual-specific 10-year CVD mortality risk by following the Globorisk algorithm (Hajifathalian et al. 2015).

Immediately after the baseline survey was administered, each respondent was given a voucher to access a free health check-up within two months. The preventive check-up consisted of two parts. First, a blood test was to be undertaken at a local laboratory to obtain measures of three key markers of CVDs (glucose, total cholesterol, and high-density lipoprotein cholesterol). Second, after the blood test results were available—usually the next day— the individual could go to the MFI clinic for a medical consultation with a doctor.[7] The consultation would focus on discussing their CVD risk factors, lifestyle and dietary habits, and the potential need for medical treatment. Overall, the check-up represented a high-quality healthcare service, estimated at USD38.[8]

3.2. Experimental design

After all members of a group had completed the baseline survey and received a voucher, they attended a short talk together. They first received basic health information on the prevalence of CVDs

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a minimum of three and maximum of seven members. The individual loan that BC members can obtain is capped at a lower level than for GS members. Finally, BC clients are required to meet weekly with MFI staff to receive support and financial literacy education.

[7] Note that the two components of the check-up were only valuable in combination since individual blood tests could not be obtained from the laboratory but from the clinic.

[8] In the private sector, a similar blood test would be charged approximately USD16 for the blood test, and a consultation with a medical doctor would cost USD22.

in El Salvador, their causes and potential consequences, and the benefits of regular preventive controls (early detection and treatment, monitoring). They were then given detailed information about the voucher, including conditions of use and any incentive offered.[9]

There were five types of incentives offered, randomized at the loan group level, stratified by group type and size (see the experimental design in Appendix Figure A2 and more details about the randomization procedures in Appendix B) as follows: no incentive (control), an individual cash reward, a group cash reward, an individual lottery, or a group lottery:[10]

In the control arm, participants were not offered any incentive to do the free medical check-up.

In both cash reward arms, participants could earn USD5 for doing the full check-up. In the *individual cash reward* arm, individuals would receive the reward immediately after the medical consultation. In the *group cash reward* arm, groups of N members were given a reward worth N × USD5, received after the last member had completed the full check-up. Hence, unless all group members did their consultation at the same time, there would be a delay between the moment the first member of the group completed the medical consultation and when they received the incentive.

In both lottery arms, participants had a 5% chance of winning USD100 if they completed the full check-up. In the *individual lottery* arm, individuals were informed that out of the 400 individuals expected to be part of this treatment arm, 20 would be drawn at the end of the study period.[11] A lottery winner who had completed the check-up would receive USD100, but would get nothing if they had not done the full check-up.[12] In the *group lottery* arm, a group of N members could win a prize worth N × USD100. Groups were informed that, four of the 80 groups randomized to this treatment

[9] Anyone could ask questions to clarify any information, and each person received a leaflet providing a summary of all the information received orally. The voucher itself clearly indicated the key information, including its expiry date, the services offered, and relevant incentives. Appendix Figure A1 shows an example of the five types of vouchers used.

[10] To prevent any manipulation of the allocation of groups to treatment arms, the MFI staff were all blinded to the randomization sequence.

[11] Because enrolled groups were on average smaller than expected, only 331 individuals were part of this treatment arm and entered the individual lottery. Hence the true probability of winning conditional on completing the take-up was 20 out of 331, or 6% (0.0604). Since participants were only ever aware of the 5% expected probability (20 out of 400), the discrepancies between arms are trivial and would not have affected individual decisions.

[12] This amount is far from substantial and would not provide winners an opportunity to improve their status (Friedman and Savage 1948). However, it remains significant and highly valuable, equivalent to about a quarter of the average loan requested by an individual to the MFI.

arm would be drawn in a lottery at the end of the study period.[13] Similarly to the individual lottery, the prize would only be paid to a winning group if *all* members of the group completed the full check-up (blood test and medical consultation).

Hence, assuming a group splits the group reward evenly between group members,[14] from an individual standpoint the value of the incentive is the same for group and individual incentives (USD5).[15,16] The key difference between group and individual incentives is the payment conditionality, which is linked to the behavior of *all* members in group incentives. In other words, if anyone defaults, no one earns anything. This is a stringent condition and one that departs from the few group incentives tested in the medical literature, where only some members of a group have to comply with the conditionality (Haisley, Volpp et al. 2012, Kullgren, Troxel et al. 2013). Yet, it is consistent with the WHO objective of opportunistic screening and monitoring check-ups, where the objective is to encourage everyone to attend screenings. This design also eliminates concerns of free-riding and only leaves open the role of social effects, which we describe further in Section 4.

Note that the timing of the payment is not held constant across treatments for three reasons. First, to keep salient the main difference between group and individual incentives linked to a one-off decision, which is that the individual incentive can be earned immediately after task completion while it may not be the case with a group incentive. In other words, the group conditionality is driving the potential difference in the timing of the payment between the individual and group variant. Second, we decided against delaying the payment of cash bonuses to the end of the study period (i.e. at the same time as the lottery) to maintain the external validity of the intervention (small cash incentives are never paid with long delays). Third, and directly linked to the second reason, delaying the payment of a small incentive would likely have weakened its effectiveness.

[13] Only 79 groups ended up being allocated to the group lottery arm, leading to a probability of 0.0506.

[14] To our knowledge, an unequal split never happened.

[15] The average cost of a round trip from home was approximately USD0.70. Hence the USD5 reward was more than enough to cover the travel costs of two return trips needed to do the blood exam and the consultation separately.

[16] The reward of US$5 represents a little more than 10% of the average daily sales of participants in our study (US$ 45.51), while the US$100 reward represents slightly more than two days of sale or 16% of the average individual loan amount (US$ 632).

3.3. Administrative data and follow-up interview

For everyone enrolled in the study, we have detailed data from the voucher use, including whether and when an individual used their voucher to do the blood test at the lab and whether and when they went to the subsequent medical consultation. We also know whether an individual requested to obtain their blood results from the clinic without doing a medical consultation. We planned to conduct face-to-face interviews with all respondents from our baseline survey, but the COVID-19 epidemic and the stringent lockdown measures introduced in El Salvador at the end of March 2020 forced us to conduct the follow-up interviews by phone instead.[17] Despite the challenging and unexpected circumstances of the follow-up survey, we were able to successfully reach 96.5% of the baseline participants.[18] Of all baseline participants, 0.86% refused to respond and 2.64% could not be reached despite multiple attempts and contacts with their fellow group members. Appendix Table A1 shows that attrition was not systematically different across treatment arms. The follow-up interview was designed to identify the ways in which the incentives had worked and to capture the potential benefits of prevention. The phone interview had to be short, so it only included four main modules: health-related behaviors and outcomes, information received during the CVD consultation, group interactions, and reasons for not using the voucher.

3.4. Sample characteristics and balance

Table A2 reports summary statistics and balance checks for the characteristics of individuals (Panel A) and groups (Panel B). Panel A shows that 84.7% of study participants are women, aged 43.5 on average, with limited education (60.2% have no or basic education), and 53.8% live under the poverty line. In general, study participants are not in good health. Overall, 46.8% have been diagnosed with hypertension, high cholesterol, or diabetes, but nearly half of them (49.5%) remain untreated.[19] Many participants also have undiagnosed health issues: our baseline measures indicate that 30.3% (59.5%) suffer from hypertension (obesity) but 38.3% (66.8%) of those remain undiagnosed. Combining health

[17] While the start of the pandemic disturbed the follow-up survey, use of the vouchers was not because the last voucher expired by the middle of March and before any restrictions or curfews were implemented.

[18] To increase survey participation, individuals were entered into a lottery to win vouchers worth USD50 to spend at a local grocery store chain.

[19] Of those diagnosed with hypertension, diabetes, and high cholesterol, respectively 31.6%, 19.6% and 67% remain untreated.

outcomes with individual characteristics (age, sex, smoking status), we find that nearly 15.7% of the population has a medium or high CVD mortality risk.[20] Usage of services is generally high, with an average of 1.1 visits to a healthcare facility in the past three months. However, use of preventive care is low with only 14.8% of participants who have ever done a preventive visit. Panel B shows that the loan groups are relatively small, with an average of four members.[21] The balance checks indicate that all characteristics are balanced across treatments, except for one variable (being under treatment for diabetes), which is expected to happen by chance.

4. Conceptual framework

To understand the expected effects of the different incentives in our experiment, we develop a simple model of the demand for the preventive check-up.

In the absence of any intervention, individuals gain $U_i = \delta^T h_i - C_i$ from completing the preventive check-up, where h_i, are the future health benefits from the check-up relative to no check-up, discounted by a factor δ_i^T and C_i is the cost of doing the check-up, which encompass both pecuniary and non-pecuniary costs. Consider now a program which introduces a bonus payoff for completing the preventive check-up, in the form of individual or group reward. With individual rewards, individual i earns a pecuniary benefit $b_i = r > 0$ immediately after completing the check-up or nothing if they do not do the check-up. With group rewards, the payment is made only when all members of their group have also completed the check-up. We define p_j as the probability that individual i assigns to all other group members completing the check-up, and δ_i^ε the factor by which she discounts the reward, with $\varepsilon \geq 0$ the time at which the last member of the group completes the check-up.[22] We also allow for the possibility that person i derives non-pecuniary benefits from doing the check-up through social effects captured by a term noted $\sigma_i \geq 0$. We remain agnostic about the nature of these effects, which can be a mix of satisfaction to conform to a group norm or behavior, an increase in the perceived health benefits h_i following information or reminders received from others, or a reduction in non-

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[20] Medium risk corresponds to a 10%–20% probability of dying from a CVD within 10 years; a high risk corresponds to a probability greater than 20%.

[21] Appendix Figure A3 shows the distribution of group sizes.

[22] Note that $\varepsilon \ll T$ because the reward is earned in the near future (at most three months), while health benefits are in the distant future.

pecuniary costs C_i (e.g. support from others to plan the visit). Under each of the three conditions, individual i undertakes the check-up only if:

Control group: $\delta^T h_i > C_i$

Individual reward: $\delta^T h_i + r > C_i$

Group reward: $\delta^T h_i + \delta_i^{\varepsilon} p_j r + \sigma_i > C_i$

Based on this, the demand for prevention should be higher in the individual reward conditions that in the control group. In addition, in the absence of social effects ($\sigma_i = 0$), individual rewards should be more effective than group rewards, due to the uncertainty about fellow members' behavior ($p_j < 1$) and, in the case of the cash rewards, the discounted delayed group payment ($\delta_i^{\varepsilon} < 1$).[23] On the other hand, if group incentives are as effective as individuals ones, we can interpret this as evidence that social effects are large enough to compensate for the lower expected monetary gains caused by the uncertainty about others' behaviors, and the delay in payment. Alternatively, group members could coordinate so that individual i has no doubt about their group completion ($p_j = 1$) *and* receives their reward immediately after the check-up ($\delta_i^{\tau} = 1$). For example, this could be the case if group members coordinate with one another to do the check-up together.

In a program where the incentive for completing a check-up comes in the form of a lottery with pay-out pay-out R received at time $t = \tau$, an individual i undertakes the check-up if:

Individual lottery: $\delta^T h_i + \delta_i^{\tau} E[R] > C_i$

Group lottery: $\delta^T h_i + \delta_i^{\tau} p_j E[R] + \sigma_i > C_i$

As before, the uncertainty linked to group conditionality (p_j) means that take-up should be higher with the individual lottery, unless social effects exist ($\sigma_i > 0$). Note that the conditions for equal effectiveness are less stringent with lotteries compared to rewards, as there is no difference in the timing of the payment between the individual and group variants.

In sum, the model clarifies that the uncertainty linked to other members' behaviors, as well as the difference in payment timing (for rewards), are two reasons to expect take-up to be higher with individual incentives. It follows that equal effectiveness of individual and group incentives should be

[23] Both sources of uncertainty mean that $r > \delta_i^{\varepsilon} p_j r$

interpreted as evidence that group dynamics are triggered that help increase the demand for prevention through three potential (non-mutually exclusive) mechanisms: by reducing the source of uncertainty, increasing the benefit of the check-up or lowering the cost faced to do it.

5. Results

5.1. Demand for preventive check-up

We first evaluate the overall effect of group incentives, by pooling the two types of incentive designs together. We estimate regressions of the following form:

$$y_{ig} = \alpha + \beta_1 individual_g + \beta_2 group_g + Z_g'\zeta + \varepsilon_{ig}, \quad (1)$$

where y_{ig} is an indicator variable reflecting the take-up decision for individual i in loan group g. The binary variables $individual_g$ and $group_g$ indicate whether group g was randomly assigned to an individual incentive arm or a group incentive arm, and coefficients β_1 and β_2 capture the impact of each type of incentive. We include a vector of stratification variables Z_g (group type and size). Standard errors are clustered at the loan-group level, the unit of randomization.

We also evaluate separately the average effect of the four incentive designs, estimating regressions of the following form:

$$y_{ig} = \alpha + \beta_{11} ind\_cash_g + \beta_{21} gr\_cash_g + \beta_{12} ind\_lot_g + \beta_{22} gr\_lot_g + Z_g'\zeta + \varepsilon_{ig}, \quad (2)$$

where ind_cash_g, gr_cash_g, ind_lott_g, and gr_lott_g are binary variables indicating whether group g was randomized to the individual cash reward, group cash reward, individual lottery, or group lottery treatment arm, respectively; and the coefficients β_{11}, β_{21}, β_{12}, and β_{12} capture each incentive's impact. While the above specifications reflect our experimental design, the results are robust to alternative specifications including individual controls or the double LASSO procedure of Belloni, Chernozhukov et al. (2014) – see Table A3. In addition, for each specification, we report sharpened q-values adjusting for testing multiple hypotheses using the false-discovery-rate methodology presented by Benjamini, Krieger et al. (2006) and Anderson (2008).[24] Following Hess (2017), we also report randomization inference p-values based on 2,000 permutations.

[24] We calculate the number of hypotheses tested separately for the pooled or disaggregated results. For example, if we test 3 outcomes, there are 6 hypotheses in the pooled analysis (3 outcomes and 2 coefficients), and 12 hypotheses in the disaggregated analysis (3 outcomes and 4 coefficients).

Table 2, Panel A presents the pooled results (equation 1). The preventive visit take-up is low in the control group, with only 15.5% of individuals seizing the opportunity to do the free medical check-up (Column 1). In this context, incentives more than double the take-up. Individual incentives increase the likelihood of completing the preventive check-up by 16.8 pp, versus 21.7 pp for group incentives, corresponding to relative increases by 108% and 140%, respectively. Contrary to what standard economics would predict, the impact of group incentives is similar to that of individual ones (p-value = 0.260). This large effect size is comparable to the average impact of individual incentives for CVD screening in high-income settings (Cheong, Liew et al. 2017). Additional analysis also shows no difference between group and individual incentives in terms of the timing of the check-up completion (see Appendix C). Looking at the disaggregated results by incentive type (Table 2, Panel B), we find that group lotteries even outperform equivalent individual ones. In the form of small cash rewards, individual and group incentives are equally effective at increasing the demand for prevention, respectively, by 21.6 and 20.5 pp. The fact that group incentives perform as well as individual incentives ($p = 0.865$) is remarkable given that it occurs *despite* the difference in timing to receive the monetary reward –immediately after the consultation for individual cash rewards relative to an average delay of 4.5 days in the group cash reward (see Appendix Figure A4 for the distribution of waiting time between own appointment and receipt of reward).[25] When incentives are designed as a lottery and payment is made at the same time for both, group incentives appear even more effective than individual ones, increasing the take-up of the check-up by 22.8 pp versus 12.0 pp for individual lotteries (p=0.063). Overall, these results suggest that group incentives create social dynamics that are strong enough to overpower the uncertainty in other members' behaviors (lotteries), but also offset the combined effect of uncertainty of others' behavior and delayed payment (cash rewards).

Next, we explore whether incentives work by attracting more individuals to complete the check-up or by reducing the diagnosis dropout—i.e., the proportion of individuals who, conditional on going to the lab, do not go to the clinic. The effect of incentives on the initial take-up is shown in Table 2, column 2, while the proportion of those who drop out is shown in column 3.

[25] In groups randomized to the group reward arm where all members completed the check-up, 50.6% of members did not wait for receiving their reward because they completed last. Conditional on waiting at least one day (i.e. not completing the check-up last), the average waiting time was 5.9 days.

Three results emerge from this analysis. First, all incentives significantly increase the share of individuals initiating the 2-step process, respectively by 65% and 100% for individual and group incentives. Since individuals do not earn any payment for doing the blood test, this suggests that incentives increase the perceived value of prevention in general. This effect appears marginally stronger for group incentives (p=0.106), a difference mainly driven by lotteries.[26] Second, we observe a large diagnostic drop-out in the control group, where 25% of those who do the blood test fail to go to the clinic to obtain their results. Unlike in the case of repeat vaccinations, we can rule out the idea that individuals do not value (or understand the value of) the follow-up visit, as the utility derived from doing a blood test without getting the result seems very limited.[27] One possible explanation for the diagnostic drop-out is that, following the first step, individuals update their perception of the costs of the visit upwards. Consistent with that interpretation, our third result shows that incentives significantly reduce dropout rates, to only 6% and 10% for individual and group incentives, respectively. Amongst all treatment arms, individual cash rewards appear the most effective at sustaining motivation after the lab visit, reducing the dropout rate to only 2.6%, versus 9%–10.4% for the other incentives. Since this is the only treatment where individuals earn a reward immediately after the consultation, this result is consistent with the notion that the diagnostic dropout is driven by individuals postponing their second visit due to high perceived costs.

5.2. Heterogeneous effects

A key question for a policy subsidizing health service use is whether it benefits those with higher needs (Ashraf, Berry et al. 2010, Dupas 2014, Dupas, Hoffmann et al. 2016). In our context, we first consider two measures of health needs to investigate the targeting effects of incentives: (i) an objective measure of CVD risk used in the medical literature based on demographic and health information collected at baseline, (ii) a subjective measure of health needs, in the form of self-reported prior use of preventive care. For each measure, we explore whether incentives differentially encourage individuals with higher needs or not. In addition, given past evidence highlighting the role of indirect

[26] For cash rewards, the take-up of the blood test is 37.7% for the individual variant and 39.4% for the group one. For lotteries, this is 30.5% and 42.6%, respectively.
[27] Arguably the pain associated with the blood test can yield a negative utility.

costs as a main barrier reducing the demand for prevention (Thornton 2008), we use a measure of indirect costs faced by individuals to do the check-up[28] and explore if the incentive encourages more those with higher costs (above median). Table 3 presents the results, with column headings listing the interacted variable. Table A4 confirms that the results are robust to including controls.

Looking at whether incentives differentially impact those considered at higher health needs, we find that individual incentives, but not group incentives, have a targeting effect, i.e. they encourage more uptake of individuals with higher needs. Looking at a baseline measure of CVD mortality risk (column 1), individual incentives increase the uptake of people with above-median risk by 10pp. Take-up of the preventive check-up is also higher for those who have used preventive services before in the individual incentive arms: the probability of completing the consultation is 16.7 pp higher in this group (column 2), an effect that is also concentrated in the individual cash reward arm. Looking at the indirect costs faced by individuals to access health services, we find no evidence that incentives encourage more those facing higher barriers (column 3).

Overall, these results suggest that group incentives are inadequate to encourage individuals with higher (health or economic) needs. This result is not entirely surprising. In a sense, it is the price to pay for encouraging all group members, regardless of their characteristics, to comply with a certain behavior. In our sample, all members complete the check-up in 26% of groups randomized to group incentives, against only 10% of groups with individual incentives (Appendix Figure A5). Does it mean that group incentives lead to over-inclusion and therefore a waste of resources? Not necessarily in our context. First, given the limited risks associated with the blood test, universal screening may be a desirable policy objective, and indeed one recommended by WHO. One reason for this is that targeting based on observable characteristics may lead to under-detection of risks factors. In our sample, 47% of individuals who do the blood test and have a below-median CVD risk measure have at least one risk factor newly diagnosed by the test.[29] In addition, past use of preventive care may capture higher

[28] We compute a composite cost measure faced by individuals by adding the transport costs to reach the clinic and income lost due to the trips taken. To calculate the latter, we combine the time taken (transport time plus an estimated 10 minutes for the blood test or consultation) with the average daily revenues from an individual's economic activity.

[29] This proportion is not driven by the fact that this is a high-risk population. If we consider individuals who did the blood test and were identified as having a low CVD risk at baseline, 43% have a new risk factor diagnosed by the test.

needs, but also better information leading to higher perceived value of prevention.[30] Encouraging equally those with different levels of information may therefore be a desirable policy goal.

6. Mechanisms

In this section we examine the mechanisms through which incentives operate, with a view to understand how group incentives can be as effective if not more, as individual ones. We investigate three channels that can help reduce uncertainty about others' behaviors within a group, as well as promote individual motivation and social effects: communication, collective action and peer effects.[31] For each of the three main mechanisms studied, we consider the effect of incentives on a summary index using a standardized inverse-covariance weighted average of outcomes (Anderson 2008). We also provide insights into the different components of each index. Finally, we rule out several alternative mechanisms that could explain the effect of group incentives. The main results for the indices are presented in Table 4.

6.1. Communication

To explore the role of communication within groups, we compute an index based on three outcomes. The first two capture the prevalence of communication, through self-reported communication to others (speaking to others about using the voucher) and communication from others (hearing about a fellow member's use of the voucher). The third outcome focuses on the effectiveness of communication, i.e. whether communication improves knowledge about group members' decisions. For that, we asked each respondent at endline whether they knew if other group members had completed the check-up or not. We combine responses with data on voucher use to compute a knowledge index capturing the share of fellow members whose decisions are accurately known to an individual. The first column of Table 4 shows that the impact of group incentives on the communication index is highly significant and stronger than the effect of individual incentives

[30] 73% of those who have done a preventive consultation before know the symptoms of hypertension and diabetes, against 65% for those who have not used preventive services before ($p = 0.01$).

[31] Tables A4 and A5 show how the results presented in Table 4, and disaggregated ones, are robust to the inclusion of additional controls.

($p<0.001$). The disaggregated results in Panel B also show that group incentives – both rewards and lotteries- improve communication relative to individual incentives.

Figure 1A presents the disaggregated results for each outcome used to compute the communication index. The prevalence of communication seems stronger in the presence of group incentives. Only group incentives increase the share of people talking to others about the voucher (by 7.9 pp). There is also suggestive evidence that the share of individuals reporting that they heard about someone's visit increases more with group incentives than individual ones (14.5 pp versus 8.3 pp, $p=0.129$). More strikingly, group incentives have large effects on the effectiveness of communication. Against a relatively low level of knowledge in the control group (37%), group incentives significantly improve the knowledge of others' decisions while there is no effect for individual incentives ($p<0.001$). With group incentives, members know on average the decisions of 58% of their peers, versus 42.5% with individual incentives.

Together, these results provide strong evidence that group incentives increase the quantity and quality of communication about the check-up, an effective strategy to reduce information asymmetry within a group and uncertainty about others' behaviors.

6.2. Collective action

Next, we explore if group incentives encouraged more collective action. We study this through three outcomes. First, we ask participants if they planned with others to go to the lab or the clinic. Then, we use time-stamp data of the lab and clinic visits to construct two more objective measures of coordination, one for each type of visit. We assume that an individual coordinated with someone in their group if their visit to the lab (or clinic) occurred on the same day as at least one fellow group member.[32] The results show that collective action is significantly more prevalent with group compared to individual incentives (Table 4, column 2). Results on the different components, shown in Figure 1B, highlight that the impact of group incentives on self-reported planning is nearly twice as large as

[32] Using two more stringent definitions of coordination, the effect of group incentives is even stronger (Appendix Table A7).

the effect of individual incentives (a 24 pp vs. 13.2 pp increase, $p = 0.001$), and three times as large for actual coordination.[33]

Collective action can serve several purposes, some of which are particularly relevant for group incentives. Planning, especially with social accountability, can effectively reduce procrastination and help individuals follow through on their intentions. Coordination is also an extreme form of monitoring fellow group members' behaviors. Finally, in the case of group cash rewards, going to the clinic at the same time as the last non-complier(s) of a group ensures there will be no delay between one's visit and receipt of the incentive payment.[34] These different motives are not mutually exclusive and instead reinforce one another.

6.3. Peer effects

In this section, we explore the role that peer effects may play in the effectiveness of group incentives. First, we look at the share of respondents who say they reminded or motivated others to use the voucher, and the share that *were* reminded or motivated by others. The results on an index measure (Table 4, column 3) suggest that peer effects are not different in group and individual incentives ($p = 0.131$), despite evidence that group incentives create peer effects while individual incentives do not (Figure 1C).

Next, because reminders could be stronger or more persuasive in the presence of group rather than individual incentives, we consider the share of individuals who say they were encouraged by others in the sample of individuals who do the check-up. The more effective peer pressure is, the higher this proportion should be. The results, displayed in Appendix Figure A6, suggest that peer pressure is more effective in the presence of group incentives: 85% of those who complete the consultation say they were reminded by others, against 77% with individual incentives (p=0.008).[35]

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[33] The difference in magnitude is driven by the fact that self-reported coordination appears over-estimated compared to actual coordination. 40% of individuals in the control group report to have coordinated, but in practice, only 8.5% of individuals coordinated their visit to the lab and 2.7% to the clinic.

[34] Appendix Table A8 shows the breakdown of all coordination events observed. It shows that 72% of all coordination events at the clinic that lead to immediate completion of the group occur with group incentives.

[35] Peer pressure effectiveness could work through a supply- or demand-side effect. On the one hand, those providing encouragement could be more persuasive or insistent due to self-interest motives. On the other hand, those receiving encouragement could be more susceptible to them because of other-regarding concerns.

Finally, following evidence of the influence of peers' experience and behaviors in health decisions, for example for the adoption of hygiene products (Oster and Thornton 2012) or health insurance (Sorensen 2006), we investigate the role of peers through the influence of 'first movers' – the first individuals to undertake the check-up in their group. If peer effects explain the strong impact of group incentives, we could expect the 'first movers' in successful groups (i.e. those where all members complete the check-up) to have specific characteristics: for example, they might be the chosen leader of the group[36] or have specific health characteristics (e.g. be healthier). An analysis of the predictors of being a first mover in group treatment arms (see Appendix Table A9) shows no evidence that first movers are different in the groups that complete, compared to those that do not complete.

Overall, these results provide limited evidence that group incentives work by activating peer effects, suggesting that people do not complete the check-up out of guilt or altruism for others. We only find some evidence that group conditionality may make reminders more persuasive. We cannot exclude that this is due to the combined effects of increased communication and coordination between members, which may provide the necessary commitment device to translate intentions into action.

6.4. Alternative mechanisms

The previous sections provide empirical support to the notion that group incentives perform as well as individual incentives thanks to social effects that reduce uncertainty about others' behaviors and provide effective reminders. This section rules out alternative mechanisms that could explain why group incentives perform as well as individual ones.[37]

Stigma. The effectiveness of group incentives could be explained by reduced stigma. Several studies in the health literature have identified social stigma as a factor contributing to low uptake of disease prevention or treatment, including for conditions such as cardio-vascular diseases (Rai, Syurina et al. 2020). In the context of jointly liable lending group, individuals could also fear that consulting a doctor without visible illness symptoms might raise other members' concerns that they might default on the loan and jeopardize their chance of future loans. If social stigma plays a role in

[36] Our partner micro-credit organization asks loan groups to choose one 'leader' who is the main person through whom they communicate.
[37] Results are robust to the inclusion of controls (see Appendix Tables A5 and A6)

health-seeking decisions, group incentives might work by providing "a social cover" for doing the check-up (Thornton 2008, Goldberg, Macis et al. 2023).

We provide two pieces of evidence against this mechanism. First, only indirect costs are predictors of screening uptake in the control group (see Appendix Table A10). If group incentives worked by reducing social stigma, we would instead expect those with observable risks (e.g. individuals aged more than 50 years old, with diagnosed risk factors, obese) to be less likely to do the check-up in the absence of any incentive. Second, recall from Section 5.2 that we found no evidence that group incentives were effective at targeting people with higher health needs. If group incentives provided an effective social cover from stigma, we would instead expect those with higher needs to benefit more.

Social norms. Group incentives could also work by diminishing the influence of 'unhealthy' social norms. Several studies have identified the influence of peers in health decisions, with evidence that unhealthy behaviors such as obesity (Christakis and Fowler 2007), smoking (Christakis and Fowler 2008), or alcohol consumption (Rosenquist, Murabito et al. 2010) can diffuse or diminish in social networks, depending on the prevailing social norm. As mentioned in Section 3.4, our study population is generally in poor health, with high prevalence of obesity, many cardio-vascular risks known and untreated. Individuals surrounded by people with unhealthy habits may not be worried about their health, but group incentives could counteract this by encouraging check-ups.

If low demand for preventive screening is driven by social norms, we would expect individuals in groups where a majority of members have visibly more unhealthy habits to be less concerned (Prina and Royer 2014), and therefore less likely to seek preventive care. We find supporting evidence for this in the control group, where only 12.4% of individuals do the check-up if they belong to groups where at least half of the members are obese, against 22.7% when less than half of their group members are obese ($p = 0.019$). If group incentives act by tackling this social norm, their effect should be concentrated in individuals belonging to these groups where 'unhealthy' is the prevailing norm. We investigate this by looking at the heterogeneity of treatment effect depending on whether individuals belong to groups where a majority of members are obese. The results, presented in Table A11, show evidence that *all* incentives, not just group ones, act by counteracting this norm, with their effect mostly concentrated in groups where most members are obese. If anything, group incentives are marginally effective in groups where obesity is less prevalent.

Social networks. Group incentives could also work by harnessing the structure and power of social networks. This idea supported by studies showing that contagion of health behaviors is stronger in tighter social networks (Christakis and Fowler 2013). In our context, we would expect to see a greater impact of group incentives in smaller groups or closer-knit groups. Yet, we fail to find supporting evidence of differential effects according to the size of groups, group clustering or group strength (see Appendix D).

Time preferences. One of the reasons for low take-up of the screening could be that individuals are impatient and discount too much the future benefits of prevention. Social or financial incentives could help them overcome such present-bias preferences (Aggarwal, Dizon-Ross et al. 2020). Using measures of time preferences collected at baseline, we find no evidence that time preferences influence the way in which people respond to incentives (see Appendix E).

7. Impact of check-ups and cost-effectiveness of incentives

7.1. Effects of preventive check-ups

For policymakers, the impact of prevention matters as much as the demand for prevention. A question of interest here is whether the check-up leads to the detection of new CVD risk factors and increases individuals' knowledge and healthy behaviors. To measure these effects, we use information collected in the follow-up telephone interview. To estimate the impact of the check-up, we use the random assignment to the four incentive groups as instruments.

The results, reported in Table 5, show that the check-up increases the probability that an individual knows at endline that they suffer from a previously unknown risk factor by more than 47 pp ($p<0.001$). This is a substantial and important benefit, especially given that the program was offered to a "mixed" population that included individuals who already knew they had one or more CVD risk factors. Turning to individuals' attitudes and behaviors, we find suggestive evidence that the check-up leads to small improvements, though not large enough to be statistically significant. There is no evidence that the check-up increases the proportion of individuals believing they have a medium to high risk of developing a CVD event (column 2) or reporting a positive attitude toward behavior change (column 3–4). While there is no evidence that the check-up changes the consumption of fast food, there is some weak evidence that participants consume fruits or vegetables more often (0.5 more days, p=0.374) and sugar-sweetened beverages less often (0.8 fewer days in the past week, p=0.293).

To address the issues inherent to these self-reported measures, we implemented an incentivized raffle where individuals had to choose between investing in healthy or unhealthy food.[38] Individuals who completed the check-up invested one more ticket in the raffle to win a basket of healthy food (p=0.126). Looking at the intention-to-treat (ITT) effect of incentives on this outcome (Appendix Table A12), we find that group cash rewards increase the value of prevention significantly, while individual cash rewards do not. This result is consistent with the idea that the social effects of group incentives increase investments in preventive health by increasing the perceived value of prevention.

Overall, the effects on self-reported attitudes and behaviors are disappointing. Although respondents generally remembered the key topics of CVD prevention discussed by the doctor (see Figure A7 in Appendix), perhaps they did not pay much attention to important information and advice given. For example, only 30.6% correctly remembered their own level of CVD risk (see Appendix Figure A8).[39] Still, these null results are not surprising and echo the modest benefits of similar preventive screening (Deutekom, Vansenne et al. 2011) and more generally the challenges to encourage behavioral change, particularly in low-income groups.

7.2. Cost-effectiveness of incentives

This section assesses the relative costs and cost-effectiveness of the different incentive schemes. We present a cost-effectiveness comparison across the four types of incentives in Table 6.

We first look at the treatment effects on the average amount paid per person (Table 6 column 1). The total cost per arm are presented in detail in Appendix Table A13. Costs include payment of the

[38] Participants could allocate nine tickets between two different raffles: in one, they could win $50 to spend on pizzas and in the other they could win $50 to spend on vegetables and fruits. We consider the number of tickets allocated to the healthy tombola as a measure of their willingness to invest in their health. This choice also mimics real-life trade-offs that individuals may have to make, deciding whether to invest more in healthy food at the expense of unhealthy one.

[39] At the consultation, based on their blood results and main characteristics, patients were told whether they had with a low, medium, or high risk of mortality within the next 10 years.

blood test at the lab and the incentives to individuals or groups. We exclude the cost of clinic staff because it is sensitive to the scale of the prevention program and specific decisions around staffing at the clinic.[40] The results show that all four incentive designs yield similar additional costs—between USD2 and USD3 more per person than the control group. Group incentives have slightly lower costs, which is driven by the structure of incentives: for example, in the individual cash reward arm, 100% of people who completed the check-up received their USD5 reward, but only 72% of compliers in the group cash reward arm did due to lack of completion by others. Still, the similarity of costs across treatments suggests that differences in the impact on the decision to do a blood test, which incurs lab costs, and to complete the consultation are not large enough to make a significant difference to average payments.

We next consider the cost-effectiveness of incentives. Column 3 (column 5) shows the cost per additional check-up (risk factor diagnosed), calculated by dividing the cost estimates in column 1 by the treatment effect estimates reproduced in column 2 (column 4). The cost per additional preventive check-up comes at around USD11 for group incentives (column 3), which is only slightly more cost-effective than individual ones (USD14), although this lower efficiency is mainly driven by the poor performance of individual lotteries.[41] Overall, except for the individual lottery arm which is significantly less effective, differences in costs and effects across incentive designs are not large enough to yield differences in cost-effectiveness. When considering new diagnosed risk factors, the trade-off between treatment effects and cost-effectiveness is more salient. Overall, group incentives appear more cost-effective than individual ones, at USD23.8 per additional diagnosis, versus USD32 for individual incentives. However, due to their larger impact on the likelihood of detecting a new diagnosis, individual cash rewards are more cost-effective than group cash rewards, with a cost of USD24.2 per new diagnosis compared to USD28.2 for group rewards. Meanwhile, individual lotteries are less than half as effective at detecting new diagnoses than group lotteries, and as a result, the cost-effectiveness

[40] During the study, ASEI hired a full-time doctor to receive all participants coming for their medical consultation due to concerns that a large influx of patients would disrupt the normal functioning of the clinic and the provision of other services. In practice, the daily flow of patients could have easily been handled by a part-time doctor.

[41] The cost per additional check-up is USD18 per additional visit for individual lotteries, while all three other incentive arms are close to USD11 per additional visit.

gap between the two is wide: group lotteries have a cost of USD20.7 per new diagnosis compared to USD51.9 for individual ones.

To go one step further, we use the cost per new diagnosis and follow the approach of Berry, Fischer et al. (2020) to estimate the cost per DALY averted for the different incentives (see Appendix F for more details). We assume that an individual diagnosed with a particular risk factor avoids a CVD death if she manages well her risk factor, which happens with a probability estimated in the medical literature. Following estimates from the Global Burden of Disease (Global Burden of Disease Collaborative Network 2020), we then relate these deaths averted to DALYs averted in Salvador. Because these effects highly depend on the type of risk factor diagnosed, we report three scenarios: an upper bound scenario where all individuals are diagnosed with the risk factor with the highest probability of being managed (diabetes), a lower bound scenario where all new diagnoses made have the lowest management probability (hypertension), and one average scenario where we compute a composite management probability following the actual risk profiles of individuals.

The pooled results, presented in Figure F1, show that group incentives are more cost-effective than individual ones, at USD487 versus USD608 per DALY averted in our average scenario. The disaggregated results, presented in Appendix Figure F2, show the marginal cost per DALY averted ranges from USD390 with group lotteries to USD1,581 with individual ones. This confirms that group lotteries are much more efficient than individual lotteries and are as cost-effective as individual cash rewards despite their lower targeting power. All of these values fall well below the cost-effectiveness thresholds typically used by policymakers of one to three times the annual per capita GDP (at purchasing power parity)—which was USD9,402 for El Salvador at the time of our study (Hutubessy, Chisholm et al. 2003).[42]

8. Conclusion

The popularity of team incentives in the private sector is driven by organizational factors (existence of team production) but also the notion that individuals can be motivated by group dynamics. In a

[42] To be conservative, for GDP per capita, we use the 2019 figure because there was a sharp decline in GDP in 2020 due to the Covid pandemic.

randomized trial organized in El Salvador with 400 existing groups, we provide strong evidence that group dynamics can also enhance the effects of simple incentives to encourage the adoption of desirable health behaviors. Despite the uncertainty about others' behaviors, incentives relying on group conditionalities are equally, if not more effective at increasing the demand for a preventive health check-up than equivalent individual ones. Combined with the savings made on payment of incentives, these effects make group incentives a more cost-effective strategy.

A potential concern with the study is that it yields significant insights for a setting where individuals have pre-established links. Caution should always be exercised in generalizing findings to broader populations or different contexts. In the study, it is likely that pre-existing connections will have facilitated the social interactions we identified. A few studies provide some reassurance that group incentives are effective in exogenously formed groups (Babcock, Bedard et al. 2015), including to encourage healthy behaviors (Haisley, Volpp et al. 2012, Kullgren, Troxel et al. 2013, Patel, Asch et al. 2016). Moreover, our results remain relevant to numerous settings where social groups are prevalent. In many low-income countries, established groups often exist that arise from geographical, social, or occupational proximities and fulfill various purposes. Beyond the micro-credit groups similar to the ones we drew upon—which are ubiquitous in low-income settings—, examples include, amongst others, informal savings clubs in which members contribute money into a pot (e.g. Rotating Savings and Credit Associations in Africa or Tandas in Latin America), farmer cooperatives where members pool resources for buying inputs or selling produce, burial societies that provides financial support for funerals, or women self-help groups common in India and South Asia (Díaz-Martin, Gopalan et al. 2022). Many already serve as platforms for public or private organizations to deliver interventions more effectively.[43] Our results therefore provide pertinent evidence for introducing new or strengthening existing interventions leveraging such groups.

[43] For example, women's groups in India are instrumental to the implementation of two large-scale community engagement initiatives of the government (the National Rural Livelihoods Mission and the National Health Mission) that promote desirable saving and healthy behaviors. Similarly, micro-finance institutions throughout the world have long used the power of social connections among informal workers to expand their activities through group loans, where individuals' motivation to preserve their social capital and standing in a group act as a substitute for material collateral.

What do these results mean for the factors that drive the demand of prevention? Whilst we cannot exclude that present bias plays a role in low demand, since none of the incentives provides a reward for starting the check-up and doing the blood test, our results are consistent with two non-mutually exclusive interpretations. On the one hand, consistent with standard economic theory, the impact of small individual incentives suggest that people may under-estimate the benefits of prevention. On the other hand, the large impact of uncertain group incentives—which are uncertain by nature—and the mechanisms through which they operate imply that small behavioral costs prevent many individuals from investing in their health.[44]

These findings have several policy implications. First, governments should pay more attention to, and introduce strategies to address the behavioral costs that individual face to invest in prevention, especially for diseases screening. In that respect, group incentives could be an effective tool, which organically creates social dynamics which help individuals follow through on their intentions. This strategy could also be considered for organizations spending resources on reminders or promotional messages; using group lotteries could prove a simpler and more effective way to generate similar actions. A related implication of our study is that group incentives may be better suited for promoting services whose coverage should be (near) universal. If there is a heterogeneity of needs within group members, incentives based on collective conditionalities will mechanically lead to over-inclusion. Still, given the evidence on the low take-up of cost-effective technologies in low-income settings, there are many potential areas of application where targeting concerns are limited, such as vaccinations in health or the adoption of new technologies in agriculture.

[44] At endline, 91% of people who had *not* used their voucher said they had wanted to use it, but failed to.

References

Aggarwal, S., R. Dizon-Ross and A. D. Zucker (2020). Incentivizing Behavioral Change: The Role of Time Preferences. Working Paper 27079, NBER.

Anderson, M. L. (2008). "Multiple Inference and Gender Differences in the Effects of Early Intervention: A Reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects." Journal of the American Statistical Association **103**(484): 1481-1495.

Ashraf, N., J. Berry and J. M. Shapiro (2010). "Can Higher Prices Stimulate Product Use? Evidence from a Field Experiment in Zambia." American Economic Review **100**(5): 2383-2413.

Ataklte, F., S. Erqou, S. Kaptoge, B. Taye, J. B. Echouffo-Tcheugui and A. P. Kengne (2015). "Burden of undiagnosed hypertension in sub-saharan Africa: a systematic review and meta-analysis." PubMed. comprises. more. than. 30 million. citations. for. biomedical. literature. from. MEDLINE, life. science. journals., and. online. books. **65**(2): 291–298.

Babcock, P., K. Bedard, G. Charness, J. Hartman and H. Royer (2015). "Letting down the team? Social effects of team incentives." Journal of the European Economic Association **13**(5): 841--870.

Baicker, K., S. Mullainathan and J. Schwartzstein (2015). "Behavioral Hazard in Health Insurance." Quaterly Journal of Economics **130**(4): 1623–1667.

Bandiera, O., I. Barankay and I. Rasul (2013). "Team incentives: evidence from a firm level experiment." Journal of the European Economic Association **11**(5): 1079–1114.

Banerjee, A., A. G. Chandrasekhar, S. Dalpath, E. Duflo, J. Floretta, M. O. Jackson, H. Kannan, F. Loza, A. Sankar, A. Schrimpf and M. Shrestha (2021). Selecting the Most Effective Nudge: Evidence from a Large-Scale Experiment on Immunization.

Banerjee, A., E. Duflo, R. Glennerster and D. Kothari (2010). "Improving immunisation coverage in rural India: clustered randomised controlled evaluation of immunisation campaigns with and without incentives." BMJ **340**: c2220.

Barceló, A., E. Gregg, E. Pérez Flores, R. Wong, R. Gerzoff, E. Cafiero and M. Meiners (2011). The Central America Diabetes Initiative (CAMDI): Survey of Diabetes, Hypertension and Chronic Disease Risk Factors. Belize, San José, San Salvador, Guatemala City, Managua and Tegucigalpa.

Beaman, L., A. BenYishay, J. Magruder and A. M. Mobarak (2021). "Can Network Theory-Based Targeting Increase Technology Adoption?" Am. Econ. Rev. **111**(6): 1918–1943.

Belloni, A., V. Chernozhukov and C. Hansen (2014). "Inference on Treatment Effects after Selection among High-Dimensional Controls." The Review of Economic Studies **81**(2 (287)): 608-650.

Benjamini, Y., A. M. Krieger and D. Yekutieli (2006). "Adaptive Linear Step-up Procedures That Control the False Discovery Rate." Biometrika **93**(3): 491-507.

Berry, J., G. Fischer and R. Guiteras (2020). "Eliciting and utilizing willingness to pay: Evidence from field trials in Northern Ghana." Journal of Political Economy **128**(4): 1436-1473.

Bovet, P., A. Chiolero, F. Paccaud and N. Banatvala (2015). "Screening for cardiovascular disease risk and subsequent management in low and middle income countries: challenges and opportunities." Public Health Rev. **36**(1): 1–15.

Breza, E. and A. G. Chandrasekhar (2019). "Social Networks, Reputation, and Commitment: Evidence From a Savings Monitors Experiment." Econometrica **87**(1): 175–216.

Burgess, S., C. Propper, M. Ratto, S. von Hinke, K. Scholder and E. Tominey (2010). "Smarter Task Assignment or Greater Effort: The Impact of Incentives on Team Performance." Economic Journal **120**(547): 968-989.

Carrillo, M. J., M. L. García, N. Vidal, K. Bermúdez and P. De Vos (2020). "Comprehensive primary health care and non-communicable diseases management: a case study of El Salvador." International journal for equity in health **19**(1): 1-17.

Cheong, A. T., S. M. Liew, E. M. Khoo, N. F. M. Zaidi and K. Chinna (2017). "Are interventions to increase the uptake of screening for cardiovascular disease risk factors effective? A systematic review and meta-analysis." BMC Fam. Pract. **18**(1): 4.

Chow, C. K., K. K. Teo, S. Rangarajan, S. Islam, R. Gupta, A. Avezum, A. Bahonar, J. Chifamba, G. Dagenais, R. Diaz, K. Kazmi, F. Lanas, L. Wei, P. Lopez-Jaramillo, L. Fanghong, N. H. Ismail, T. Puoane, A. Rosengren, A. Szuba, A. Temizhan, A. Wielgosz, R. Yusuf, A. Yusufali, M. McKee, L. Liu, P. Mony and S. Yusuf (2013). "Prevalence, Awareness, Treatment, and Control of Hypertension in Rural and Urban Communities in High-, Middle-, and Low-Income Countries." JAMA **310**(9): 959–968.

Christakis, N. A. and J. H. Fowler (2007). "The Spread of Obesity in a Large Social Network over 32 Years." N. Engl. J. Med. **357**(4): 370–379.

Christakis, N. A. and J. H. Fowler (2008). "The Collective Dynamics of Smoking in a Large Social Network." N. Engl. J. Med. **358**(21): 2249–2258.

Christakis, N. A. and J. H. Fowler (2013). "Social contagion theory: examining dynamic social networks and human behavior." Stat Med **32**(4): 556-577.

Cohen, J., P. Dupas and S. Schaner (2015). "Price Subsidies, Diagnostic Tests, and Targeting of Malaria Treatment: Evidence from a Randomized Controlled Trial." American Economic Review **105**(2): 609--645.

Deutekom, M., F. Vansenne, K. McCaffery, M.-L. Essink-Bot, K. Stronks and P. M. M. Bossuyt (2011). "The effects of screening on health behaviour: a summary of the results of randomized controlled trials." J. Public Health **33**(1): 71–79.

Díaz-Martin, L., A. Gopalan, E. Guarnieri and S. Jayachandran (2022). "Greater than the Sum of the Parts? Evidence on Mechanisms Operating in Women's Groups." World Bank Res. Obs.: lkac001.

Dupas, P. (2014). "Short-run subsidies and long-run adoption of new health products: evidence from a field experiment." Econometrica **82**(1): 197-228.

Dupas, P., V. Hoffmann, M. Kremer and A. P. Zwane (2016). "Targeting health subsidies through a nonprice mechanism: A randomized controlled trial in Kenya." Science **353**(6302): 889-895.

Dupas, P. and E. Miguel (2017). Impacts and Determinants of Health Levels in Low-Income Countries. Handbook of Field Experiments. E. Duflo and A. Banerjee, North Holland.

Friebel, G., M. Heinz, M. Krueger and N. Zubanov (2017). "Team Incentives and Performance: Evidence from a Retail Chain." Am. Econ. Rev. **107**(8): 2168–2203.

Friedman, M. and L. Savage (1948). "The utility analysis of choices involving risk." Journal of Political Economy **56**(0): 279-304.

Global Burden of Disease Collaborative Network (2020). Global Burden of Disease Study

Goldberg, J., M. Macis and P. Chintagunta (2023). "Incentivized Peer Referrals for Tuberculosis Screening: Evidence from India." American Economic Journal: Applied Economics **15**(1): 259–291.

Haisley, E., K. G. Volpp, T. Pellathy and G. Loewenstein (2012). "The impact of alternative incentive schemes on completion of health risk assessments." Am. J. Health Promot. **26**(3): 184--188.

Hess, S. (2017). "Randomization Inference with Stata: A Guide and Software." The Stata Journal **17**(3): 630-651.

Hutubessy, R., D. Chisholm and T. T.-T. Edejer (2003). "Generalized cost-effectiveness analysis for national-level priority-setting in the health sector." Cost Eff. Resour. Alloc. **1**(1): 8.

Karing, A. (2018). Social Signaling and Childhood Immunization: A Field Experiment in Sierra Leone. B. University of California.

Karing, A. and K. Naguib (2018). Social Signaling and Prosocial Behavior Experimental Evidence in Community Deworming in Kenya. B. University of California.

Kast, F., S. Meier and D. Pomeranz (2018). "Saving more in groups: Field experimental evidence from Chile." Journal of Development Economics **133**: 275--294.

Kremer, M. and E. Miguel (2007). "The illusion of sustainability." Quarterly Journal of Economics **122**(3): 1007-1065.

Kullgren, J. T., A. B. Troxel, G. Loewenstein, D. A. Asch, L. A. Norton, L. Wesby, Y. Tao, J. Zhu and K. G. Volpp (2013). "Individual- versus group-based financial incentives for weight loss: a randomized, controlled trial." Ann. Intern. Med. **158**(7): 505--514.

Li, Y., J. Meng, C. Song and K. Zheng (2020). "Information Avoidance and Medical Screening: A Field Experiment in China." Manage. Sci.

Ministerio de Salud/Instituto Nacional de Salud (2015). Encuesta nacional de enfermedades crónicas no transmisibles en población adulta de El Salvador ENECA-ELS 2015, Resultados relevantes. San Salvador, El Salvador, Ministerio de Salud e instituto Nacional de Salud.

Murray, C. J., A. Y. Aravkin, P. Zheng, C. Abbafati, K. M. Abbas, M. Abbasi-Kangevari, F. Abd-Allah, A. Abdelalim, M. Abdollahi and I. Abdollahpour (2020). "Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019." The lancet **396**(10258): 1223-1249.

O'Donoghue, T. and M. Rabin (2001). "Choice and Procrastination." The Quarterly Journal of Economics **116**(1): 121-160.

Okeke, E. N. and I. S. Abubakar (2020). "Healthcare at the beginning of life and child survival: Evidence from a cash transfer experiment in Nigeria." Journal of Development Economics **143**: 102426.

Okeke, E. N., C. A. Adepiti and K. O. Ajenifuja (2013). "What is the price of prevention? New evidence from a field experiment." J. Health Econ. **32**(1): 207–218.

Ordunez, P., E. Prieto-Lara, V. P. Gawryszewski, A. J. Hennis and R. S. Cooper (2015). "Premature Mortality from Cardiovascular Disease in the Americas–Will the Goal of a Decline of “25% by 2025” be Met?" PloS one **10**(10): e0141685.

Oster, E. and R. Thornton (2012). "Determinants of technology adoption: peer effects in menstrual cup take-up." Journal of the European Economic Association **10**(6): 1263--1293.

Patel, M. S., D. A. Asch, R. Rosin, D. S. Small, S. L. Bellamy, K. Eberbach, K. J. Walters, N. Haff, S. M. Lee, L. Wesby, K. Hoffer, D. Shuttleworth, D. H. Taylor, V. Hilbert, J. Zhu, L. Yang, X. Wang and K. G. Volpp (2016). "Individual Versus Team-Based Financial Incentives to Increase Physical Activity: A Randomized, Controlled Trial." J. Gen. Intern. Med. **31**(7): 746--754.

Prina, S. and H. Royer (2014). "The importance of parental knowledge: evidence from weight report cards in Mexico." J. Health Econ. **37**: 232–247.

Rai, S. S., E. V. Syurina, R. M. H. Peters, A. I. Putri and M. B. M. Zweekhorst (2020). "Non-Communicable Diseases-Related Stigma: A Mixed-Methods Systematic Review." Int. J. Environ. Res. Public Health **17**(18).

Rogers, T., K. L. Milkman, L. K. John and M. I. Norton (2015). "Beyond good intentions: Prompting people to make plans improves follow-through on important tasks." Behavioral Science & Policy **1**(2): 33-41.

Rosenquist, J. N., J. Murabito, J. H. Fowler and N. A. Christakis (2010). "The spread of alcohol consumption behavior in a large social network." Ann Intern Med **152**(7): 426-433, w141.

Sánchez, M. D., M. Anaya, D. O. Harris, T. Marín, D. M. Pinto, L. Pinzón, S. Vladislavovna Doubova, L. Tejerina, M. Rocha and F. C. Guanais (2020). "From the Patient's Perspective: Experiences with Primary Health Care in Latin America and the Caribbean." IDB Publications (Books).

Sorensen, A. T. (2006). "Social learning and health plan choice." Rand J. Econ. **37**(4): 929–945.

Thornton, R. (2008). "The Demand for, and Impact of, Learning HIV Status." American Economic Review **98**(5): 1829-1863.

Wagstaff, A., E. van Doorslaer and R. Burger (2019). "SMS nudges as a tool to reduce tuberculosis treatment delay and pretreatment loss to follow-up. A randomized controlled trial." PLoS One **14**(6): e0218527.

White, J. S., W. H. Dow and S. Rungruanghiranya (2013). "Commitment contracts and team incentives: a randomized controlled trial for smoking cessation in Thailand." Am. J. Prev. Med. **45**(5): 533–542.

White, J. S., C. Lowenstein, N. Srivirojana, A. Jampaklay and W. H. Dow (2020). "Incentive programmes for smoking cessation: cluster randomized trial in workplaces in Thailand." BMJ **371**: m3797.

Wilson, N. (2016). "Antiretroviral therapy and demand for HIV testing: Evidence from Zambia." Econ. Hum. Biol. **21**: 221–240.

World Health Organization (2007). Prevention of cardiovascular disease: guidelines for assessment and management of total cardiovascular risk Geneva, Switzerland, WHO.

World Health Organization (2018). Noncommunicable diseases country profiles 2018. WHO. Geneva, Switzerland, WHO.

Table 1. Impact of incentives on the demand for prevention

	(1) Completed the screening	(2) Did the blood test	(3) Dropped after blood test
Panel A: Pooled incentive designs			
Individual incentive	0.168	0.134	-0.191
	(0.036)	(0.038)	(0.061)
	[<0.001]	[<0.001]	[0.001]
	{0.001}	{0.003}	{<0.001}
Group incentive	0.217	0.205	-0.153
	(0.041)	(0.043)	(0.063)
	[<0.001]	[<0.001]	[0.003]
	{<0.001}	{<0.001}	{0.004}
P-value for group vs. individual incentives	0.260	0.106	0.183
Panel B: Disaggregated incentive designs			
Individual Reward	0.216	0.170	-0.224
	(0.046)	(0.047)	(0.060)
	[<0.001]	[0.001]	[0.001]
	{<0.001}	{0.002}	{<0.001}
Group Reward	0.205	0.188	-0.160
	(0.055)	(0.057)	(0.066)
	[0.001]	[0.001]	[0.007]
	{<0.001}	{0.001}	{0.006}
Individual Lottery	0.120	0.099	-0.149
	(0.042)	(0.047)	(0.068)
	[0.003]	[0.012]	[0.011]
	{0.009}	{0.035}	{0.025}
Group Lottery	0.228	0.221	-0.146
	(0.052)	(0.053)	(0.066)
	[<0.001]	[<0.001]	[0.011]
	{<0.001}	{<0.001}	{0.015}
P-value for group vs. individual reward	0.865	0.770	0.061
P-value for group vs. individual lottery	0.063	0.039	0.951
Control mean	0.155	0.206	0.250
# of teams	400	400	400
# of individuals	1629	1629	555

Notes: Table presents OLS estimates. The dependent variables in columns 1 to 3 are binary indicators of whether an individual completed the full CVD preventive check-up (blood exam and medical consultation), whether an individual completed the blood exam, and whether an individual completed the medical consultation conditional on having completed the blood exam. The samples in columns 1 and 2 include all individuals, while column 3 only includes individuals who completed the blood test. All models include group type fixed effects (Banco Comunal, Small Grupo Solidario, or Large Grupo Solidario). Standard errors are clustered at the group level and reported in parenthesis. False-discovery rate corrected q-values based on Benjamini, Krieger et al. (2006) and Anderson (2008) are presented in square brackets and randomized inference p-values following Hess (2017) using 2,000 permutations are presented in curly brackets.

Table 2. Heterogeneous effects of incentives

	Above median CVD risk	Used preventive care before	Above median opportunity cost
	(1)	(2)	(3)
Panel A: Pooled incentive designs			
II: Individual incentives	0.116	0.144	0.211
	(0.041)	(0.036)	(0.045)
	[0.006]	[<0.001]	[<0.001]
	{0.009}	{0.001}	{<0.001}
GI: Group incentives	0.203	0.212	0.257
	(0.050)	(0.043)	(0.050)
	[<0.001]	[<0.001]	[<0.001]
	{0.003}	{<0.001}	{<0.001}
Interacted variable	0.005	-0.130	-0.001
	(0.034)	(0.033)	(0.037)
	[0.333]	[<0.001]	[0.352]
	{0.908}	{0.005}	{0.985}
II × Interacted variable	0.108	0.167	-0.088
	(0.051)	(0.061)	(0.051)
	[0.029]	[0.007]	[0.064]
	{<0.001}	{<0.001}	{0.017}
GI × Interacted variable	0.025	0.035	-0.081
	(0.052)	(0.067)	(0.054)
	[0.241]	[0.241]	[0.079]
	{<0.001}	{0.011}	{0.003}
Panel B: Disaggregated incentive designs			
IR: Individual Reward	0.160	0.188	0.316
	(0.051)	(0.045)	(0.097)
	[0.005]	[0.001]	[0.005]
	{0.001}	{<0.001}	{<0.001}
GR: Group Reward	0.072	0.099	0.254
	(0.049)	(0.044)	(0.087)
	[0.009]	[0.003]	[0.010]
	{0.004}	{0.001}	{0.001}
IL: Individual Lottery	0.182	0.197	0.297
	(0.064)	(0.057)	(0.107)
	[0.114]	[0.029]	[0.008]
	{0.145}	{0.021}	{0.002}
GL: Group Lottery	0.223	0.226	0.298
	(0.065)	(0.055)	(0.094)
	[0.003]	[0.001]	[0.005]
	{0.001}	{<0.001}	{0.001}
Interacted variable	0.005	-0.131	-0.011
	(0.034)	(0.033)	(0.023)
	[0.429]	[0.001]	[0.323]
	{0.907}	{0.005}	{0.985}
IR × Interacted variable	0.114	0.187	-0.053
	(0.063)	(0.081)	(0.042)
	[0.067]	[0.029]	[0.139]
	{<0.001}	{<0.001}	{<0.001}
GR × Interacted variable	0.100	0.143	-0.077
	(0.064)	(0.074)	(0.041)
	[0.269]	[0.248]	[0.186]
	{<0.001}	{0.011}	{0.015}
IL × Interacted variable	0.041	0.066	-0.052
	(0.064)	(0.086)	(0.048)
	[0.108]	[0.055]	[0.064]
	{0.001}	{0.026}	{0.254}
GL × Interacted variable	0.009	-0.000	-0.037
	(0.067)	(0.092)	(0.043)
	[0.429]	[0.429]	[0.231]
	{<0.001}	{0.069}	{0.003}

Notes: Table presents OLS estimates. The dependent variables in columns 1 to 3 is a binary indicator of whether an individual completed the full CVD preventive check-up (blood exam and medical consultation). Column 1-3 report heterogeneous results using: (1) above the median CVD risk; (2) whether the respondent had ever gone to a preventive consultation before; and (3) above median opportunity costs complete the full CVD preventive check-up. All models include group type fixed effects (Banco Comunal, Small Grupo Solidario, or Large Grupo Solidario). Standard errors are clustered at the group level and reported in parenthesis. False-discovery rate corrected q-values based on Benjamini, Krieger et al. (2006) and Anderson (2008) are presented in square brackets and randomized inference p-values following Hess (2017) using 2,000 permutations are presented in curly brackets.

Table 3. Mechanisms

	Communication index	Collective action index	Peer effects index
	(1)	(2)	(3)
Panel A: Pooled incentives designs			
Individual incentive	0.135	0.256	0.137
	(0.081)	(0.078)	(0.082)
	[0.033]	[0.002]	[0.033]
	{0.145}	{0.004}	{0.074}
Group incentive	0.463	0.578	0.222
	(0.086)	(0.091)	(0.081)
	[<0.001]	[<0.001]	[0.0105
	{<0.001}	{<0.001}	{0.003}
P-value: Group vs. Ind	<0.001	<0.001	0.131
Panel B: Disaggregated incentive designs			
Individual Reward	0.137	0.285	0.131
	(0.102)	(0.096)	(0.092)
	[0.065]	[0.005]	[0.050]
	{0.198}	{0.003}	{0.166}
Group Reward	0.484	0.587	0.242
	(0.107)	(0.126)	(0.011)
	[<0.001]	[<0.001]	[0.037]
	{<0.001}	{<0.001}	{0.009}
Individual Lottery	0.133	0.226	0.143
	(0.094)	(0.095)	(0.090)
	[0.060]	[0.018]	[0.054]
	{0.159}	{0.024}	{0.121}
Group Lottery	0.443	0.569	0.203
	(0.105)	(0.105)	(0.088)
	[<0.001]	[<0.001]	[0.019]
	{<0.001}	{<0.001}	{0.024}
P-value: Reward Group vs. Ind	0.005	0.028	0.184
P-value: Lottery Group vs. Ind.	0.007	0.004	0.433
Control mean	-0.234	-0.330	-0.142
# of teams	400	400	400
# of individuals	1586	1629	1572

Notes: Table presents OLS estimates. The outcomes in columns 1, 2 and 3 are standardized weighted indices for each category (Anderson, 2008). The communication index combines whether the individual talked about using the voucher with another group member, if they heard from other members about their screening experience and a knowledge rating of other members screening status. All models include group type fixed effects (Banco Comunal, Small Grupo Solidario, or Large Grupo Solidario). Standard errors are clustered at the group level and reported in parenthesis. False-discovery rate corrected q-values based on Benjamini, Krieger et al. (2006) and Anderson (2008) are presented in square brackets and randomized inference p-values following Hess (2017) using 2,000 permutations are presented in curly brackets.

Table 4. Effects of preventive check-up (IV estimation)

	Diagnosis	Knowledge	Attitude towards behaviour change		Healthy behaviours			
	Diagnosed with new risk factor	Believes has medium/high risk of developing CVD	Willing to change habits to improve health	Believes CVD risk factors cannot be changed	# of days eating fast food	# of days eating fruits or vegetables	# of days drinking SSBs	# of tickets for healthy lottery prize
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Did the CVD check-up	0.472	0.091	0.160	-0.050	0.053	0.540	-0.807	0.965
	(0.065)	(0.152)	(0.123)	(0.116)	(0.508)	(0.610)	(0.767)	(0.632)
Group type effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interview week effects								
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cragg-Donald Wald F-test	15.132	13.777	14.368	14.368	14.368	14.368	14.368	14.368
Observations	1,629	1,493	1,572	1,572	1,572	1,572	1,572	1,571

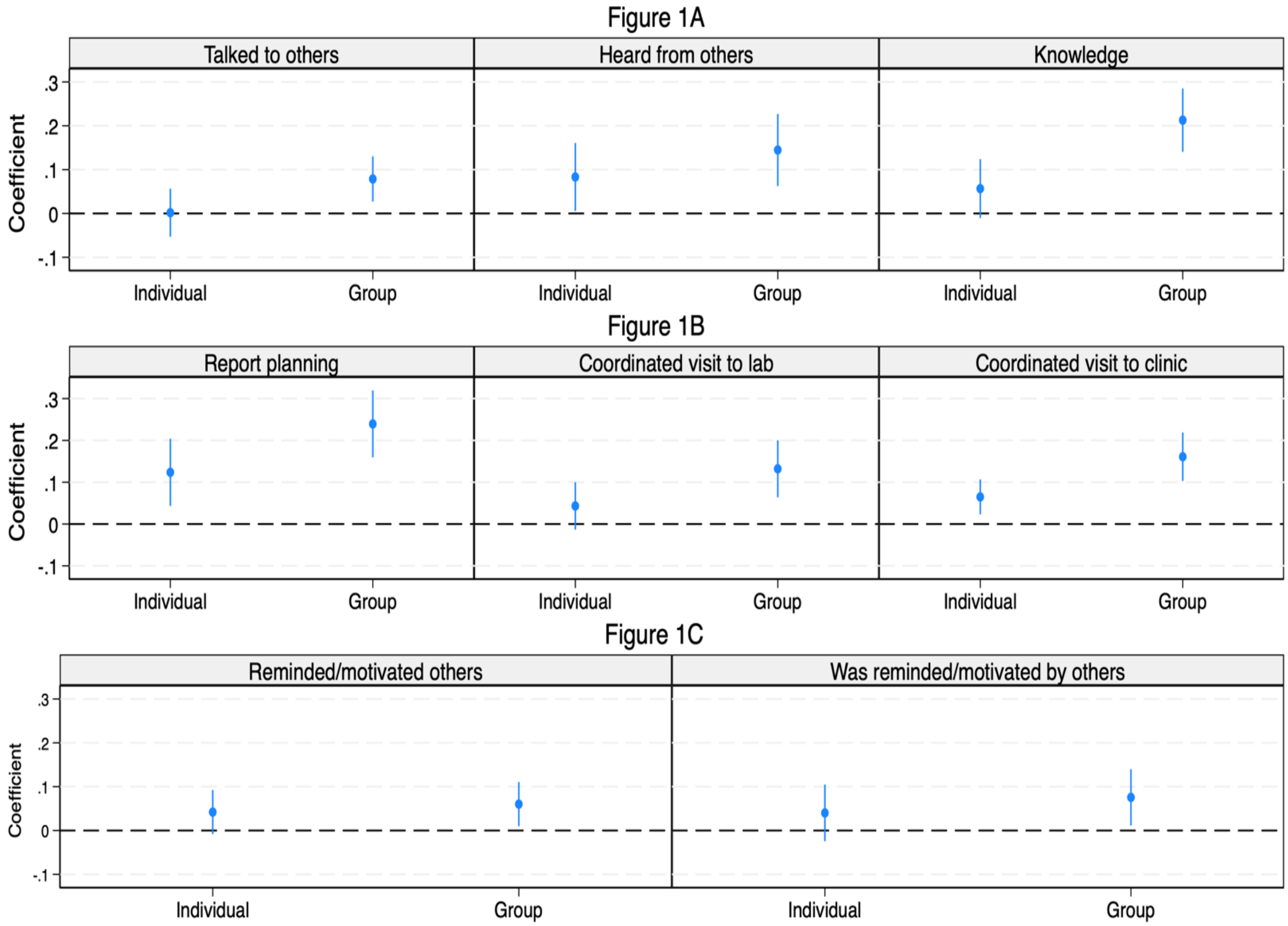
Notes: Table presents 2SLS estimates with standard errors clustered at the group level in parenthesis and all four treatment group dummies as instrumental variables for completing the full medical check-up. The dependent variable is a binary indicator whether an individual completed the full CVD preventive check-up (blood exam and medical consultation). Dependent variables are defined as follows: Column 1 presents whether the individual has been diagnosed with at least one CVD risk factor in the follow up survey; Column 2 is a binary dependent variable whether the individual perceives their risk of developing CVD to be medium or high; Column 3 is a binary indicator whether the individual was willing to change their habits to improve their health; Column 4 is a binary variable whether the respondent believes something can be done to improve CVD risk factors; Column 5 is a continuous measure of the number of days in the last week in which the respondent ate fast food; Column 6 is a continuous measure of the number of days in the last week in which the respondent ate either fruits or vegetables; Column 7 is a continuous of the number of days in the last week in which the respondent consumed sugar sweetened beverages; and Column 8 is a continuous measure ranging from 0-10 on how many tickets they choose for the health lottery prize. Group type fixed effects account for the stratification variables Banco Comunal, Small Grupo Solidario, or Large Grupo Solidario. Individual controls include a binary indicator whether the individual is over the age of 50, gender, a binary indicator for whether the individual has basic education or higher, 10-year CVD mortality risk at baseline, BMI at baseline, self-reported average daily earnings, and self-reported opportunity cost of travelling to the clinic.

Table 5. Cost effectiveness of completed check-up and new diagnosis

		Preventive check-up		Diagnosis	
	Amount paid per person	Completed check-up	Cost per check-up	New diagnosis	Cost per new diagnosis
	(1)	(2)	(3)	(4)	(5)
Panel A: Pooled incentive designs					
Individual incentive	2.506	0.168	14.908	0.078	32.019
	(0.459)	(0.036)	(2.557)	(0.023)	(11.898)
Group incentive	2.301	0.217	10.623	0.097	23.788
	(0.712)	(0.041)	(1.622)	(0.025)	(10.064)
Panel B: Disaggregated incentive designs					
Individual reward	2.707	0.216	12.557	0.112	24.201
	(0.411)	(0.046)	(0.934)	(0.031)	(5.879)
Group reward	2.238	0.205	10.919	0.079	28.248
	(0.510)	(0.055)	(1.034)	(0.031)	(62.267)
Individual lottery	2.304	0.120	19.163	0.044	51.904
	(0.801)	(0.042)	(7.539)	(0.026)	(2857.213)
Group Lottery	2.364	0.228	10.357	0.114	20.695
	(1.315)	(0.052)	(2.810)	(0.033)	(8.720)
N	1629	1629		1629	

Notes: Columns 1,2 and 4 present OLS estimates with standard errors clustered at the group level in parenthesis. The dependent variable in column 1 is the amount paid to the participant, the outcomes in columns 2 and 4 are binary outcomes of whether an individual completed a check-up or whether they were given a new risk factor diagnosis. Columns 3 and 4 are the cost per completed check-up and cost per new diagnosis respectively. Estimates and standard errors in columns 3 and 5 obtained from bootstrapped multiple dependent multivariate regressions with the amount paid per person and the completed check-ups for column 3 and the amount paid per person and the number of new diagnoses for column 5. Values in table represent the average ratio and standard errors of the ration distribution are presented in parenthesis. All models include group type fixed effects (Banco Comunal, Small Grupo Solidario, or Large Grupo Solidario).

Figure 1. Impact of incentives on mechanisms



Notes: the figure plots the effect of individual and group incentives on each of the individual outcomes making up the index of communication (Figure 1A), collective action (Figure 1B) and peer effects (1C) presented in Table 4.