

**The Nueva Ecija cardiovascular risk experiment:  
An evaluation of the impact of risk information and screening on primary  
prevention of cardiovascular disease**

**Study Protocol**

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## 1. Introduction

Cardiovascular disease (CVD) accounts for one third of all deaths, making it the leading cause of death worldwide (Roth et al 2015). The vast majority (71%) of CVD-related deaths occur in low- and middle-income countries (LMICs), where the number of such deaths increased by two thirds between 1990 and 2013 (ibid). Over this period, the CVD attributable death rate declined by 43% in high-income countries but by only 13% in LMICs. The proportion of total deaths that are caused by CVD is falling in high-income countries but rising in LMICs.

The high and growing number of CVD deaths in low- and middle-income countries is not due to greater exposure to risk factors. The Prospective Urban Rural Epidemiology (PURE) study has demonstrated that while low-income countries have a lower CVD risk-factor burden than high-income countries, they have higher rates of major cardiovascular disease and CVD-related death (Yusuf et al 2014). Deficiencies in prevention and control of disease for given exposure to CVD risks result in a great deal of avoidable mortality in the developing world.

There is a lack of awareness and control of CVD risks worldwide that is most severe in LMICs. The PURE study documents low awareness, medication and control of hypertension (Chow et al, 2013)<sup>1</sup>. Such gaps are indicative of more general deficiencies in information regarding exposure to CVD risks and ability to influence these risks through lifestyle and medication. But the gaps are also attributable to deficiencies in healthcare systems. Primary care in LMICs is often focussed on maternal and child services and has tended not to engage in systematic primary prevention of CVD. Consequently, access and affordability of diagnostic testing and medication may be lacking for the minority of individuals who do have some awareness of potential exposure to CVD risk factors.

International agencies are assisting national governments in their efforts to address these problems. The World Health Organization (WHO) Essential Package of Non-Communicable Disease (NCD) Interventions for Primary Health Care in Low Resource Settings (PEN) provides a template for improved prevention, detection and management of chronic illness (WHO 2010). Even more specific to CVD, the WHO, in collaboration with United States (US) Centers for Disease Control and Prevention (CDC) and international medical associations, has recently launched the [Global Hearts Initiative](#). This includes the HEARTS (WHO 2016) package that aims to strengthen management of CVD in primary care largely through implementation of the treatment protocols and risk-based management approach set out in the PEN. Both packages advocate classifying and managing patients on the basis of a global CVD risk score, as opposed to a single risk factor approach.<sup>2</sup>

The PEN has been widely adopted in LMICs. Given the very low level of primary prevention of CVD in many countries, the package certainly has the potential to make an important impact on population health. But there are reasons for only cautious optimism. First, as implemented, risk assessment is done opportunistically when patients consult a health facility. This may do little to bring exposure to heightened CVD risk to the attention of the vast majority of people who are unaware of their hypertension, diabetes or dyslipidemia. To go below the tip of the iceberg of CVD risks, it may be

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<sup>1</sup> There is: i) a low rate of awareness of hypertension among those diagnosed by survey measurements; ii) a low rate of medication of those diagnosed as hypertensive; and, iii) a low rate of blood pressure control among those under medication.

<sup>2</sup> WHO guidelines propose a hybrid approach of treating individuals with elevated risk indicated by a probability of a CVD event within 10 years according to the WHO/ISH charts in excess of a threshold (e.g. 30%) or high blood pressure ( $\geq 160/90$  mmHg) or high blood cholesterol (total cholesterol  $\geq 8$  mmol/dL) (WHO 2007). The CVD risk threshold can be determined by countries on the basis of resource availability.

necessary to combine the improved primary care offered in facilities with information that alerts individuals to their susceptibility to CVD and their potential to benefit from primary prevention. Without this, uptake of risk assessment and screening may be low.

Even if at-risk individuals do seek screening, the health impact could still be muted if implementation of the program is weak. Staff may lack the training and/or motivation to follow the protocol of risk assessment, screening, counselling and medication. Diagnostic equipment may not be available. Supplies of medication may be inadequate or sporadic. Without investment of resources necessary to cope with the demands on primary care facilities that can be expected to arise from higher rates of detection of CVD risk, adoption of the PEN may promise more than can be delivered.

While the PEN protocols specify treatments of proven cost-effectiveness, as far as we are aware, the package itself has not been evaluated as implemented in any country. Its effectiveness in delivering primary prevention of CVD and averting avoidable mortality has not been established. This gap in evidence is remarkable given the scale of the CVD burden in LMICs and widespread reliance on the PEN to reduce it.

This project aims to go some way towards filling the knowledge deficit by assessing the demand for and effect of primary prevention of CVD implemented through the PEN in the Philippines (PhilPEN). Its first objective is to establish the role of deficient information about CVD risks in discouraging healthy behaviour and constraining demand for primary prevention. Randomized provision of information on personal CVD risk based on measured risk factors will allow us to assess the extent to which perceived risks respond to such information and, consequently, how lifestyles and the demand for CVD screening and medication are affected.

The second objective is to evaluate the extent to which the PhilPEN program is successful in delivering effective primary prevention that reduces the risk of CVD. This will be done by randomly encouraging uptake of the program's risk screening and using this to trace the impact on exposure to risk factors, medication of hypertension and the predicted risk of CVD and awareness of this risk.

## 2. Setting

CVD is the main cause of death in the Philippines; 30% of deaths are attributable to cardiovascular conditions (WHO, 2012), which is close to the global average. While the CVD death rate in the Philippines is lower than in most LMICs in the Western Pacific, it is much higher than in neighbouring high-income countries. This is indicative of a great deal of avoidable mortality.

The high rate of CVD mortality in the Philippines, as elsewhere in developing Asia, is partly the consequence of high prevalence of associated risk factors: raised blood pressure at 22%, smoking at 25%, physical inactivity at 46%, overweight/obesity at 31% and borderline-high cholesterol at 47% (FNRI-DOST, 2015). However, these rates are not higher than those of the high-income countries in the region that have considerably lower CVD-related mortality (WHO, 2012). This suggests deficiencies in the prevention and control of CVD given exposure to risks. Like many LMICs, the Philippines faces a major health policy challenge: demographic and behavioural changes generate a heavy NCD burden before the health system has developed the universal, resilient and responsive primary care required to manage it.

The Philippines adopted its version of the PEN program in 2012 (Department of Health 2012a, 2012b). PhilPEN sets out a protocol for risk assessment and screening, lifestyle counselling and medication of hypertension and diabetes in all primary care facilities. From 2012, staff in Rural Health Units (RHU) and Urban Health Centers (UHC) began to be trained in operation of the protocol. By 2015, training was complete in 70% (78%) of municipalities (cities).

The PhilPEN protocol is the WHO protocol for the integrated management of diabetes and hypertension. The target population consists of individuals aged 25 years old and over with no established cardiovascular disease. The protocol consists of five actions.

- 1) **Risk assessment:** Questions and measurements identify individuals as being at risk of CVD if they have at least one of the following characteristics: aged >40 years, smoker, overweight (BMI ≥ 23), central adiposity (waist ≥ 90cm (male)/ 80cm (female)), raised blood pressure (≥ 120/80 mmHg), diabetes (reported diagnosis), family history of hypertension, stroke or heart attack, family history of diabetes or kidney disease. Some facilities conduct purposive risk assessment in the community. Most rely on opportunistic assessment when someone attends a RHU/CHC. The protocol requires that all individuals identified as ‘at risk’ continue to Action 2.
- 2) **Risk screening:** Questions are used to detect symptoms of angina, heart attack, stroke or transient ischemic attack (TIA), and measurements are taken of: a) blood lipids; b) urine protein; c) blood glucose (if has symptoms of diabetes but not diagnosed); and, d) urine ketones (if newly diagnosed with diabetes).
- 3) **Referral** to a higher level facility if: a) BP ≥ 140/90 mmHg and aged <40 or already medicated with at least one drug; b) known heart disease, stroke, TIA, diabetes, kidney disease, angina, claudication or worsening heart failure; c) certain cases of high blood sugar; or d) any proteinuria.
- 4) **Prediction** of ten-year risk of fatal or non-fatal CVD event using World Health Organization/International Society of Hypertension (WHO/ISH) risk chart (with or without measure of cholesterol) for those not referred at Action 3.
- 5) **Treatment:** Both individual risk factors and the total CVD risk score are used in prescribing the treatment response (see Appendix A). Those exposed to particularly high risk through a single risk factor (hypertension, pre-existing CVD, high cholesterol and diabetes) should be prescribed the appropriate medication. Those with the CVD risk above 30% are to be given an antihypertensive if blood pressure is elevated and also a statin. Those with CVD risk 20-30% are to be given a low dose antihypertensive. Those with risk below 20%, as all others, are to be counselled on diet, physical activity and smoking cessation. The stipulated frequency of periodic follow-up depends on the risk score.

Department of Health (DOH) monitoring of PhilPEN implementation in six regions in 2015 revealed that not all facilities were following the protocol. Implementation requires that health facilities have sufficient supplies of medications, test devices and materials. The monitoring did not assess the availability of devices and materials at health centers but interviews conducted by the study team in Rizal and Pampanga provinces revealed that many RHUs are unable to perform blood tests and must refer patients to higher level facilities, which can result in the test not being undertaken.

PhilPEN was initially (2013) supported by DOH central procurement and distribution of drugs to RHUs under the Complete Treatment Packs (COMPACTS) program. In 2015, support for PhilPEN was shifted to the Maintenance Medicines Program and the Hypertension and Diabetes Clubs (H and D). Instead of the seven molecules for CVDs supplied under the COMPACT program, only four molecules are provided by the latter programs. Specifically, these programs are intended to make the anti-hypertensives (amlodipine, losartan, and metoprolol), as well as one diabetes medication (metformin), available at all RHU/CHCs at no charge irrespective of the patient’s insurance cover or income. Statins are not supplied, despite the protocol stipulating that they should be given to all patients with a CVD risk in excess of 30% and to those with particularly high total cholesterol (≥ 8 mmol).

Allocation of the drug supply across facilities is demand based, although interviews conducted by the study team in selected RHUs reveal substantial delays in deliveries and possible stock-outs. There is substantial variation across facilities in the management of drug inventories. Some allow for potential shortages by admitting patients to the program only if a six-month supply of medication is secured in advance for that patient.

The study will be conducted in Nueva Ecija, a landlocked province of 2.15 million people in Central Luzon, which is one of the regions with the highest prevalence of major CVD risk factors, such as high blood glucose and smoking, in the country (FNRI-DOST, 2015). The province of Nueva Ecija is chosen because of its relatively high rate of poverty (29.6% compared with national average of 26.3% in 2015) despite being reasonably accessible from Metro Manilla (180 km). A high prevalence of poverty is important since the study aims to induce utilization of preventive care at RHU/CHCs, which mainly serve the poorer population. The vast majority of the population (83%) is rural dwelling.

### 3. Research objectives, questions and hypotheses

#### 3.1 Objectives

Broadly, the project has two objectives. First, it seeks to further understanding of how beliefs about CVD risks affect health lifestyles and the demand for preventive care. Second, it aims to establish the effectiveness of the PhilPEN program in delivering primary prevention of CVD. The first objective has a scientific motivation of advancing knowledge of the formation of health beliefs. But it also derives from the practical need to raise demand for primary prevention if the burden of CVD on population health is to be lightened. Not only will we measure the accuracy of beliefs about exposure to CVD risk, but by randomly providing information on personal CVD risk, we will assess the extent to which biased beliefs constrain demand for primary prevention and sustain unhealthy lifestyles. In addition, we will test whether beliefs about susceptibility to CVD are responsive to the receipt of information on personal risk.

The second objective is more immediately motivated by policy. Implementation research on the PEN program is lacking. To the best of our knowledge, this will be the first study to establish whether the program as it is implemented is effective in delivering primary prevention of CVD.

Meeting both objectives will allow us to distinguish between possible scenarios. One is that PhilPEN is effective in preventing CVD of patients who access it but that its impact on population health is muted because poor information on susceptibility to CVD reduces the demand for primary prevention. Another is that even if improved information is effective in raising this demand, it will have little impact on population health through PhilPEN because of deficiencies in the operation of the program in health facilities.

#### *Beliefs, information and health behaviour*

The gross under-diagnosis of hypertension and diabetes suggests that improving awareness of risk factors is central to reducing CVD morbidity and mortality. Inadequate medication of these conditions is likely attributable, in large part, to lack of availability and affordability of medicines. But it could also stem from under appreciation of the risks of untreated, asymptomatic conditions, as well as the effectiveness of pharmacotherapies in preventing the progression from risk factor exposure to disease. Lack of appreciation of the long term gains from treating a condition that does not currently cause discomfort likely contributes to poor adherence to medication and lack of control of hypertension.

Central to these explanations for low awareness, medication and control of hypertension, diabetes and other CVD risk factors are beliefs about susceptibility to health risks, severity of consequent health conditions and effectiveness of medication in containing illness. According to the *health beliefs model* (Rosenstock 1966) providing individuals with information on their risk of developing CVD and counselling on actions to avert or manage the risk will lead to adoption of healthier lifestyles and uptake of effective screening and medication. But this may be overly simplistic. Without sufficient knowledge of the epidemiology of CVD, behaviour may change little in response to information about exposure to risk factors that do not immediately manifest in health problems. A negative result from a screening test could even encourage unhealthy habits that take time to have physiological effects. Bad news from a screening test that the risk is higher than had been anticipated may be filtered out by optimistically biased individuals wishing to avoid the distress aroused by contemplation of life-threatening disease (Sharot & Garrett 2016). Understanding how individuals respond to information on CVD risks is critical to designing programs that are effective in managing those risks.

We will elicit perceptions of CVD risk alongside the collection of data on health and behaviours related to CVD, including utilization of preventive care. These data combined with the randomized provision of information on personal CVD risk will allow us to identify the impact of information on lifestyles, preventive care and intermediate health outcomes and how it operates through beliefs about susceptibility to CVD. This goes beyond policy simulations that rely on assumptions about the impact of information on beliefs. For example, from the estimated impact of beliefs about HIV on sexual activity, Delevande and Kohler (2016) infer that policy should target beliefs. But that prescription is valid only if beliefs are responsive to information. We can test this.

If it is confirmed that beliefs about CVD risks do respond to the provision of information on those risks, then we can use the exogenous variation in risk perceptions induced by the experiment to estimate the causal effect of beliefs on behaviour. This overcomes a fundamental problem of the endogeneity of beliefs arising from their dependence on past behaviour (Paula et al 2014). The information intervention provides an instrument for beliefs that identifies their impact on choices.

The data on beliefs give us an important advantage over most studies of the impact of information. They allow the mechanism to be traced. Information programs are often found to be ineffective in changing health behaviour. Usually, it is not known whether this is because the information did not shift beliefs or because any change in beliefs did not feed through to behaviour. If this experiment also produces a negative result, we will be able to identify at what stage the *theory of change* failed.

#### *Primary prevention of CVD through the PEN*

The PEN is founded on a substantial body of evidence that establishes the effectiveness of behavioural change (smoking cessation, weight loss, physical activity and reduced intake of salt and fat) and medication in preventing CVD. It is known that quitting smoking and taking antihypertensives, for example, reduce the risk of heart attack. The difficulty lies not in knowing what to do for someone at risk of CVD. Rather, it lies in identifying who is at risk and ensuring that they get the interventions that are known to be effective.

The PEN relies on the WHO/ISH charts to identify those at elevated risk of CVD. These charts are not based on sound, verifiable statistical methods. Studies that assessed their external validity find very poor performance (Selvarajah et al 2014). The standard procedure for constructing a CVD risk prediction algorithm is to estimate a model for CVD events as a function of previously measured risk factors in a cohort followed over time. This method was not adopted to construct the WHO/ISH charts. The method by which they were derived is rather opaque. Risk factor prevalence estimates for each of the six WHO

regions were obtained from the WHO Collaborative Risk Assessment Project (WHO 2007), absolute CVD risks were taken from the Global Burden of Disease study and each coefficient representing the impact of a risk factor on the 10-year risk of a CVD event was taken from a separate published study.

Kariuki et al (2013) evaluate the performance of the WHO/ISH charts against criteria for a clinically useful CVD risk assessment (Cooney et al, 2009). The algorithm is found lacking with respect to representativeness of sample (which is entirely lacking), appropriateness of statistical methods (not specified) and checks on internal and external validity (not conducted). Selvarajah et al (2014) demonstrate that even the chart that makes use of information on cholesterol performs poorly in predicting CVD risks in the Malaysian population, with gross underestimation of risk. Despite the study sample having high prevalence of risk factors, the WHO/ISH risk chart placed 90% in the low-risk category (10-year CVD risk <10%), while the non-laboratory Framingham algorithm (D'Agostino, 2008), which uses BMI instead of cholesterol, categorized only 48% as low risk. The WHO/ISH chart placed only 3% in a high-risk category (10-year CVD risk >30%), while Framingham placed 23% in this category (10-year CVD risk  $\geq$ 20%). In addition to low agreement on risk categorization, there was low correlation between WHO/ISH and both the Framingham and the SCORE algorithms. The low correlation was due to the WHO/ISH charts placing many at low risk that the other two algorithms classified as high. The tendency for WHO/ISH charts to categorize the vast majority in the low risk category despite high prevalence of CVD risk factors has been demonstrated for Cambodia (97%) (Dugee et al 2013), Cuba (90%) (Nordet et al 2013), Jamaica (89%) (Tulloch-Reid et al 2013) and Mongolia (94%) (Dugee et al 2013). Accuracy of the charts, particularly whether the risk classification is sufficiently detailed for medium to high risks, has been questioned (Persson et al 2003; Yikona et al 2002).

The apparent downward bias in risk prediction using the WHO/ISH charts means that the PEN, in the Philippines and elsewhere, may well be failing to deliver primary prevention of CVD to many who could benefit from it. One objective of this study is to examine whether this is indeed the case.

More specific to the Philippines, lack of resources and incentives for implementation of the PEN may have reduced its effectiveness there. Beyond the supply of some medicines and the training of staff, health facilities did not receive any increase in their budgets from the Department of Health (DOH) to support the implementation of PhilPEN. This, the lack of provision of some medications, the uncertain supply of other medications, the inability of some facilities to conduct all the required tests and the evidence from monitoring that the protocol is not being followed in all facilities, all suggest that the impact on population health may fall well short of the potential impact of a more effectively implemented program. One goal of this study is to establish the effectiveness of the PEN as it is actually implemented in the Philippines. This is more relevant than examination of a perfectly implemented program, since the medications and lifestyle changes prescribed by such a program have already been proven to be highly effective in the primary prevention of CVD. The question is whether such interventions are being implemented.

Since few health facilities are conducting risk assessment in the community, many who could benefit from primary CVD prevention may not be getting it. We will induce individuals to attend facilities for risk assessment and use this variation to evaluate the effectiveness with which the PhilPEN protocol is being implemented.

### 3.2 Hypotheses and tests

We first propose hypotheses regarding relationships between CVD beliefs, information and behaviour that will be tested using data on elicited beliefs and the information experiment, which are summarized in Table 1.

**Q1: Are the elicited beliefs interpretable as subjective probabilities?**

[H1a] Elicited probabilities have face validity and are consistent with rules of probability.

**Tests:**

- Use data from section A.
- Face validity: Ask for perceived life expectancy and for perceived chance of living past 80 years. Check whether those variables are positively correlated.
- Monotonicity: Ask for perceived probability of a destructive earthquake in respondent’s province within one year and within 10 years and check percentage of respondents for whom the latter reported probability is not smaller than the former.
- Binary complementarity: Ask for perceived probability that there will be a destructive earthquake in respondents’ province within the next 10 years and perceived probability that there will NOT be a destructive earthquake during the same period. Check percentage of respondents for whom the probabilities add up to 1. Compute mean sum of those two subjective probabilities and test whether it equals 1.

[H1b] The prevalence of consistency violations varies with education.

**Test:**

- Regress binary outcome indicating violation of probability rule (monotonicity and binary complementarity) on education level (and possibly other characteristics).

**Table 1 Overview of risk perceptions survey module**

Section	Treatment group	Control group
A. Training questions	A <sub>T</sub>	A <sub>C</sub>
B. Perceived average CVD risk (base rate)	B <sub>T</sub>	B <sub>C</sub>
C. Information on average CVD risk	C <sub>T</sub>	—
D. Perceived personal CVD risk (prior)	D <sub>T</sub>	D <sub>C</sub>
E. Information on personal CVD risk	E <sub>T</sub>	—
F. Perceived personal CVD risk (posterior)	F <sub>T</sub>	—
G. Information on CVD risk if reduce risk factor exposure	G <sub>T</sub>	—
H. Perceived personal CVD risk if reduce risk factor exposure	H <sub>T</sub>	H <sub>C</sub>

Note: CVD risk is the probability of having a heart attack or stroke within the next 10 years. We also ask about the probability of getting diabetes within the next 10 years. Sections B, D & F also ask about perceptions of life expectancy and probability of survival to 80.

**Q2: Do elicited beliefs incorporate information about objective risks?**

[H2a] Perceived CVD and diabetes risks, perceived life expectancies and subjective survival probabilities are correlated with objective risks predicted from risk factors, including demographics, BMI etc.

**Test:**

- Regress perceived personal risks from both information treatment group and control group on 10-year CVD risk predicted from Globorisk, 10-year diabetes risk predicted from Finnish Diabetes Risk Score (FINDRISC) (Lindstrom and Tuomilehto 2003) and lifetable survival probabilities.<sup>3</sup>
- Data from section D - prior to treatment group receiving information on personal CVD risk.

**[H2b]** Perceived CVD and diabetes risks, and perceived life expectancies, deviate from predicted risks due to differential weighting of risk factors.

**Test:**

- Regress perceived personal risks of both information treatment group and control group (section D) on risk factors and compare coefficients with those obtained from regression of predicted probabilities on risk factors. For example, for personal 10-year CVD risk, compare coefficients from model of reported probability to those used in Globorisk risk prediction tool to produce predicted probabilities. Moreover, compare other coefficients to those found in previous literature on the determinants of CVD and diabetes risks, and on life expectancies, such as, family history and exercise.
- Regress perceived personal CVD and diabetes risks, life expectancies and subjective survival probabilities (section D) on the respective perceived base rates (section B) and on risk factors to test the extent to which perceived personal risks are based on perceived base rates with an adjustment to make use of information available to the respondent on risk factors.

**[H2c]** Perceived base rates for CVD, diabetes, life expectancy and survival probability are higher than objective (predicted) base rates.

**Tests:**

- Compute mean deviations of perceived base rates (section B) from predicted base rates. A positive (negative) mean deviation hints at overestimation (underestimation) of CVD prevalence/diabetes prevalence/life expectancy/survival probability.
- Compute mean ratios of perceived base rates to objective (predicted) base rates. A mean ratio  $> 1$  ( $< 1$ ) hints at overestimation (underestimation) of CVD prevalence/diabetes prevalence/life expectancy/survival probability.
- Compare proportion of sample with perceived base rate  $<$  objective (predicted) base rate with proportion with perceived base rate  $>$  objective base rate.

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<sup>3</sup> This test could be conducted using all survey respondents, including those in the lottery intervention arm. The reason we exclude the latter is because later tests make use of the information intervention and we want to have a consistent sample throughout.

**[H2d]** The accuracy of base rate estimates varies with education, personal risks, life expectancies and survival probabilities, the respondent's confidence in the accuracy of his perceived base rate, the respondent's degree of worry about CVDs, the respondent's degree of dispositional optimism, and possibly other characteristics.

**Tests:**

- Repeat computation of mean deviations and mean ratios as explained in [H2c] for each gender/age category combination and check whether CVD/diabetes prevalence, life expectancy and survival probabilities are systematically (by factors defined in [H2d]) over- or underestimated.
- Regress mean square estimation error  $((\text{perceived} - \text{predicted})^2)$  and binary indicator of whether base rate has been over- or underestimated on education level, predicted personal CVD/diabetes risk, predicted life expectancies and survival probabilities, confidence about own base rate estimates, worry about CVDs, dispositional optimism, and possibly other characteristics.

**[H2e]** Perceived personal CVD risk is negatively correlated with perceived life expectancies and survival probabilities.

- Regress perceived personal CVD risk on perceived life expectancies and on survival probabilities until the age of 80 years (section D).
- Compute fraction of respondents who state a perceived life expectancy conditional on experiencing a CVD event lower than their unconditional perceived life expectancy.

**[H2f]** Perceived personal CVD and diabetes risks, life expectancies and subjective survival probabilities deviate systematically from base rates with a tendency towards optimism bias.

**Tests:**

- Compute mean deviations of prior perceived personal risk (section D) from predicted base rate for treatment and control group. A negative mean deviation is consistent with optimism bias.
- Compare the mean deviation of the treatment group that is given information on the base rate (section C) with the control group that is not. Establish the extent to which under-/over-estimation of the base rate contributes to apparent optimism/pessimism bias.
- Compute mean ratio of perceived personal risk to predicted base rate for treatment and control group. A mean ratio  $< 1$  is consistent with optimism bias.
- Compare proportion of sample with perceived personal risk  $<$  base rate with proportion with perceived personal risk  $>$  base rate for treatment and control group. This does not suffer from the same sensitivity to outliers as the two measures proposed immediately above.
- Repeat the mean deviation test for an event with positive valence and similar average risk as 10-year CVD risk. For this we use the probability of living past the age of 80 (section D). A positive mean deviation in this case would be consistent with pessimism bias. If we find this, then we cannot conclude that positive mean deviation in previous test is indicative of optimism bias.

- Test whether control group individuals state lower perceived personal risks (section D) than perceived base rates (section B) given not provided with base rate information.
- Compute share of unrealistically optimistic, accurate and unrealistically pessimistic individuals according to the definitions of Radcliffe and Klein (2002). Test whether there are significantly more unrealistically optimistic than unrealistically pessimistic individuals.
  - In particular, compute the ratio of predicted personal CVD risk to predicted CVD base rate (GloboRisk), as well as the ratio of perceived personal CVD risk (section D) to perceived CVD base rate (section B). Individuals who provide a perceived risk ratio of more than 10% lower than their predicted risk ratio are defined as unrealistically optimistic. Likewise, individuals who consider themselves to be at higher relative risk than their predicted risk ratio (by more than 10%) are considered unrealistically pessimistic. Individuals whose perceived relative risk is within 10% of their predicted risk ratio are considered accurate.
  - Since a ratio is affected more by noise at small values than at large values, we will also define optimism / pessimism in terms of the difference between perceived personal and base rate CVD risk in comparison with the difference in the respective predicted risks.

**[H2g]** Individuals high in dispositional optimism, high in comparative optimism, and low in unrealistic optimism have the most favorable profile with respect to health, anxiety and knowledge. In particular, we expect that these individuals exhibit the best health status and lowest risk factor levels, have the lowest predicted risks of having a heart attack or a stroke within 10 years, worry the least about this risk and have the highest CVD risk factor knowledge (see Radcliffe and Klein, 2002).

**Test:**

- Regress health status, risk factor levels, predicted 10-year personal CVD risks, worry about CVD risk and risk factor knowledge on the degree of dispositional optimism, a binary variable representing comparative optimism and a binary variable representing unrealistic optimism.
- Unrealistic optimism is computed as described in [H2f] following Radcliffe and Klein (2002). Comparative optimism is a binary variable indicating whether an individual stated a lower perceived personal risk than his/her respective perceived base rate.
- Test whether coefficients of dispositional, comparative and unrealistic optimism are consistent with the hypothesis.

**[H2h]** Dispositional optimists possess more optimistic risk perceptions, but not more optimistically biased risk perceptions. In particular, dispositional optimism is positively correlated with comparative optimism, but uncorrelated with unrealistic optimism (see Radcliffe and Klein, 2002).

**Test:**

- Measure correlation between dispositional optimism and comparative optimism.
- Measure correlation between dispositional optimism and unrealistic optimism according to definition of Radcliffe and Klein (2002) (see [H2f]).

**[H2i]** Individuals understand that they can decrease their personal CVD risk by improving their risk factor profile.

**Test:**

- Compute fraction of respondents who report a personal CVD risk conditional on reducing exposure to risk factors (i.e. smoking, BMI and blood pressure) (section H) smaller than their perceived unconditional personal CVD risk ( $F_T$  and  $D_C$ ). Test whether this fraction is higher for treatment than for control group.
- Regress binary variable indicating a perceived personal CVD risk conditional on reduced exposure to risk factors smaller than the perceived unconditional personal CVD risk on knowledge about CVD risk factors. Test whether individuals with a higher CVD risk factor knowledge are more likely to state a conditional risk smaller than their unconditional risk.
- Compute difference between perceived unconditional personal CVD risk and perceived conditional personal CVD risk for both control and treatment groups and regress on variables that indicate the respondents' smoking status, BMI and systolic blood pressure level. Test whether higher risk factor levels are associated with a higher difference between perceived unconditional and conditional CVD risks.

**Q3: Do beliefs about susceptibility to CVD respond to information on predicted personal CVD risk?**

[H3a] Beliefs about personal susceptibility to CVD are updated to incorporate information provided on objective CVD risk predicted from risk factor exposure.

**Test:**

- We test whether beliefs are updated consistently with Bayes rule such that,  $posterior_i = \lambda \cdot predicted_i + (1 - \lambda) \cdot prior_i$  where  $\lambda \in [0,1]$  is an updating weight representing the individual's willingness to abandon her own prior in favor of the provided risk information. To estimate  $\lambda$  for the 10-year personal CVD risk, we estimate:

$$(posterior_i - prior_i) = \lambda(predicted_i - prior_i) + \varepsilon_i, \quad (3.1)$$

where the *prior* is perceived personal CVD risks of the information treatment group before being told their predicted risk obtained from Globorisk ( $D_T$ ), *posterior* is the equivalent after being told the predicted risk ( $F_T$ ) and the *predicted* is the Globorisk prediction of personal CVD risk. This yields an estimate of the extent of updating following the provision of only personal CVD risk information.  $\hat{\lambda} = 1$  indicates complete revision of beliefs in which there is 100% reliance on the new information in the prediction and the prior is completely dismissed.  $\hat{\lambda} = 0$  indicates no updating of beliefs.  $\hat{\lambda} \in (0,1)$  indicates some updating, which can still be consistent with Bayes. For example, the respondent may weigh the new information and the prior in relation to the perceived sample size from which each is obtained.

- To test the response of risk perceptions to the different types of information provided, we estimate regressions of the general form:  $p_i = \beta x_i + \gamma I_i + u_i$ , where  $I_i$  is a dummy variable indicating whether a respondent has been allocated to the information treatment or to the control group and the interpretation of  $\gamma$  varies according to the definition of the dependent variable as follows:

<b>Dependent variable (<math>p</math>)</b>	<b>Effect identified</b>
$D_T, D_C$	Effect of base rate CVD risk information on perceived personal CVD risk.

$F_T, D_C$	Effect of information base rate + personal CVD risk information on perceived personal CVD risk.
$H_T, H_C$	Effect of base rate + personal + reduced risk factor CVD risk information on perceived personal CVD risk if reduced risk factors.
$F_T-H_T, D_C-H_C$	Effect of information on change in CVD risk if reduced risk factors on perception of that change.

- Using the treatment group only, we obtain an alternative estimate of the effect of being informed of predicted personal CVD risk on perceived personal CVD risk by regressing the latter on an indicator of whether it is measured prior to or after receiving personal risk information. That is, a simple before-after comparison:  $p_i = x_i\beta + \gamma 1(p_i = F_{Ti}) + u_i$ ,  $p_i = D_{Ti}$  or  $F_{Ti}$ .
- We will run similar regressions to test for updating of confidence about reported risks and worry about CVD risk. See the last point under [H5a] on the relevance of the impact of information on belief confidence.

**[H3b]** Individuals who are exposed to the information intervention do not simply memorize numbers and percentages they are told in the treatment, but incorporate the information to update beliefs about event likelihoods related to CVD risks.

**Test:**

- Estimate the correlation between the prior-posterior change in perceived life expectancy and the prior-posterior change in perceived 10-year CVD risk. A negative correlation means that individuals update their life expectancy in a direction consistent with their revision to perceived personal CVD risk. For example, if the perception of CVD risk is raised, then life expectancy is reduced. We will repeat the same exercise for life expectancies conditional on experiencing a heart attack/stroke. As survival probabilities conditional on a CVD event are independent of CVD risk, a coefficient of zero is consistent with Bayesian updating. We use the same beliefs as described in [H3b] to test for updating following the provision of both base rate and personal CVD risks and the provision of only personal CVD risks.

**[H3c]** Updating of beliefs is heterogeneous with respect to education, predicted CVD risk, confidence about CVD risk estimates and worry about CVD events.

**Test:**

- Repeat regression (3.1) allowing  $\lambda$  to vary with the stated characteristics.

**[H3d]** Updating of beliefs is asymmetrical in response to positive information, i.e.  $prior_i > predicted_i$ , and negative information i.e.  $prior_i < predicted_i$ .

**Test:**

- We run the following regression:

$$(posterior_i - prior_i) = \lambda_{1i}(predicted_i - prior_i) \times 1(predicted_i \leq prior_i) + \lambda_{2i}(predicted_i - prior_i) \times 1(predicted_i > prior_i) + \varepsilon_i$$

and test  $\lambda_{1i} = \lambda_{2i}$  against  $\lambda_{1i} > \lambda_{2i}$ . That is, under the alternative hypothesis, individuals who receive good news respond more than those who receive bad news. Such asymmetric updating is

consistent with the reinforcement of optimism bias. However, in light of Harris and Hahn (2011) and Shah et al. (2016), we cannot infer a mechanism for optimism bias from  $\lambda_{1i} > \lambda_{2i}$  alone.

**Q4: Do beliefs about susceptibility to CVD affect behavior in relation to lifestyles and the demand for preventive care?**

**[H4a]** Beliefs play an important role in determining health behavior. Individuals are forward-looking and take into account their perceived susceptibility to CVD in deciding on their use of primary prevention and health lifestyles. Further, they use perceptions of the response of CVD risk to risk factors when deciding whether to change health habits such as smoking and diet/exercise.

**Test:**

- Run regressions of the form,  $y_i = \beta x_i + \theta \hat{p}_i + \varepsilon_i$ , where the dependent variable is an indicator of a) whether the person has attended a health facility for a checkup, including blood pressure measurement and diagnostic tests, b) whether is taking medication for hypertension/diabetes, c) smoking (at all and intensity), d) BMI, e) exercise and possibly others. In one set of regressions,  $\hat{p}_i$  will be the predicted value of the perceived personal CVD risk, which will be obtained from one of the regressions described under [H3a]. That is, in the first stage, perceived personal CVD risk measured after the giving the treatment group information on the base rate and their predicted personal risk is regressed on the treatment group indicator. The IV estimate of  $\theta$  tells us how behaviour responds to changes in CVD risk perceptions induced by information on those risks.
- The regression model described in the preceding paragraph is possibly incorrectly specified. It supposes that an individual chooses her health behaviour in response to her perceived level of CVD risk. Logically, behaviour is determined by perceptions of how CVD risk varies with that behaviour. To test this model of rational behaviour, in the regressions described in the previous paragraph, we will replace the perception of personal CVD risk with the difference between this and the perception of what the CVD risk would be if the individual were to reduce her modifiable risk factors. This difference in risk perceptions will be instrumented by regressing it on the treatment group indicator.

**Q5: Does the demand for preventive care and health behavior, and ultimately CVD risk, respond to information on current CVD risk?**

**[H5a]** Receiving information on the predicted 10-year CVD risk (including information on the base rate and the risk conditional on reduced exposure to risk factors) affects the demand for primary prevention and lifestyles related to CVD risk. As a result, the provision of information reduces CVD risk.

**Test:**

- Repeat the regressions described in [H4a] but replace the perceived risk with  $I_i$  indicating whether the individual was in the information treatment group. That is, estimate the reduced form effect of the information intervention on behaviour.
- Run the same sort of regression but with the dependent variable being predicted CVD risk at follow-up and conditioning on predicted CVD risk at baseline. If the information intervention has

succeeded in reducing risk factors (blood pressure, smoking and BMI) either through utilization of preventive care or directly through lifestyles, then the mean CVD risk score of the information treatment group will fall relative to that of the control group.

[H5b] Receipt of information on CVD risks affects behaviour not only through the correction of biased beliefs but also by reducing intrinsic uncertainty and increasing confidence in beliefs.

#### *Elaboration*

Individuals may be apprehensive of utilizing their beliefs about CVD risk because they lack confidence in the accuracy of those beliefs. Their beliefs are ambiguous. If individuals are ambiguity seeking in the loss domain, which is often found (Dimmock et al 2015), and are informed that their risks are lower than they had reported, then on gaining confidence in their downwardly revised beliefs they may become responsive to them. Being surer that the CVD risk is 15% rather than being very uncertain that it is 20% may cause an individual to adopt healthier behaviour.

#### **Test:**

- Repeat the regressions of the previous test but rather than including a single indicator of treatment group enter two indicators. One identifies respondents in the treatment group informed that their risk is above their initially reported risk. The other identifies respondents in the treatment group informed that their risk is at or below their reported risk. If it is only the correction of bias in risk perceptions that affects behaviour, then only the first group should adopt healthier behaviour. The second group, if anything, should adopt less healthy behaviour. If, to the contrary, the second group responds to the positive news they are given of their CVD risk by adopting healthier habits, this suggests an effect through reduced ambiguity. In addition, we will examine how the provision of information affects stated confidence in individuals' estimates of their risks of heart attack/stroke.

#### **Q6: Is PhilPEN effective in delivering primary prevention of CVD to those who seek care at RHU/CHCs?**

[H6a] As currently implemented, PhilPEN does not reduce the risk factor exposure and increase the medication of individuals with elevated CVD risk.

#### **Test:**

- Induce random variation in presentation for checkup at RHU/CHCs, which under PhilPEN are required to conduct CVD risk assessment of all patients, to screen those meeting specified criterion, to counsel all those screened on smoking cessation and to provide hypertension and diabetes medication to those at high risk defined by the WHO PEN protocol.
- The information intervention will not be used to generate this random variation since beliefs about CVD risk can impact on behaviour directly even without contact with health facilities and the PhilPEN program.
- Rather, a *randomized encouragement design* is adopted in which respondents in randomly selected barangays will be offered the opportunity to enter a lottery for a money prize on condition of attending a RHU/CHC for a checkup within a month. The lottery will have a selection probability of 10% and a prize of 5,000 PHP. There will be one lottery within each of the selected barangays.

- The offer of a lottery ticket will be used to instrument presentation for checkup at RHU/CHC allowing the effect of the latter on predicted 10-year CVD risk, plus risk factors (smoking, BMI, blood pressure), hypertension diagnosis and medication at follow-up to be identified.
- Specifically, we will estimate the regression model,

$$Y_{it} = \gamma Y_{it-1} + \beta x_{it-1} + \tau \hat{s}_i + \mu_{it} \quad (6.1)$$

where  $Y_{it}$  represents the outcome variable (e.g. predicted CVD risk) at follow-up and  $\hat{s}_i$  is the predicted value of a binary variable that equals one for those who attended a RHU/CHC for a checkup, and zero otherwise. The prediction is obtained from the first stage regression described in [H6b] that makes use of the random offer of entry to the lottery.  $Y_{it-1}$  and  $x_{it-1}$  are the outcome and covariates respectively at baseline. Note that only individuals that are either in the lottery incentive group or in the control group are used for this regression.

- The instrumental variable estimate of  $\tau$  is an estimate of the impact of a RHU/CHC checkup on the outcome for those induced to present for checkup by the lottery offer who would not have presented for a checkup otherwise.

**[H6b]** The lottery offer is a strong instrument for presentation at a RHU/CHC for a checkup.

**Test:**

- Using both the treated respondents who are offered the lottery prize and the control respondents who are not, we will regress a binary variable indicating RHU/CHC attendance ( $s_i$ ) on a binary variable indicating whether or not the lottery prize was offered ( $L_i$ ), i.e.

$$s_i = \gamma Y_{it-1} + \beta x_{it-1} + \kappa L_i + u_i. \quad (6.2)$$

$\hat{\kappa} > 0$  indicates that the lottery offer raises attendance. We will test for weakness of the instrument.

**[H6c]** Individuals who have a preference for risk respond more to the offer of a lottery prize. Thus, the intervention has a larger effect on individuals who potentially engage most in lifestyles that bring exposure to CVD risk.

*Elaboration*

The lottery instrument will allow identification of a local average treatment effect. That is, the effect of the PhilPEN on those who respond to the offer of the lottery but would not otherwise have presented for a checkup at a RHU/CHC, i.e. *compliers*.

Risk averse individuals are most likely to invest in preventive care and to present for checkup at a RHU/CHC in the absence of any lottery incentive. They are most likely to be *always takers*. This can be established assuming an expected utility maximizer who decides whether to invest in preventive care by comparing its benefit – reduced probability of succumbing to CVD – with its cost, which includes fees, transport expenses and foregone earnings.

While the lottery will be offered without charge to all participants in the treatment group, its conditionality on going for a checkup at a RHU/CHC means that taking up the offer carries a cost. Hence,

the lottery is a gamble and will appeal most to individuals with a preference for risk. These are the individuals who are least likely to go for a checkup in the absence of the lottery incentive. Hence, we expect compliance to be greatest for those with a preference for risk, who may be more likely to engage in unhealthy behaviour.

The hypothesis that compliance will be greatest among those with a preference for risk is founded on the logic of the expected utility model in which risk attitudes are entirely captured by concavity of utility. Alternative models can give different predictions. For example, if one allows for nonlinear weighting of probabilities, then individuals who overweight small probabilities will find the lottery most attractive. This is the reason we believe a lottery offers a more efficient mechanism for incentivizing checkup than the offer of a subsidy to everyone. However, in that case, individuals who are excited most by the lottery may also be worried most by reasonably small CVD risks and may be most likely to have invested in preventive care without the lottery incentive.

We will use Prospect Theory (Kahneman and Tversky 1979; Tversky and Kahneman, 1992) to examine how response to the lottery varies with a richer characterization of risk attitudes captured by a value function,  $u(x)$ , and a probability weighting function,  $w(p)$ , that maps probabilities to decision weights.

Prospects are valued as  $PT(x_p, y) = w(p)u(x) + (1 - w(p))u(y)$ . We intend to assume power utility  $u(x) = x^r$  where  $r$  indicates the curvature of the value function for gains. We plan to use the one-parameter form of the probability weighting function introduced by Prelec (1998),  $w(p) = \exp(-(-\ln p)^\alpha)$ . When the *likelihood insensitivity* parameter is less than one,  $\alpha < 1$ , there is overweighting of small probabilities and underweighting of moderate and large probabilities. Under  $\alpha > 1$  the weighting of small probabilities and large probabilities is reversed. With  $\alpha = 1$  all probabilities are weighted linearly. For given  $\alpha$ , smaller  $r$  corresponds to more risk averse behaviour.

In this framework, the demand for preventive care and the impact of the lottery on that demand depends on the parameters  $r$  and  $a$ , as well as the probability of winning the lottery in relation to the perceived CVD risk. Consider an individual with  $a < 1$ . Over a large range of  $p$  (approximately 15-80%),  $w'(p) < 1$  and demand for preventive care is suppressed because the individual perceives that it would have little impact on the probability of having a heart attack or stroke. This individual also over weights the probability of winning the lottery. Hence, she will react strongly to the lottery. An individual with  $a < 1$  who perceives the CVD risk to be lower, say 5%, may have  $w'(p) > 1$  – she perceives that prevention has a large impact on the CVD risk. Hence, without the lottery, her investment in preventive care will be higher than the first individual and, although the lottery remains attractive because of over weighting the probability of winning, its impact on preventive care must be lower than for the first individual.

By utilizing individual-specific estimates of  $r$ ,  $a$  and perceived CVD risk, we can therefore form categories of individuals we expect to respond more and less to the lottery.

#### **Test:**

- The likelihood insensitivity parameter,  $\alpha_i$ , and the utility curvature parameter,  $r_i$ , will be identified for each individual  $i$  using their responses to hypothetical lottery (in gain domain) choice questions specifically designed for use in a survey context and previously used in the Philippines to estimate risk preferences (Van Wilgenburg et al., 2017).
- First, we will test whether compliance varies with a composite measure of risk aversion that comprises both utility curvature and likelihood insensitivity. Using  $r_i$  and  $\alpha_i$  we will compute

each individual's certainty equivalent of the lottery ( $CE_i$ ), and subtract this from the expected value of the lottery ( $EV = 500$ ) to get the risk premium  $R_i$ . This is calculated for all individuals irrespective of whether they are in the treatment group offered the lottery.  $R_i > 0$  indicates risk aversion,  $R_i < 0$  indicates risk loving and  $R_i = 0$  is risk neutrality.

- We will estimate the following regression model,

$$s_i = \gamma Y_{it-1} + \beta x_{it-1} + \psi_1 L_i + \psi_2 R_i + \psi_3 L_i \times R_i + u_i. \quad (6.3)$$

- $\psi_1$  corresponds to the lottery response of risk neutral individuals.<sup>4</sup> This will be positive if the expected gain from the lottery (500 PHP) is sufficient to bridge the shortfall of the expected health gain of the checkup from its cost. In the absence of the lottery incentive, this shortfall presumably explains why the individual does not go for a checkup. If the estimate of this parameter is not significantly greater than zero, we will learn that the perceived gains of a checkup fall short of the costs by more than 500 PHP.
- $\psi_3 < 0$  corresponds to greater compliance among more risk loving individuals.
- Because the estimates of the individual specific risk parameters, and so the risk premium, can be expected to be noisy, we will also try an alternative specification that enters binary indicators of whether the respondent is risk loving or risk averse (interacted with the lottery indicator) into the first stage regression, with risk neutral being the reference category.
- After having established whether compliance varies with a composite measure of risk attitudes, we will explore whether response to the incentive varies with utility curvature and likelihood insensitivity separately. We will estimate the following type of regression model,

$$s_i = \gamma Y_{it-1} + \beta x_{it-1} + \phi_1 L_i + \phi_2 (r_i - 1) + \phi_3 1(\alpha_i < 1) + \phi_4 L_i \times (r_i - 1) + \phi_5 L_i \times 1(\alpha_i < 1) + u_i \quad (6.4)$$

- $\phi_1$  is the response to the lottery of individuals with linear utility who do not overweight small probabilities.
- $\phi_4 > 0$  indicates greater compliance from those with a less concave utility function. Conditional on the likelihood insensitivity parameter, this implies greater response from less risk averse individuals, which is what we expect.
- $\phi_5 > 0$  indicates greater compliance of those who overweight small probabilities, which is expected if one considers only the overweighting of the probability of winning the lottery and ignores the consequence of the likelihood insensitivity parameter for the demand for preventive care without the lottery incentive.
- Because of the anticipated noise in the estimates of the risk parameters, we will consider alternative specifications that do not enter the utility curvature parameter estimate ( $r_i$ ) continuously, but group the respondents by whether this estimate is less than, equal to or greater than 1.
- Finally, we will classify individuals into groups according to values of the risk parameters and CVD risk perceptions and compare response to the lottery across these groups. For example, compliance is likely to be high among individuals with convex utility who overweight small

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<sup>4</sup> We include the baseline values of the outcome and the covariates in this regression to maintain its interpretation as the first stage of an IV model. However, to explore variation in response to the randomly assigned lottery, these controls should not be necessary.

probabilities and perceive the CVD risk to lie in the range in which it is believed to be affected little by prevention ( $r_i > 1$ ,  $\alpha_i < 1$ ,  $0.15 < p < 0.8$ ).

- To characterize the risk preferences of compliers, we will run the first stage regression (6.2) separately for individuals with  $R_i > 0$ ,  $R_i = 0$  and  $R_i < 0$  and compute the relative likelihood that a complier is risk averse/risk neutral/risk loving, which is given by the ratio of the estimated response to the lottery in the respective group to the response in the full sample. A higher relative likelihood for the  $R_i < 0$  group supports our hypothesis that a complier is more likely to be someone with a preference for risk. We will follow the same procedure for groups formed from different combinations of  $\alpha_i$  and  $r_i$  in order to test, for example, whether a complier is more likely to have convex utility and overweight small probabilities.

**[H6d]** Individuals who are impatient and who display a present bias respond more to the lottery offer. Thus, the intervention has a larger effect on individuals who engage most in risky lifestyles that offer immediate reward and invest least in preventive health behavior that gives a long-run gain for a short-run cost.

### *Elaboration*

Benefits from preventive care and health behaviour are derived in the long run. Individuals who discount the future more are expected to invest less in prevention and indulge more in lifestyles that yield immediate benefits but carry long-term health risks. Conversely, those who discount less aggressively are more likely to be always takers of preventive care and healthy behaviours.

The chance to win a lottery brings the benefits from preventive care forward, which is valued most by the least patient individuals. Hence, these subjects are more likely to respond to the lottery offer.

Investment in preventive care can be further discouraged by present bias – the tendency to place additional weight on costs and benefits experienced immediately resulting in a discount rate over a length of time that is higher when the period begin in the present. Such bias can result in failure to implement plans for healthier living. From a distance, diet or exercise in the future can seem desirable but when the time comes to start dieting or exercising the immediate costs outweigh the heavily discounted long-term gains.

The opportunity to enter a lottery conditional on going for a checkup at a RHU/CHC gives the respondent the chance of a more immediate reward for the cost of taking this preventive action. Hence, it may help counter present bias.

### **Test:**

- We will characterize respondents according to their degree of impatience and whether they display present bias by implementing an instrument used by Ashraf et al (2005) to examine how these traits influence the response to the offer of a savings product in the Philippines. This involves a standard procedure of asking respondents hypothetical questions about whether they would choose to receive a smaller amount of money now or a larger amount in one month. By varying the amount of money offered in one month, respondents who discount more aggressively can be distinguished.

- To identify present bias, respondents are asked to choose between receiving a smaller amount in six months or a larger amount in seven months. Those who choose the smaller amount now rather than the larger amount in one month but who are prepared to wait seven months for the larger amount rather than accept the smaller amount in six months display present bias, or hyperbolic discounting. Those who choose the larger amount in one month rather than the smaller amount now, but who choose the smaller amount in six months rather than the larger amount in seven months also display time inconsistency. We will examine whether response to the lottery differs in this group but since noise is likely to be largely responsible for this type of inconsistency, we do not expect systematic variation in the response of this group relative to others.
- Using these stated choices, we will form groups of respondents who are more/less impatient and who do or do not display present bias.
- In the first stage regression, analogous to the procedure described in [H6c], we will interact the lottery instrument with indicators of the degree of impatience and with an indicator of whether the respondent displays present bias. .
- We will then compute and compare the relative likelihoods that a complier is present-biased and impatient to varying degrees.

**[H6e]** Individuals who overweight small probabilities experience a higher reduction in risk factor exposure and increase in medication through PhilPEN than individuals who weight probabilities linearly and individuals who overweight small probabilities.

#### *Elaboration*

Individuals who overweight small probabilities are less likely to invest in preventive care and to adopt healthier behaviour in response to CVD risks of 10% or so that are significant in terms of potential health impact but are considered small in characterizations of the distribution of probability weights. These individuals are thus likely to be in greater need for preventive interventions and may benefit most from the medication and counselling delivered by PhilPEN.

#### **Test:**

- We will run the instrumental variable regression  $Y_{it} = \gamma Y_{it-1} + \beta x_{it-1} + \tau \hat{s}_i + \mu_{it}$  as described in [H6a] separately for individuals with  $\alpha_i > 1$  and individuals with  $\alpha_i \leq 1$ . A significantly larger  $\hat{\tau}$  for individuals with  $\alpha_i > 1$  supports the hypothesis.

## 4. Elicitation of risk perceptions

Elicitation of subjective probabilities of future cardiovascular events is a key input to our analysis of the role of CVD risk perceptions in determining health behaviour and demand for primary prevention. Although the collection of expectations data is complicated by the limited formal education and numeracy skills of most of our sample, there is accumulating evidence that, if questionnaires are carefully designed, the measurement of such beliefs in the developing world is both feasible and valuable (Attanasio, 2009; Delavande et al., 2011a).

Asking respondents directly for probabilities or percent chances is often considered too abstract for developing country settings. Visual aids are commonly used (Attanasio, 2009). For example, the respondent can be asked to allocate physical objects, like beans or stones, representing probability units into a number of bins (Delavande et al., 2011b). Hill (2009) asks coffee farmers in Uganda to distribute 20 beans across three piles representing different price categories in accordance with their predictions of

future coffee prices. Attanasio et al. (2005) ask respondents to indicate a point on a ruler graded from 0 to 100 that corresponds to the likelihood of receiving income in excess of a certain amount.

To mitigate concerns that our respondents might be unfamiliar with the formal concept of probability, we will ask them to mark a number of coloured dots from 100 arranged in a square on a tablet screen (Figure 1). The respondent is asked a question, such as: “What do you think is the chance that you will have a heart attack or a stroke within the next 10 years?” The interviewer shows the respondent the square of dots and instructs her to mark the number that she thinks corresponds to that chance. When marked, the dots change colour. The respondent’s reported probability, i.e. the number of marked dots, is also visible to the respondent as a number next to the figure. A similar approach has been used by Kerwin (2016), who uses a diagram of 100 pairs of stick figures representing couples, to elicit perceptions of the HIV transmission rate.

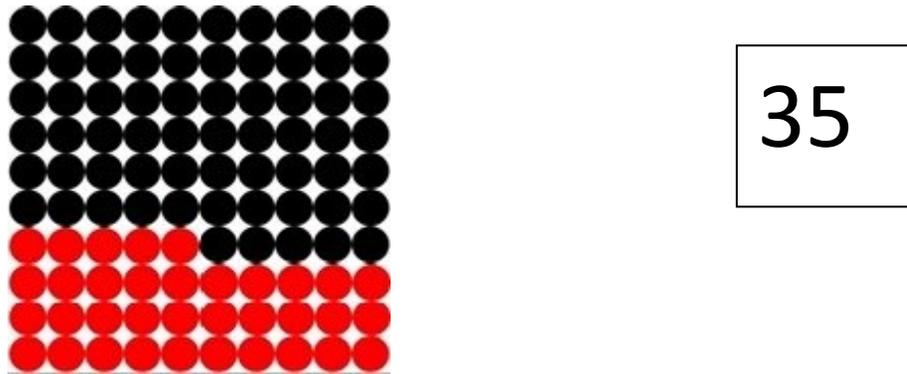


Figure 1 Belief elicitation tool

A potential concern when asking expectations questions is the tendency for probabilities to heap at the “focal” probability of 50%. This response may reflect the respondent’s uncertainty about the probability rather than a precise evaluation that there is a 50:50 chance of the event occurring (Delavande and Kohler, 2009). In training questions, we follow the Health and Retirement Study and Kerwin (2016) by asking respondents who report 50% whether they really believe that the probability is 50%, or whether they are just not sure. This forces the respondent to consider what a response of 50% really means, and it gives us the option to control for respondents who have a tendency to give a focal response when they are not sure.

The risk perceptions module consists of eight sections. The first section familiarizes the respondent with probabilities and use of the belief elicitation tool. It starts with a simple explanation of probabilities using the example of the chance of a destructive earthquake within the following 12 months. The respondent then has to answer a number of expectations questions related to the example. The answers are used to test whether the elicited beliefs are consistent with basic properties of probabilities, such as monotonicity.

Section 2 asks the respondent to report the chance that someone of the same age and gender will have a heart attack or a stroke within ten years. This is interpreted as the respondent’s perception of the CVD base rate. Section 3, as well as Sections 5-7, is completed only by respondents in the information treatment group. These sections are described in the next section of this document. In section 4, the respondent is asked to report the chance that she will have a heart attack or a stroke in the next ten years. This is interpreted as the prior belief of personal CVD risk. In Section 8, the respondent is asked to report what her chance of a heart attack or stroke within ten years would be if she were to adopt healthier behaviour, i.e. to quit smoking (if a smoker) and to control blood pressure and weight.

After stating her perceived CVD risk in Sections 2 and 4 (and 6), the respondent is asked how confident she is in her answer on a five-point scale ranging from 1 (not at all confident) to 5 (extremely confident).

Respondents are likely to differ in how certain they are that the stated probability is close to the actual probability of having a heart attack or a stroke. Moreover, in Section 4 (and 6) the participant is asked how worried she is about having a heart attack or a stroke on a five-point scale ranging from 1 (not at all worried) to 5 (extremely worried).

## 5. Interventions

### 5.1 Common issues

Two interventions will be allocated to respondents – the provision of information on CVD risk and the offer of a lottery ticket conditional on going for a checkup. The study is a randomized parallel experiment with two separate, non-overlapping treatment groups and one control group. Randomization will be done at the level of the barangay, which is the smallest administrative unit in the Philippines roughly equivalent to an electoral ward.

*Soliciting the participation of the LGUs.* After the sample barangays have been drawn and assigned to the treatment arms, the study team will schedule visits with the corresponding local chief executives (LCE) and the municipal/city health officer (MHO/CHO) to solicit their participation. A standard letter will be delivered stating the aims of the study and clarifying that several barangays in a municipality will be assigned to different treatment arms. An agreement will be drafted stating the responsibilities of UPEcon Foundation R4D Study Team and the Local Government Units (LGUs). The terms of the agreement will explicitly state which barangays will be included in the study and in which barangays sampled residents will be given the lottery tickets on condition of attendance at the RHU/CHC. We will explore whether the budget will allow giving a small token of appreciation to the LCE and the MHO after the follow-up survey is completed, signalling the end of the field work part of the study.

### 5.2 Information on CVD risk

#### *Information provided*

Respondents randomly allocated to this treatment group will receive information on the predicted probability of having a heart attack or stroke within 10 years. The predictions will be obtained from the Globorisk tool (Ueda et al 2017). The reasons for using this algorithm are given in the next sub-section. All information will be provided within the risk perceptions module of the survey. Only this module will differ across the two treatment groups (information and lottery) and the control group. Information obtained from earlier modules will be retrieved automatically and used to make predictions of CVD risk consistent with the risk factor profile of the respondent in the information treatment group.

Three types of information on CVD risks will be provided to those in the respective treatment group: a CVD base rate, a personalized CVD risk and an optimal CVD risk. The CVD base rate will be predicted from the respondent's age and sex only. This information will be provided immediately after the respondents are asked to report the chance of someone of their age and gender having a heart attack or a stroke within ten years, and immediately before being asked to report the chance that they will have a heart attack or stroke within that period. The respondents will be presented with the information both as a chance of X in 100 and as the number of people (X) out of 100 the same age and sex as the respondent that doctors would expect to have a heart attack or stroke within ten years.

After reporting their own chance of having a heart attack or stroke within ten years, the respondents in the treatment group will be told the risk for someone with the same age, sex, smoking status, BMI and blood pressure as them. Each respondent will not be told that this is their own chance of having a heart attack or stroke. Rather, if the respondent is female, she will be told that out of 100 women her age, with the same

weight and blood pressure as her, and who (don't) smoke like her, doctors would expect X to have a heart attack or stroke within 10 years. Analogous information will be provided to male respondents. After being given this information, the respondent is asked again to report their 10-year CVD risk. This is interpreted as the posterior belief (after the provision of personalized information).

Finally, a treatment group respondent will receive information on what the 10-year CVD risk would be for someone of the same age and gender who did not smoke, and had normal blood pressure and BMI. This will be presented as the optimal risk that could be achieved through primary prevention. If the respondent's risk is above the optimal, then they will be told the reason(s) for this - smoking, above a healthy weight or blood pressure reading is above normal. And the respondent will be told how the risk could be reduced – quit smoking, lose weight, get blood pressure down by taking medication, exercising, losing weight, eating less salt and fat. If the respondent's risk is not above the optimal, then they will be congratulated and advised how to keep the risk low.

#### *CVD risk prediction algorithm*

We have several reasons for not using the WHO/ISH risk charts to predict 10-year CVD risk, despite their use in PhilPEN. First, there are the methodological weaknesses of these charts identified in Section 2. They appear to produce downwardly biased predictions of CVD risk, which would result in less variation within the treatment group in the information on CVD risk provided. Besides providing inaccurate information and missing much of the variation in actual risk, we would need a much larger sample size in order to identify the effect of the intervention. It would hardly be worthwhile to randomize to a treatment if there is no variation in that treatment for 90% of the treated.

Further, the WHO/ISH charts only allow categorization of individuals into five ranges of CVD risk. They do not provide a point estimate of the CVD risk for each individual. This would have two drawbacks for our study. First, it would further limit the variation in the information we would be able to provide in the intervention. Second, it would not allow us to test the extent to which individuals use the information provided to update their reported estimate of the CVD risk.

By using the [Glorisk](#) risk prediction model (Ueda et al, 2017), we avoid the limitations of the WHO/ISH charts. The Glorisk study used data on individuals with no history of CVD from eight US cohort studies to estimate models for the probability of experiencing fatal or non-fatal heart attack or stroke over a period of 10 years (Hajifathalian et al, 2015; Ueda et al, 2017). The models were then recalibrated using country-specific data on CVD incidence rates (derived from mortality rates) and on risk factor prevalence rates to obtain risk charts for 182 countries. These are the first country-specific CVD risk charts to have been derived using a consistent methodology. The models perform well in validation analysis using data from non-US health surveys. The office-based Glorisk risk algorithm, which substitutes BMI for data on diabetes and cholesterol, has been shown to predict the same risk classification as the laboratory-based version in 80% of cases, although it substantially underestimates risk for individuals with diabetes (Ueda, et al, 2017).

Glorisk allows us to predict CVD risks specific to the Filipino population, while the WHO/ISH charts are calibrated only for the population of the Western Pacific Region. Given we are not able to measure blood glucose and lipids, the office-based Glorisk is particularly valuable. The WHO/ISH chart that does not use information in cholesterol achieves this by simply entering the same (average) cholesterol value for all individuals. Entering reported diagnosed diabetes in the WHO/ISH charts will result in gross underestimation of risk for all with undiagnosed diabetes. We will avoid this by excluding individuals from the information intervention who report a diagnosis of diabetes and using the office-based Glorisk.

One disadvantage of using the Globorisk algorithm is that the information treatment group respondents will be given a risk prediction that may be inconsistent with what they are told in PhilPEN screening using the WHO/ISH chart at a RHU/CHC. However, this would happen anyway even if we were to use the WHO/ISH charts since the prediction done at the facility would use more information (on blood glucose, a different measure of blood pressure and, possibly, cholesterol). In any case, we will emphasize to each respondent that we are not informing of their own personal risk, but rather the predicted risk for a person with a similar risk factor profile to them.

### 5.3 Lottery incentive for CVD risk assessment

The goal of the second intervention is to evaluate the effectiveness of the PhilPEN program in delivering primary prevention of CVD. This will be achieved by offering randomly selected respondents a ticket for a lottery with a money prize on condition that they visit a RHU/CHC for a checkup. There will be one prize per barangay giving each respondent a one in ten chances of winning P5000 (US\$100). The prize is equivalent to approximately 14 days earnings at the regional minimum wage<sup>5</sup>. This *randomized encouragement design* will induce exogenous variation in patients accessing the PhilPEN program allowing its impact to be estimated.

As noted in Section 3.1, there are potential weaknesses in implementation of the PhilPEN program and the purpose of this component of the experiment is to establish the effectiveness of the program as it is currently implemented. For that reason, there is no supply-side component to the intervention. Respondents will simply be told that they can enter a lottery if they go to the RHU/CHC for a checkup. The health facilities will be told to conduct an assessment deemed appropriate for any particular patient that requests to be issued with a lottery ticket. No instructions will be given that the facilities should follow the PhilPEN protocol. We will evaluate whether they do implement the protocol for patients who qualify (by age if nothing else) for full risk screening.

The remainder of this sub-section describes the logistics of the lottery intervention.

*Designating a RHU/CHC point person.* The agreement will state that the MHO/CHO should designate a point person in the RHU/CHC facility who will be responsible for handing out the lottery tickets. This should be one of the medical staff (e.g. the rural health nurse, midwife or the MHO/CHO, or PhilPEN coordinator) who performs or delegates the performance of the PhilPEN profiling and screening. The identity of this point person will be included in the information provided by enumerators to the lottery recipients.

*Voucher and ticket.* A voucher will be given by the enumerator to those deemed eligible for the lottery intervention at the end of the interview. This voucher will be surrendered at the facility to the RHU/CHC point person in exchange for a lottery ticket. The voucher and ticket will both be pre-numbered with the same number.

*Voucher contents.* The voucher will indicate “This voucher entitles \_\_\_\_\_ (to be filled in) to a ticket for a lottery offering a 1 in X chance of winning Php 5000.” To make the voucher credible, it will carry the name, signature and contact details of the local study team head. It may also carry an endorsement of the Mayor or the MHO, evidenced by their signature or stamp. The voucher will also indicate the claiming period, the facility where the ticket can be claimed and the name of the point person in that facility, i.e., “To claim your ticket, you must see Ms/Mr Point Person at xxx Health Center for a physical assessment before XXXX. The lottery will be drawn on XXX”

<sup>5</sup> The minimum daily wage in Region III, where Nueva Ecija is located, is P334, P364 and P353 in the agricultural, non-agricultural and service sectors respectively in 2017.

*Ticket contents.* The ticket will contain the same information as the voucher: number, study team leader, endorsement of LCE or MHO. In addition, the ticket will contain the date when the prize will be drawn (respondents will be given one month to claim the lottery tickets and will be advised of the date of the draw, which is one week after the claiming period) and the number that can be called to confirm whether the respondent has won, or to obtain any other information.

*Informing the RHU/CHC of potential lottery ticket recipients.* Upon the completion of each day's interviewing, the enumerator will provide the list of interviewed voucher recipients (with their names, addresses, and voucher numbers) to the RHU/ CHC facility point person via SMS or email with a copy to the UPecon team.

*Survey operations.* The UPecon team will give pre-numbered vouchers to the survey enumerators. The survey team would have to record the names of the sampled respondents given the vouchers and report the same to the UPecon team by SMS or email when the interview is finished. The survey team should also inform the RHU/CHC point person by SMS or email the recipient of the voucher as well as the voucher number. Unused vouchers will be surrendered to the UPecon team at the end of the baseline survey.

*Interview procedure.*

- a. *Before the interview.* In barangays where the lottery treatment will be implemented, the informed consent form will include a line that requests the respondent to agree to having their name, contact number sent to the RHU/CHC. The consent form will indicate that these are for the purpose of verifying identity at the RHU/CHC.
- b. *After the interview.* If the respondent is deemed eligible for the lottery intervention, the enumerator will read from a prepared script informing that the respondent is eligible to enter the lottery and that they can claim the ticket from a designated point person at the health center. The script will make it clear that the voucher only entitles them to a lottery ticket and that their name will not be entered if they do not claim the ticket by attending the RHU/CHC for a checkup. The script will also make it clear that they can only claim the ticket after a certain date (possibly two days from receipt of the voucher) and only until a specific date (one month after the interview). The script will also inform the respondent the prize money for the lottery and the chance of winning. The enumerators will be given a prepared answer to give if they are asked whether everyone can enter the lottery. The enumerator will ask the respondent to sign a form indicating that they have understood the terms of the voucher and the lottery.
- c. *Tagging the recipients.* The respondents who receive the vouchers will be tagged by the survey firm. The questionnaire will include fields that indicate whether the respondent is eligible, whether the respondent received the voucher, the date of the receipt of the voucher, and the voucher number.

*Instructions to the RHU/CHC point person.* To verify the identity of the person claiming the lottery ticket, the point person will be instructed to ask for the name, address, birthday and age as of last birthday, and mobile number of the respondent or any family member. These details will be recorded on a form to be submitted to UPecon. The point persons will not be explicitly instructed to follow the PhilPEN protocol. Rather, they will be told to assess the patients claiming the lottery ticket as they would any other person attending the RHU/CHC for an assessment. Given the sample only contains individuals aged 40+, recording of the person's age should alert the RHU/CHC that, consistent with the PhilPEN protocol, screening should be conducted.

The information will be recorded on the detachable portion of the lottery ticket (similar to the usual raffle tickets) so that it looks authentic. The point person will then collect the voucher, release the lottery ticket with the same number as that on the voucher and have the recipient sign a receipt. We will leave it to the point person to convince the lottery voucher recipient to undergo any assessment deemed appropriate and to release the ticket afterwards.

*UPecon recording of who went to the clinic.* Part of the tasks of the RHU/CHC point person is to collate information on who among the voucher recipients have gone to the clinic to claim their tickets. We will request the point person to text a designated number (UPecon hotline) with the name, age, voucher and ticket number that have been claimed, and the contact details of the recipient, immediately after the lottery ticket has been claimed (at the end of each day). After the designated time period allowed to claim tickets, the UPecon R4D team will collect the ticket stubs and vouchers from the RHU/CHC point person.

*Lottery draw.* The UPecon Team will be responsible for drawing the lottery winners. During the ticket claiming period, the UPecon team will update the list of respondents who have claimed their tickets based on the SMS and email messages of the RHU/CHC point persons. The UPecon team will validate this with the list of voucher recipients submitted by the survey team. Matching voucher and ticket numbers will be included in the list of lottery entries. Once the claim period for the tickets has passed, one week will be allowed for all the claimed ticket numbers to be transmitted to the UPecon team and for all ticket stubs and vouchers to be collected from the RHU/CHCs by the UPecon team. One winner will be drawn from each barangay included in the lottery intervention. If there are no claimants of the lottery tickets from the particular barangay, no winner will be drawn. Once the winners are drawn, an SMS message will be sent to the respondent informing them that they have won and for them to expect a message as to how the prize can be claimed. They will also be informed to designate a representative should they not be available to receive the prize.

*Prize delivery and distribution.* To deliver the lottery prize, the UPecon Team will explore the option of using the cash remittance companies (Western Union, LBC), cash transfer facilities of the telecom companies (“GCASH,” “Smart Padala”), the pawnshop companies (e.g., Cebuana Lhuiller) and cash delivery facilities being used by OFW for remittances. The UPecon team will explore which of these facilities will have the widest reach in Nueva Ecija and the relative costs of using these remittance facilities.

*Claiming procedure.* The prize money should be directly handed to the named respondent upon surrendering the lottery ticket and upon presentation of a valid ID. The name and address of the winner can also be given to the messenger or courier company to validate the identity of the winner. In case the respondent is not present, a duly authorized representative should be on hand to receive the prize, also upon surrendering the ticket. A receipt should be signed by the one who received the prize and this receipt would be surrendered to the UPecon.

*UPecon lottery back-end.*

- a. *Hotline.* The UPecon study team will institute a lottery “hotline.” UPecon will explore whether a four-digit number could be assigned as a further credibility or security measure. This hotline number will be given to the survey team and the RHU/CHC point persons. This hotline will be monitored and manned by UPecon research assistants. This is where the survey team will SMS or email the respondents that have been interviewed and given vouchers, and which in turn will be transmitted to the RHU/CHC point person. This will also serve as a monitoring mechanism on the pace of the conduct of the survey and will also be a quick count of those who have presented themselves at the RHU/CHC for screening. This hotline number would also be printed on the

vouchers and tickets in case respondents would have queries. In case the preferred mode of payment is through telecom remittances, this number would also be used to remit the prize money.

- b. *Viber or Facebook page.* A Viber or Facebook page may be created with members including the RHU/CHC point persons, the UPecon administrator and the survey team. This can again be a method to update the information on who have been given the vouchers. The viability of this option depends on whether the RHU/CHC point person have internet connectivity and data plans.
- c. *Prize administration.* The UPecon study team will be in charge of remitting the prize money to the winners. The UPecon team will tag these winners and encode an indicator in the survey data.

*Additional security measures will be developed to:*

- a. ensure against duplication of vouchers and tickets
- b. ensure against a non-respondent claiming the tickets at the facility
- c. ensure against a non-winner receiving the prize
- d. stipulate protocol in case of voucher and ticket loss

*Additional expenses (To follow based on decisions).*

- e. *Fees for hotline (prepaid plan?)*
- f. *Data plan for CHC/RHU point persons?*
- g. *Fees for delivery of prize money (usually % of prize money)*
- h. *Token to RHU/CHC point person to defray the incidental cost for managing the lottery?*

## 6. Timeline

A baseline survey will serve two purposes. First, it will identify respondents eligible for the interventions within the randomly selected barangays and will be the point at which the interventions are delivered. Second, while the impact of the interventions will be identified by comparison between each randomly selected treatment group and the control group post intervention, data collected on outcomes and covariates at baseline will be used to increase power.

**Table 2: Timeline**

Activity	2017												2018			
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
UPecon IRB approval	X															
Canton de Vaud Ethics Committee approval			X													
Field mobilization		X	X	X												
Contracting survey firm		X	X	X												
Translation & programming of questionnaire			X	X												
Pre-test and questionnaire revision			X	X												
Train enumerators			X	X												
Field baseline survey					X	X										
UPecon survey monitoring					X	X										
Survey firm delivers baseline data						X	X									
Progress report to FSNSF-SDC				X												
Analysis of baseline data								X	X							
Draft paper from baseline analysis										X	X					

Activity	2017							2018							
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Track respondents										X					
Workshop on baseline results									X						
Draft follow-up questionnaire									X						
Pre-test and questionnaire revision										X					
Train enumerators											X				
Field follow-up survey												X	X		
UPecon survey monitoring												X	X		
Survey firm delivers follow-up data														X	
Analysis of follow-up data														X	X
Write papers															→

Our intention is to field the baseline survey in August-September 2017. As explained above, the information intervention will form part of the risk perceptions module of the baseline survey. The module used with information treatment group respondents will differ from that used with the lottery treatment group and the control group. The module will be positioned in the survey after physical measurements of blood pressure and BMI in order that these measures can be used in the calculation of the predicted CVD risk that will be revealed to the treatment group respondents.

Those allocated to the lottery intervention will be told of their chance to enter the lottery at the end of the baseline survey and given a voucher to be exchanged for a lottery ticket at a specific RHU/CHC. The chance to enter the lottery expires one month after the baseline in order that we observe a sufficiently long period between risk assessment at the designated facility and the follow-up survey.

The follow-up will be conducted around 6-7 months after the baseline in March-April 2018. This will provide sufficient time to observe the effect of medications prescribed at initial contact with the RHU/CHC and to assess whether follow-up consultations are conducted for the target populations, as stipulated by the PhilPEN protocol.

## 7. Outcomes

We will estimate effects on predicted CVD risk, risk factors, health care management of CVD, CVD-related behaviours, perceptions of CVD risk and knowledge of CVD risk factors.

### *Principal outcome*

The principal outcome for both interventions is mean 10-year risk of a heart attack or stroke predicted using the office version of Globorisk (Udea et al 2017).

- i) Mean 10-year risk of CVD event (Globorisk prediction)

The information intervention may impact on this outcome through multiple mechanisms. Individuals who are made aware that the CVD risk for individuals with their risk factor profile is higher than they had anticipated, who are provoked to recognize that they face a non-negligible risk without having given serious thought to this risk previously and who are told by how much the risk could be reduced by quitting smoking, reducing blood pressure, losing weight etc, may be provoked to take actions to reduce their risk. Actions could include: going for a checkup at a RHU/CHC or other health facility with the possibility of subsequently being put on medication for hypertension, diabetes or high cholesterol, attempting to lose weight through diet and/or exercise, and quitting smoking. Any efforts that are

effective in reducing blood pressure, reducing weight and stopping smoking will translate into a reduced 10-year CVD risk score.

The lottery intervention may impact on the predicted 10-year CVD risk by inducing respondents to attend a RHU/CHC where they can access PhilPEN risk assessment. Given the age criterion for inclusion in the study (40+), according to the protocol all those attending a RHU/CHC should be subject to PhilPEN risk screening, which includes tests for blood glucose, urine protein and cholesterol, in addition to measures of blood pressure and weight taken in risk assessment. All those screened should be given counselling on smoking cessation, diet and exercise. Those with sufficiently high risk, should be given medication for hypertension and/or diabetes, which are supplied to RHU/CHCs by the department of health. According to the protocol, those with sufficiently high risk should also be given statins, although these are not supplied by the department of health.

The proportion of the population with elevated CVD risk is likely to be more important for population health than is the mean risk. Unfortunately, we do not have data that allow us to estimate the proportion with elevated risk predicted by the Globorisk algorithm. Hence, we cannot conduct power calculations for this outcome. However, we intend to estimate the impact on it providing that an ex-post calculation confirms that there is sufficient power. We will estimate effects on:

- ii) Proportion with 10-year CVD risk (Globorisk prediction)  $\geq \tau\%$

The threshold ( $\tau$ ) for elevated CVD risk will be set at 10%, and if there proves to be sufficient power, also 20% and 30%.

#### *Risk factors*

The Globorisk predicted CVD risk can fall only if the risk factors that enter the algorithm improve. We will estimate effects on these individual risk factors.

- iii) Mean systolic blood pressure (mean of last two measures on single visit)
- iv) Proportion with elevated blood pressure (systolic  $\geq 140$ , mean of last two measures on single visit)<sup>6</sup>
- v) Mean BMI
- vi) Proportion overweight/obese (BMI > 25)
- vii) Proportion currently smoking.

While the Globorisk score is not a function of central adiposity, it is measured as part of the PhilPEN risk assessment with a waist circumference in excess of 90cm (men)/80cm (women) being sufficient to flag a patient as ‘at risk’ of CVD. We will estimate effects on:

- viii) Mean waist circumference
- ix) Proportion with waist circumference  $\geq 90$ cm (men) / 80cm (women).

#### *Diagnosis and medication of hypertension*

Information on personal CVD risk and the contribution of blood pressure to this may induce individuals to test for hypertension and to get medication if needed. Improved diagnosis and medication of hypertension is one of the main objectives of the PhilPEN program. We will test for effects on:

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<sup>6</sup> We identify elevated blood pressure from the systolic measurement because only this enters the Globorisk prediction of CVD risk. We will record diastolic blood pressure and also estimate effects on the proportion with elevated blood pressure defined at systolic  $\geq 140$  and/or diastolic  $\geq 90$ .

- x) Proportion with undiagnosed hypertension (numerator = systolic/diastolic BP  $\geq$  140/90 + not diagnosed with hypertension; denominator = all respondents)
- xi) Proportion taking antihypertensive medication in the last 2 weeks.

Despite the fact that PhilPEN screens for diabetes and the DOH supplies medication for diabetes, we will not estimate effects on the rate of diagnosis or medication for diabetes since power will be insufficient.

#### *Health behaviour*

Besides medication, blood pressure may be brought under control through changes in lifestyle, which our lottery intervention may impact on indirectly through the counselling that is part of the PhilPEN protocol and the information intervention may influence by revealing why an individual's risk is elevated. Besides smoking, we will test for effects on *alcohol consumption, diet (intake of fruit, vegetables and salty foods) and exercise*. Since we do not have base rate estimates of the means of these outcomes in the absence of any intervention, tests for effects on them will be subject to an ex-post power calculations confirming that there is sufficient power to detect effects.

#### *Knowledge of CVD risk factors*

Our information intervention will directly inform of CVD risk factors by explaining the reasons an individual's predicted risk is above the lowest level that would be attainable if risk factors were at their minimum levels. Contact with the PhilPEN primary prevention program may directly improve knowledge of CVD risk factors through counselling on healthy lifestyle. It is possible, therefore, that both interventions may improve knowledge of the causes of CVD. We will test for effects on an index of knowledge constructed from a battery of questions about CVD risk factors. Since we have no estimate of the mean of this score in the control group, we will conduct ex-post power analysis to establish whether there is indeed sufficient power to detect an effect on this score.

#### *Outcomes specific to lottery intervention*

For the lottery intervention, we will examine whether attending a RHU/CHC for a checkup increases the probability of receiving medical advice on the adoption of healthier habits, as is prescribed by the PhilPEN protocol. Specifically, we will estimate effects on:

- xii) The proportion of smokers/ex-smokers who have been advised by a doctor or health worker to quit smoking.
- xiii) The proportion of smokers/ex-smokers who have received counselling on smoking cessation.
- xiv) The proportion who have been advised by a doctor or other health worker to drink less alcohol (out of all who have ever consumed alcohol).
- xv) The proportion who have been advised by a doctor or other health worker to eat less salty and/or fatty food.
- xvi) The proportion who have been advised by a doctor or other health worker to eat more fruit & vegetables and/or grains & pulses.
- xvii) The proportion who have been advised by a doctor or other health worker be more physically active.
- xviii) The proportion of individuals overweight or obese (at baseline) who have been encouraged by a health professional to lose weight.

Since we do not have estimates of base rates for these outcomes that can be used to conduct power calculations, estimating effects on them will be contingent on ex-post analyses establishing that there is sufficient power. In addition, we will monitor whether those who attend a RHU/CHC receive advice

(/counselling) on smoking, alcohol consumption, diet and exercise, as well as being tested for hypertension, diabetes and hyperlipidemia, and whether they receive the respective medications.

#### *Outcomes specific to information intervention*

The information intervention will be used to estimate effects on beliefs about the risk of CVD. Specifically, we will estimate the effect of providing information on:

- xix) the CVD base rate on mean perceived 10-year risk of heart attack or stroke for someone of same age and sex;
- xx) the predicted CVD risk for someone with same risk profile as the respondent on mean perceived own 10-year risk of heart attack or stroke (posterior CVD risk);
- xxi) the predicted CVD risk for someone with the respondent's age and sex but the optimal risk profile on the mean perceived own 10-year risk of heart attack or stroke if were to adopt healthy lifestyle.

We do not have information necessary conduct power calculations for outcomes xix)-xxi) and so will carry out ex-post analysis to establish whether we have sufficient power to test for effects on these outcomes.

#### *Outcomes not specific to CVD*

If either of the intervention were to be successful in reducing exposure to CVD risk factors, then, in the long term, health gains will arise from it. Over a 6-7 month follow-up period, we do not anticipate that there will be sufficient time for general health affects to materialize and be apparent in a sample of the size studied. Nonetheless, we will measure general health using the SF-36v1. We will also measure labour outcomes (employment, hours and earnings), although we do not anticipate that the follow-up duration and sample size will be sufficient to detect any effects that may exist. Analyses of these outcomes will only be undertaken if an ex-post power calculation confirms that there is sufficient power, although this will not address the issue of the length of the follow-up.

## 8. Sampling

The primary sampling unit (PSU) and the level at which treatment will be randomly allocated is the barangay. The is the lowest administrative unit in the Philippines. There are 849 barangays in Nueva Ecija. Barangays will be randomly drawn for inclusion in the study and randomly allocated to one of the two treatment groups or the control group with probabilities set to achieve the required sizes of the groups.

Within a barangay, interval sampling will be used: starting from a random location, a procedure will be followed to randomly select households moving out from that point. Selected households will be screened to establish whether each includes anyone aged from 40 to 70 inclusive. If so, one such person will be randomly selected as the main survey respondent and the potential subject of the intervention in the treatment group barangays. Further screening will be undertaken to establish whether the selected person is eligible for the study, mainly on the basis of CVD history (see next section). In addition to the main respondent, we will ask the head of household, spouse or other adult to answer questions about the household in general.

## 9. Inclusion and exclusion criteria

We restrict attention to individuals aged 40 and above because this is one of the criteria for proceeding from risk assessment to risk screening under the PhilPEN protocol. Hence, we know that all respondents

induced to go for a checkup should be given a full screen with tests for blood glucose, urine protein and, if available, blood lipids. By restricting attention to the 40+ age group, we focus on the population in which CVD risks begin to rise steeply and preventive care is most needed. In addition, Globorisk predicts 10-year CVD risk only for individuals aged 40-74. We exclude those older than 70 because comorbidities are likely to rise steeply beyond that age, and because older individuals are likely to be more cognitively challenged in responding to the risk perceptions and risk attitudes questions.

We will exclude from the study individuals who report that they have been diagnosed as having heart disease or diabetes, or who report that they have had a heart attack or a stroke. This is consistent with the study's focus on primary prevention of CVD. Those with heart disease, or who have had a heart attack or stroke, can benefit from secondary prevention. But examination of demand for and the effectiveness of such care would require another sampling strategy to identify a sufficiently large pool of potential beneficiaries. We exclude those with a diagnosis of diabetes because the office based version of Globorisk we will use substantially underestimates the 10-year CVD risk for those with diabetes.

Those currently (past 2 weeks) taking medication for hypertension will also be excluded because they are already receiving primary prevention of CVD. Respondents who report that they have been diagnosed with hypertension will be included provided they are not currently taking antihypertensives. Hence, those who are not adhering to this medication will be included in all components of the study. Those taking medication for diabetes will be excluded, although this should be a redundant exclusion criterion given those with a diagnosis of diabetes are excluded.

After completing a household roster to identify if there is anyone aged 40-70 and selecting one such person, there will be a short screening module to identify and eliminate anyone who meets the exclusion criteria defined in the previous two paragraphs. Also excluded will be those who have some medical problem that prevents measurement of blood pressure or BMI.

## 10. Power analysis

To determine the sample sizes for this randomized parallel cluster design experiment, we first calculate the size of the lottery intervention group required to have sufficient power to detect an effect of this treatment assuming a control group of equal size. Having established the size of the control group, we then work out the requisite size of the information intervention group with an unbalanced design. The reason for starting with the lottery intervention is that compliance with this treatment will be less than 100%, i.e. not every subject will be persuaded by the chance to win a lottery to go for a checkup, and so a larger sample size will be required to detect an effect size equal to that achieved by the information intervention with the same power. The unbalanced design is not efficient for evaluating the impact of the information intervention (assuming equal variances in the treatment and control groups) but the overall study design achieves efficiency by using one control group to identify the effects of two treatments.

We take account of the loss of power resulting from the clustered sampling of households within a barangay. Since we expose only one individual within each household to an intervention, we have a two-level cluster design with treatment allocated at the higher level. We use `clustersampsi` in Stata<sup>®</sup> to conduct all power calculations (Hemming and Marsh 2013).

We intend to stratify barangays by their urban/rural classification before random selection into the sample and random allocation to one of the two treatment groups or the control group. Because we do not yet have the information necessary to allow for this stratification, the power analysis presented below is conducted assuming no stratification. This is conservative: once stratification is allowed for, the required sample sizes will be smaller than those calculated here.

## 10.1 Parameter values

To the extent that it is possible given the estimates available, we have strived to base the choice of parameter values on evidence. However, it must be acknowledged that, as is often the case with power calculations, the evidence is often lacking or meagre, and we often must resort to guesstimates. In doing so, we have endeavoured to err on the side of conservatism and have conducted sensitivity analyses.

### *Power*

Power is set to 80% and statistical significance to 5%.

### *Minimum detectable effect size*

We calculate the sample size necessary to detect a small effect size ( $\delta$ ) defined as 0.2 standard deviation (SD) units (Cohen 1992). Consider our main outcome i) – the 10-year risk of a heart attack or stroke predicted by the office-based Globorisk algorithm. Given an estimated mean 10-year CVD risk of 11.35% in the control group, which we obtain from Globorisk for individuals aged 40-69 with mean values of all risk factors, if the standard deviation is one fifth of the mean, then an effect size of 0.2 SD corresponds to a 4% reduction in the mean. The assumption that the standard deviation is one fifth of the mean is based on estimates of the distribution of 10-year CVD risk scores (Gale et al 2014; Gray et al 2014). However, we caution that these estimates are not obtained using the Globorisk algorithm and most are for samples of high-income country populations.<sup>7</sup>

We deliberately choose a small effect size in order to ensure that our samples will be sufficient to detect only marginal impacts of the interventions on the risk factors that determine the CVD risk prediction. The logic is threefold. First, risk factors such as smoking and weight are notoriously hard to influence. Second, our information intervention is of unknown effectiveness and we recognize a possibility that a non-negligible fraction of respondents are unable to absorb the information provided on their CVD risks. Third, while the procedures defined by the PhilPEN protocol are proven to be effective, our aim is to establish effectiveness as the program is implemented, which may fall well short of the stipulated testing, medication and counselling.

For mean systolic blood pressure (outcome iii), mean BMI (v) and mean waist circumference (viii), we obtain the estimated control group means from measures taken in the 2013 National Nutrition Survey (NNS) for individuals aged 40-69 (FNRI-DOST, 2015). The standard deviation is assumed to be one seventh of the mean for systolic blood pressure, one fifth of the mean for BMI and one ninth of the mean for waist circumference based on Ezzati et al (2004). In each case, we set the minimal detectable effect size to 0.2 SD units of the mean.

Control group proportions for elevated blood pressure (outcome iv), overweight/obese (vi), smoking (vii), central adiposity (ix), undiagnosed hypertension (x) and hypertension medication (xi) are also taken from the 2013 NNS for individuals aged 40-69. For these binary outcomes, we set the minimal detectable effect size to the small value defined by Cohen (1992) as 0.2 of his h-index.

### *Intra cluster correlation*

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<sup>7</sup> Using the Framingham algorithm for 10-year CVD risk (D'Agostino et al 2008), Gale et al (2014) report a mean of 14.3% and a standard deviation of 2.59 for an English sample of 60+, non-frail persons with no history of CVD. A small study of 40+ employees without previous CVD in a region of Wales reports means (standard deviations) of non-laboratory based Framingham 10-year CVD risk of 10.7% (2.4) for males and 4.8% (1.2) for females (Gray et al 2014).

To the best of our knowledge, there are no estimates available of the intra cluster correlation for (predicted) 10-year CVD risk with clusters defined by communities resembling the size of Filipino barangays. Some idea of the correlation is given by ICCs for CVD risk factors, which determine predicted risk. Table 3 provides estimates of such ICCs for clusters defined at the level of primary care practice obtained from three North American studies.

While homogeneity of CVD risk factors within Filipino barangays need not necessarily closely resemble the homogeneity observed within primary care practices in North America, these estimates at least give an idea of the ICC that might be expected. We set the ICC at 0.1, which is almost twice the highest estimate for any risk factor in Table 3. This is even more conservative than might appear at first sight since one would expect there to be even less within community homogeneity in CVD risk predicted on the basis of all risk factors than there is in each individual risk factor individually.

**Table 3 Estimates of intra cluster correlation coefficients for CVD risk factors at the level of primary care practices in North America**

	Eastern Ontario Singh et al (2015)	Rhode Island and Massachusetts Parker et al (2005)	Vermont Littenberg & MacLean (2006) <sup>±</sup>
Systolic Blood Pressure	0.054	0.047	0.042
Low Density Lipoprotein	0.035	0.006	0.045
Fasting Blood Glucose	0.023	0.016	N/A
Body Mass Index	N/A	0.031	0.011
Smoking	N/A	0.036	0.005

± Individuals with diabetes only.

For all other outcomes, we also assume an ICC of 0.1 in our baseline power calculations and test sensitivity to revising the value downward to 0.05.

#### *Cluster size*

We aim to observe 10 individuals within each cluster at follow-up who have been exposed to an intervention (or are in the control group). To achieve this, we sample a larger number at baseline to allow for attrition and non-eligibility for the lottery intervention. This cluster size is set to achieve a balance between constraining the sample size while limiting costs incurred by surveying in many barangays.

#### *Autocorrelation in outcomes*

We will estimate treatment effects using ANCOVA. That is, the post-treatment outcome observed at follow-up will be regressed on an indicator of treatment group membership and the pre-treatment outcome, plus covariates observed at baseline. The coefficient on the treatment indicator is the estimated treatment effect. For given power and minimal detectable effect size, the required sample size is decreasing with the autocorrelation of the outcome (as well as the proportion of its variance that can be explained using baseline values of covariates).

Estimates of the autocorrelation in predicted 10-year CVD risk are not available, as far as we are aware. Age, sex, smoking and BMI, four of the five predictors of CVD risk used by Globorisk, are obviously very highly autocorrelated. The fifth predictor – a single visit measure of blood pressure – can be

expected to display much lower serial correlation. Blood pressure can vary depending on recent activity and diet, although we will follow a standard protocol for its measurement. It may also vary with the enumerator, although this will be minimized by use of an electronic meter and we can control for enumerator effects.

In addition to the baseline value of the outcome, we will also control for a very larger battery of baseline covariates, including socioeconomic characteristics, medical history, health behavior and knowledge of risk factors.

Admittedly, we do not have a good idea of how the follow-up outcome will vary with all of these factors. We assume for the main power calculations a correlation of 0.6, which corresponds to an explained variance of 0.36. This would seem to err on the side of conservatism, given the very extensive set of covariates that can be used. We use the same value for all outcomes. We test sensitivity of the required sample size to reducing the autocorrelation to 0.4.

*Attrition rate*

We assume an attrition rate of 10%. This seems reasonably conservative given that the follow-up survey will be only 6-7 months after the baseline and we will make efforts to track respondents in the interim period. This will consist of obtaining the cellphone/ contact numbers of all respondents during the baseline interview. We shall instruct our survey contractor to develop and execute a plan to trace the respondents in between surveys. Their tracing strategy must include contacting each respondent at least once, and possibly twice, during the interim period to check if the respondents are still in the same location. Contact will be through a SMS, a telephone call and, if necessary, a personal visit. We will also engage a local field coordinator (other than the survey firm) to help out in validating the tracing reports of the survey firm, and in coordinating with Barangay Health Worker (BHW) or barangay captain about the whereabouts of respondents that we cannot locate.

*Adjustment for refusal, ineligibility and item non-response*

Individuals who report a diagnosis of heart disease, heart attack, stroke or diabetes, or who are taking medication for hypertension or diabetes will be ineligible. We must first screen the initially sampled individuals to identify these cases. Using data from the NNS, we estimate this group will amount to 14% of those initially sampled. Other sampled individuals will be eligible but will refuse to give consent to participate. We assume 15% of those sampled will not give their consent. Costs will be incurred performing the initial screening of sampled households before the ineligible and non-consenting cases are identified. We adjust the initially selected sample upwards to allow for these non-usable respondents. A similar adjustment is made for an assumed 5% of the eligible sample who will not answer all requisite questions or complete all measurements despite initially giving consent.

*Compliance rate*

Not all respondents who are offered a voucher will go to a RHU/CHC for a checkup and so get the lottery ticket to which they are entitled. And some of the control group will go to the RHU/CHC despite not being offered any inducement. We have no firm evidence on which to hazard a guess about the extent to which the offer of a lottery ticket will be effective in persuading people to go for a checkup. Based on the facts that the offered prize of P5000 (US\$100) is roughly equivalent to 14 days' earnings at the average wage in the province, and from discussions with health workers in the area, we believe that response will be high. We assume a compliance rate of 60% and conduct sensitivity analysis setting this as low as 50%.

Table 4 summarises all the parameter values used in the various scenarios considered in the power calculations.

**Table 4 Parameter values used in power calculations**

Parameters	Scenario 1 (main)	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Significance level ( $\alpha$ )	0.05	0.05	0.05	0.05	0.05
Power (1- $\beta$ )	0.8	0.8	0.8	0.8	0.8
Minimum detectable standardized effect size ( $\delta$ )	0.2	0.2	0.2	0.2	0.2
Attrition rate	0.1	0.1	0.1	0.1	0.1
Refusal to consent rate	0.15	0.15	0.15	0.15	0.15
Item non-response rate	0.05	0.05	0.05	0.05	0.05
Ineligibility rate	0.14	0.14	0.14	0.14	0.14
Average cluster size at follow-up	10	10	10	10	10
Intra-cluster correlation	0.1	0.05	0.1	0.05	0.1

Autocorrelation in outcomes	0.6	0.6	0.6	0.6	0.4
Compliance rate in lottery intervention	0.6	0.6	0.5	0.5	0.6

**Table 5 Means of outcome variables used in power calculations**

	Control group	Treatment group
Mean CVD risk	11.35	10.89
Mean systolic BP in mm Hg	125.61	122.02
Proportion with BP $\geq$ 140 mm Hg	0.31	0.22
Proportion on BP medication	0.10	0.16
Proportion of undiagnosed hyper-tension	0.20	0.13
Mean BMI	23.35	22.41
Proportion with BMI > 25	0.31	0.22
Mean waist circumference in cm	82.01	80.19
Proportion with high waist circumference	0.40	0.30
Proportion currently smoking	0.17	0.10

## 10.2 Results

Required sample sizes under the main scenario for parameter values described in the previous sub-section are given in Table 6. Estimates under alternative scenarios are given in Appendix B Tables B1-B4. The requisite sample size differs little across the outcomes but is slightly larger for the binary outcomes. We will set the sample size to that required to have sufficient power to test for the specified minimal effect size on the binary outcomes under the main scenario.

**Table 6: Sample size calculations – Main scenario (1)**

	Mean CVD risk	Mean systolic BP in mm Hg	Mean BMI	Mean waist circumference in cm	Binary outcomes
<b><i>Required sample sizes</i></b>					
Info treatment per round (unadjusted)	287	293	287	293	299
Lottery treatment per round (unadjusted)	1,306	1,333	1,306	1,333	1,361
Control per round (unadjusted)	1,306	1,333	1,306	1,333	1,361
Total baseline sample (adjusted)	4,816	4,916	4,816	4,916	5,019
Total follow-up sample	2,899	2,959	2,899	2,959	3,021
Number of clusters	290	296	290	296	303
Avg. cluster size at baseline	16.61	16.61	16.61	16.61	16.56

In implementing the sampling design, we will sample 303 barangays out of 849 distributed across the 32 municipalities and cities in Nueva Ecija province. We will meet with the mayors of all 32 municipalities to introduce the study, get their consent and endorsement of our field activities within their jurisdiction. This will be done during the field mobilization phase (see Table 2).

Since treatment will be randomized at the barangay level, there is no issue of contamination across households within a barangay. But since one RHU/CHC typically serves more than one barangay (there are 63 RHU/CHCs in the province), contamination through the same facility serving both treatment and control barangays needs to be considered. This is not an issue for the information intervention and control groups since the former does not require that the RHU/CHC do anything. The facility will be unaware of patients that belong to these two groups. There could be an issue if the role of the RHU/CHC in implementation of the lottery causes it to operate differently for all patients. One possibility is that it

improves implementation of the PhilPEN protocol across the board. Another is that the facility expends more effort on the patients entitled to enter the lottery, since it knows they are being monitored by the study, and neglects other patients. We will make efforts to avoid these reactions by encouraging the RHU/CHC to operate as it was and simply to issue the lottery tickets on completing a physical assessment of a patient presenting with a voucher. But even if the experimental effect cannot be completely avoided, it is not a major problem for the study. The lottery is used to provide random variation in go for a checkup at a RHU/CHC. This variation will be used to compare outcomes of those in the treatment group who go for a checkup with those in the control area who do not. We are not comparing outcomes of those who go for a checkup in the treatment and control barangays. So, even if the service improves for those in the control barangay, it does not invalidate our identification strategy.

## 11. Survey instrument

The baseline instrument contains a screening module to establish eligibility of the household and a main respondent for the study and interventions according to the inclusion/exclusion criteria described in section 9. Thereafter, two modules completed by the head of household, their spouse or another adult obtain information on housing conditions and ownership of assets that will be used to construct a wealth index. The randomly selected main respondent aged 40-70 will complete modules on socio-demographic characteristics, medical history, knowledge of CVD risk factors, health behaviour, CVD risk perceptions, general health (SF-36), health care utilization and expenses, work and earnings, and risk and time preferences.

To obtain incentive compatible measures of risk preferences, we offer different sets of choices in which respondents can win real money. Monetary incentives help to avoid potentially distorted measures of preferences due to self-serving biases, inattention and strategic motives that commonly arise in hypothetical choice experiments (Camerer and Hogarth, 1999). A commonly used and widely accepted procedure to implement real incentives in individual choice experiments is a random incentive system (Baltussen et al., 2012). In our study, we use a hybrid random incentive system in which only a randomly chosen subset of participants is selected after choices have been made and one of their choices is implemented. This procedure not only allows us to award sizeable nominal payoffs to a large sample of respondents while remaining within the project budget, but it also helps avoid income and portfolio effects that might occur if all tasks are paid out. We follow previous studies by randomly paying out 10% of the respondents (March et al., 2016). The maximum amount a respondent can earn is PHP 400.

Physical measurements of height, weight, waist circumference and blood pressure will also be obtained from the sampled individuals. Those allocated to the information treatment will be given a different risk perceptions module that provides information on average (for their age and gender) and predicted CVD risks. A final module completed by a barangay representative will collect information on proximity to health facilities.

The baseline survey instrument is attached as Appendix C.

The follow-up survey will be substantially shorter than the baseline instrument and will focus on obtaining data on outcomes.

## 12. Consent Process

The survey and interventions will not expose the study participants to any obvious potential harms. Nonetheless, we shall endeavor to take every precaution to protect the welfare of the participants. We will

secure the informed consent of all survey respondents – household respondent and main respondent – before the baseline interview. The consent forms state (see Appendix D):

- Study objective, investigators and funding source.
- The topics covered in the interview and its length.
- The physical measurements made (blood pressure, hip and waist circumferences, height and weight), with the assurance that the measurement will be temporarily stopped if the respondent is uncomfortable and resume only upon the consent of the respondent.
- Voluntary nature of the survey and right of respondent to stop the interview at any time.
- That follow-up survey to be conducted after 6-7 months.
- That confidentiality of the information shared and the identity of the respondent will be protected.
- That the respondent may ask for clarifications to the enumerator; or call study team members through the contact numbers or email provided for any complaint, question or clarification.
- That the respondent indicates consent by writing his/her name, signing over it and specifying the date in front of the enumerator.

The text of the consent form will be read by the enumerator before proceeding with the interview. Only when the consent form is signed by the respondent and the “consent and sign” option is ticked will the interview proceed.

Respondents in the lottery treatment group will be asked to sign an additional consent form to confirm their acceptance of the conditions under which the lottery will be conducted and they will be allowed to enter it. This includes information on what they must do to collect a lottery ticket from a RHU/CHC, which facility they must attend, by what date and how the winners will be informed (see Appendix D).

There is no separate consent form to confirm participation in the information treatment. This intervention does not involve the provision of any medical care, nor the offer of a financial reward on condition of seeking preventive care. Respondents are simply informed of the risk of heart attack/stroke within 10 years conditional on age, sex, blood pressure, BMI and smoking status. Respondents are told that these risks are estimated by doctors based on monitoring the health of thousands of individuals over many years. They are told that the estimates are specific to the Philippines.

A conformé letter of agreement will be sent to the mayor of every municipality or city from which barangays and households will be sampled. The letter contains information about the study, its objectives, proponents and funding source, and study activities (surveys and interventions) that will be undertaken. Additionally, the letter solicits the support and permission of the mayor to engage the local rural health unit/city health center in the lottery intervention. The tasks and responsibilities of the participating RHU/CHC are also laid out in an accompanying sheet. The letter assures the mayor that participation in the survey and interventions is voluntary, and informed consent of the participants will be sought first before the interview and participation in the intervention. Assurance will be given that participation of RHU/CHC will not generate any added cost to the local government, and that the study team will provide the lottery prize and take charge of delivering the prize money to the winner. The mayor will indicate his support and permission by signing the conformé.

### 13. Ethical issues

#### *Data protection*

To track respondents at follow-up, records of their names and addresses will need to be kept. These records will be kept on a secure computer in encrypted files accessible only by specified members of the immediate study team. Files containing names and addresses will not be shared by anyone outside of the study team. When data are made available to other researchers, respondents will be distinguished only by unique identification numbers and no names and addresses will be included in the data files.

#### *Blood pressure information*

Blood pressure will be measured using a digital monitor following standard procedures. It can be anticipated that some participants will have an elevated blood pressure reading that may warrant preventive actions. We will adopt the following protocol for dealing with elevated blood pressure readings:

- $140/90 \text{ mmHg} \leq \text{BP} < 180/120 \text{ mmHg}$ : Tell the respondent of the likelihood of hypertension, and advise to see a physician for confirmation. The information and advice will be recorded on an orange coloured card given to the respondent. Proceed with the interview.
- $\text{BP} \geq 180/120 \text{ mmHg}$ : Advise the respondent to proceed immediately to the nearest health facility. Issue a red coloured card with this advice. Stop the interview.

The BP thresholds specified above are slightly higher than standard recommendations to account for the fact that we will be using digital monitors, which are known to register higher BP readings than aneroid monitors.

#### *Lottery intervention*

A voucher will be given to the respondent, encouraging them to go for a checkup at their designated RHU/CHC. This intervention does not pose any risk to the respondents. It encourages them to seek preventive care.

The intervention is a one-time offer of a lottery ticket conditional on going for a checkup. Once the respondent goes for a checkup, then according to the PhilPEN protocol there should be continuity of risk assessment and, when needed, sustained management of CVD / diabetes. The protocol specifies the periodicity of risk assessments subsequent to an initial assessment/screening and the criteria for putting a patient on antihypertension/diabetes medications (Appendix A).

This group will not be informed of their Globorisk predicted CVD risk at baseline, although they will be told if their blood pressure is high (see above). At follow-up, the respondents in this group will be told their predicted CVD risk.

#### *Information intervention*

Each respondent in this group will be informed of their 10-year risk of heart attack or stroke for someone of the same age and sex as the respondent, and then conditional on the same age, sex, BMI, smoking status and blood pressure as the respondent. It will be emphasized that neither prediction is the risk precisely for the individual respondent. Rather, it will be pointed out that the risk varies with other factors not taken into account in the prediction.

There is also no issue of continuity of treatment since it is information that is provided, not medical care. At baseline, respondents in this group will not be informed that they can attend the RHU/CHC for a CVD risk assessment, although they are free to do so. At follow-up, they will be given this information. But they will not be offered the lottery incentive.

#### *Control group*

The information to be provided on 10-year risk of heart attack or stroke is publicly available from [Glororisk](#). Hence, the control group can access this information. And the control group will be told the results of the physical measurements from which the CVD risk predictions are calculated. At follow-up, the control group will be told of the age, sex and risk factor conditional CVD risks.

The lottery intervention will not subsequently be offered to the control group. However, the preventive care the lottery aims to encourage is already available to all respondents. Everyone is currently entitled to go for a risk assessment at a RHU/CHC. At follow-up, the control group will be told that they can go for a risk assessment at the RHU/CHC.

## 14. Ensuring data quality

We shall require the survey contractor to propose and implement measures to ensure data quality. Two data quality concerns are paramount. First, full interviews are indeed conducted. As proofs, the survey contractor will report the timing and recording of the interviews, and supervisor's notes. The firm will also submit regular data dumps so that we may check the completeness of the interviews conducted. Second, the enumerators implemented the procedure for randomly selecting households within the barangay. Towards this, we will provide strict instructions in the enumerator's manual, and clarify with the survey the penalties that they mete out to the enumerator who failed to follow instructions (or who cheat in completing the interviews). Another possible measure that we will explore with the survey firm is to use GPS to track the actual interviews.

Additionally, the UPecon team members will also conduct random spot checks to observe how enumerators try to initiate and complete interviews, solicit the consent of the respondents, administer the interventions, and select the households in the barangay. To help us out in this activity, we will also engage a local field coordinator.

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## Appendices

### Appendix A – Prescribed treatments under PhilPEN

The PhilPEN operations manual (Department of Health, 2012b), following the WHO protocol for the integrated management of diabetes and hypertension, stipulates that the prescribed treatment response depends on both assessment of individual risk factors and the total 10-year risk of a CVD event predicted using the WHO/ISH charts, as follows:

- 1) Individual risk factors:
  - a. All with BP  $\geq$  160/100 mmHg to be given antihypertensive treatments.
  - b. All with stable CVD or diabetes continue with prescribed treatment and considered to have CVD risk  $>$ 30% (see below).
  - c. All with total cholesterol  $\geq$  8 mmol to be given lifestyle advice and statins.
  - d. All with diabetes to be given Metaformin (if blood glucose high despite diabetic diet), given a statin if  $\geq$ 40 and resources sufficient, given advice on foot care, referred for eye examination every 2 years, and followed-up every 3 months.
- 2) CVD risk  $<$ 20%:
  - a. Counsel on diet, physical exercise and smoking cessation.
  - b. If risk  $<$ 10%, follow-up after 12 months.
  - c. If risk 10-  $<$ 20%, follow-up after 3 months until meet targets, and then 6-9 months.
- 3) CVD risk 20% -  $<$ 30%
  - a. Counsel on diet, physical exercise and smoking cessation.
  - b. If BP  $\geq$  140/90 (in DM  $\geq$ 130/80), to be given low dose of an antihypertensive, beta-blocker or calcium channel blocker (Hydrochlorthiazide, Enalapril, Atenelol or Amlodipine).
- 4) CVD risk  $\geq$ 30%
  - a. Counsel on diet, physical exercise and smoking cessation.
  - b. If BP  $\geq$  130/80, to be given one of Thiazide, ACE inhibitor, beta-blocker or calcium channel blocker.
  - c. To be given a statin.
  - d. Followed-up every 3 months.

## Appendix B – Sample size calculations – Sensitivity analysis

**Table B1 Results of power calculations and cost estimations – Scenario 2**

	Mean CVD risk	Mean systolic BP in mm Hg	Mean BMI	Mean waist circumference in cm	Binary outcomes
<b><i>Required sample sizes</i></b>					
Info treatment per round (unadjusted)	220	226	220	226	232
Lottery treatment per round (unadjusted)	1,000	1,028	1,000	1,028	1,056
Control per round (unadjusted)	1,000	1,028	1,000	1,028	1,056
Total baseline sample (adjusted)	3,687	3,790	3,687	3,790	3,894
Total follow-up sample	2,220	2,282	2,220	2,282	2,344
Number of clusters	222	229	222	229	235
Avg. cluster size at baseline	16.61	16.55	16.61	16.55	16.57
<b><i>Estimated costs in PHP</i></b>					
Total cost	10,642,249	10,904,744	10,642,249	10,904,744	11,164,135

**Table B2 Results of power calculations and cost estimations – Scenario 3**

	Mean CVD risk	Mean systolic BP in mm Hg	Mean BMI	Mean waist circumference in cm	Binary outcomes
<b><i>Required sample sizes</i></b>					
Info treatment per round (unadjusted)	269	274	269	274	280
Lottery treatment per round (unadjusted)	1,880	1,920	1,880	1,920	1,960
Control per round (unadjusted)	1,880	1,920	1,880	1,920	1,960
Total baseline sample (adjusted)	6,693	6,834	6,693	6,834	6,977
Total follow-up sample	4,029	4,114	4,029	4,114	4,200
Number of clusters	403	412	403	412	420
Avg. cluster size at baseline	16.61	16.59	16.61	16.59	16.61
<b><i>Estimated costs in PHP</i></b>					
Total cost	18,434,482	18,803,017	18,434,482	18,803,017	19,173,026

**Table B3 Results of power calculations and cost estimations – Scenario 4**

	Mean CVD risk	Mean systolic BP in mm Hg	Mean BMI	Mean waist circumference in cm	Binary outcomes
<b><i>Required sample sizes</i></b>					
Info treatment per round (unadjusted)	206	211	206	211	217
Lottery treatment per round (unadjusted)	1,440	1,480	1,440	1,480	1,520
Control per round (unadjusted)	1,440	1,480	1,440	1,480	1,520
Total baseline sample (adjusted)	5,126	5,267	5,126	5,267	5,410
Total follow-up sample	3,086	3,171	3,086	3,171	3,257
Number of clusters	309	318	309	318	326
Avg. cluster size at baseline	16.59	16.56	16.59	16.56	16.60
<b><i>Estimated costs in PHP</i></b>					
Total cost	14,369,292	14,737,016	14,369,292	14,737,016	15,107,025

**Table B4 Results of power calculations and cost estimations – Scenario 5**

	Mean CVD risk	Mean systolic BP in mm Hg	Mean BMI	Mean waist circumference in cm	Binary outcomes
<b><i>Required sample sizes</i></b>					
Info treatment per round (unadjusted)	378	378	378	384	390
Lottery treatment per round (unadjusted)	1,722	1,722	1,722	1,750	1,778
Control per round (unadjusted)	1,722	1,722	1,722	1,750	1,778
Total baseline sample (adjusted)	6,349	6,349	6,349	6,451	6,554
Total follow-up sample	3,822	3,822	3,822	3,884	3,946
Number of clusters	383	383	383	389	395
Avg. cluster size at baseline	16.58	16.58	16.58	16.58	16.59
<b><i>Estimated costs in PHP</i></b>					
Total cost	17,513,807	17,513,807	17,513,807	18,038,748	18,038,748

Appendix C – Questionnaire for baseline survey – attached

## Appendix D – Consent Forms

### **UPecon Foundation**

ECONOMICS BUILDING, U.P. CAMPUS, DILIMAN, QUEZON CITY 1101  
TELS: 927-9686/92; 9205463 FAX: 921-3359; 9205462

## **The Nueva Ecija Cardiovascular Risk Experiment**

### **CONSENT FORM FOR HOUSEHOLD RESPONDENT (R1)**

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*The Nueva Ecija Cardiovascular Risk Experiment* is being carried out by the UPecon Foundation, Inc., a research institution of the University of the Philippines, Diliman, Quezon City. The study is part of a multi-country research consortium led by the University of Lausanne and funded by the Swiss Agency for Development and Cooperation and the Swiss National Science Foundation.

Your household has been randomly selected to participate in this study, which aims to improve prevention of cardiovascular disease (CVD). The findings will be used to help policymakers deliver more effective CVD prevention programs.

The main part of the study consists of an interview with someone aged between 40 to 70 years old. If there is such a person in your household, I would like to ask him/her about his/her health, diet, exercise and other health-related topics, as well as some background information on employment, education, etc. I would also like to measure the person's weight, height, waist size and blood pressure. If there is more than one person aged 40-70 in the household, I will randomly select one for interview. I would like to ask you some questions to establish if there is anyone aged 40-70 living the household, and to obtain some information on your house and possessions.

The complete interview and physical measurements will take approximately three hours. The interview with you about the household will take about 15 minutes. The remaining time will be required for the interview and physical measurements of the person aged 40-70.

There is no reason why participation in the study would be damaging to the health, wellbeing or finances of people in your household. If the person selected for interview were to experience even the slightest discomfort during measurement of his/her blood pressure or waist size, which is very unlikely, we would interrupt the examination until he/she regains composure and is ready to proceed.

Your decision to take part in the study is voluntary. You are not obliged to do anything that makes you uncomfortable. There will be a follow-up interview after six months or so. Participation is again entirely voluntary. You may withdraw from the study at any time you wish.

Information provided by any member of your household will be treated with utmost confidentiality. I will enter your answers directly into a computer to ensure that errors are minimized. Your anonymity will be fiercely protected by the researchers conducting the study. Names, your address and any other information that could be used to identify members of your household will be deleted from the data file when it is stored. They will be replaced by a numerical code that cannot possibly be linked to your name and address. The data will be used for research purposes only. Access to the data will be protected by the UPecon researchers who are also professors at the UP School of Economics.

#### **Contact Information**

If you have any questions, you can ask me or contact the research study team (Dr. Joseph Capuno or Dr. Aleli Kraft) in the UPecon Office by calling or texting the following numbers \_\_\_\_\_ or you can e-mail at \_\_\_\_\_.

Your signature indicates that you understand what the study involves and that you are willing to participate.

**CONSENT:**

I give my consent to participate in this research study subject to the conditions above.

Name of Respondent:

\_\_\_\_\_

Signature of Respondent:

\_\_\_\_\_

Date (MM/ DD/ YY):

\_\_\_\_\_

Name of Interviewer:

\_\_\_\_\_

Signature of Interviewer:

\_\_\_\_\_

(Note for the interviewer) Did respondent:

Consent and sign	1
Consent but did not sign	2
Refused to participate	3

# UPecon Foundation

ECONOMICS BUILDING, U.P. CAMPUS, DILIMAN, QUEZON CITY 1101  
TELS: 927-9686/92; 9205463 FAX: 921-3359; 9205462

## The Nueva Ecija Cardiovascular Risk Experiment

### CONSENT FORM FOR INDIVIDUAL RESPONDENT (R2)

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*The Nueva Ecija Cardiovascular Risk Experiment* is being carried out by the UPecon Foundation, Inc., a research institution of the University of the Philippines, Diliman, Quezon City. The study is part of a multi-country research consortium led by the University of Lausanne and funded by the Swiss Agency for Development and Cooperation and the Swiss National Science Foundation.

You have been randomly selected to participate in this study, which aims to improve prevention of cardiovascular disease (CVD). The findings will be used to help policymakers deliver more effective CVD prevention programs.

I would like to ask you some questions about your health, lifestyle (e.g., diet, exercise), perception of health risks and health care use, as well as your employment, education, etc. I would also like to measure your weight, height, waist size and blood pressure.

The complete interview and physical measurements will take approximately two and a half hours.

There is no reason why participation in the study would damage your health, wellbeing or finances. If you were to experience even the slightest discomfort during measurement of your blood pressure or waist size, which is very unlikely, we would interrupt the examination until you regain your composure and you are ready to proceed.

Your decision to take part in the study is voluntary. You are not obliged to do anything that makes you uncomfortable. There will be a follow-up interview after six months or so. Participation is again entirely voluntary. You may withdraw from the study at any time you wish.

The information you provide will be treated with utmost confidentiality. I will enter your answers directly into a computer to ensure that errors are minimized. Your anonymity will be fiercely protected by the researchers conducting the study. Your name, address and any other information that could be used to identify you will be deleted from the data file when it is stored. They will be replaced by a numerical code that cannot possibly be linked to your name and address. The data will be used for research purposes only. Access to the data will be protected by the UPecon researchers who are also professors at the UP School of Economics.

#### Contact Information

If you have any questions, you can ask me or contact the research study team (Dr. Joseph Capuno or Dr. Aleli Kraft) in the UPecon Office by calling or texting the following numbers \_\_\_\_\_ or you can e-mail at \_\_\_\_\_.

Your signature indicates that you understand what the study involves and that you are willing to participate.

---

#### CONSENT:

I give my consent to participate in this research study subject to the conditions above.

Name of Respondent:

\_\_\_\_\_

Name of Interviewer:

\_\_\_\_\_

Signature of Respondent:

\_\_\_\_\_

Date (MM/ DD/ YY):

\_\_\_\_\_

Signature of Interviewer:

\_\_\_\_\_

(Note for the interviewer) Did respondent:

Consent and sign	1
Consent but did not sign	2
Refused to participate	3

# UPECON Foundation

ECONOMICS BUILDING, U.P. CAMPUS, DILIMAN, QUEZON CITY 1101  
TELS: 927-9686/92; 9205463 FAX: 921-3359; 9205462

## The Nueva Ecija Cardiovascular Risk Experiment

### CONSENT FORM FOR PARTICIPATION IN LOTTERY

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Many thanks for generously giving your time to answer all these questions.

We would like to offer you the opportunity to enter a lottery that will give you a one in ten chance of winning five thousand pesos (P5000). Entering the lottery is free. To enter, you must take the voucher the enumerator will give you to the Rural Health Unit/City Health Center of \_\_\_\_\_, request a physical assessment and ask for a lottery ticket in exchange for the voucher. The RHU/CHC will not charge you for the examination or the lottery ticket.

The lottery is funded by the Nueva Ecija Cardiovascular Risk Experiment. It is administered by the UPECON study team, which will liaise with the RHU/CHC to identify which study participants collect their lottery tickets. From those that do, the study team will randomly select around ten percent (1 in 10) to each receive a prize of P5000. We anticipate that roughly one person from each barangay in which the study is being conducted will win a prize of this amount. The study team will make arrangements for the winners to receive the P5000 payment.

The terms and conditions for participating in the lottery are as follows:

1. The voucher is in your name. It can be used only by you, and not anyone else, to collect a lottery ticket at the RHU/CHC.
2. For verification purposes, you agree that your name, address, sex and age are sent to the RHU/CHC where you may claim your lottery ticket, and that these details are also recorded on the voucher.
3. You sign the voucher in the presence of the survey enumerator and you sign for the lottery ticket at the RHU/CHC.
4. The lottery ticket can be claimed on or before \_\_\_\_\_ at RHU/CHC of \_\_\_\_\_ from (name of the point person in the RHU/CHC).
5. You must bring a photo ID and the voucher when you go to collect the lottery ticket at the RHU/CHC.
6. When you go to collect the lottery ticket from the RHU/CHC, you request a physical assessment and consent to any examinations deemed necessary to assess your physical health without being obliged to pay.
7. If you do not exchange the voucher for a lottery ticket at the RHU/CHC, then you will not enter the draw.
8. The lottery will be drawn **xxx** weeks after this interview.
9. The winning lottery numbers will be announced through SMS and our website ([www.upecon.org/.....](http://www.upecon.org/)). The names of the lottery winners will be kept confidential.
10. UPECON will contact those holding tickets with a winning number to arrange for the P5000 to be paid.

#### Contact Information

If you have any questions, you can ask me or can contact the research study team (Dr. Joseph Capuno or Dr. Aleli Kraft) in the UPECON Office in UP Diliman, Quezon City by calling or texting the following numbers \_\_\_\_\_ or you can e-mail at \_\_\_\_\_.

Your signature indicates that you understand the conditions under which you are allowed to enter the lottery and that you are willing to participate.

**CONSENT:**

I give my consent to participate in the lottery under the conditions specified above.

Name of Respondent:

\_\_\_\_\_

Signature of Respondent:

\_\_\_\_\_

Date (MM/ DD/ YY):

\_\_\_\_\_

Name of Interviewer:

\_\_\_\_\_

Signature of Interviewer:

\_\_\_\_\_

(Note for the interviewer) Did respondent:

Consent and sign	1
Consent but did not sign	2
Refused to participate	3

# UPecon Foundation

ECONOMICS BUILDING, U.P. CAMPUS, DILIMAN, QUEZON CITY 1101  
TELS: 927-9686/92; 9205463 FAX: 921-3359; 9205462

## LGU conformé

Date:

Hon. \_\_\_\_\_  
Mayor  
Municipality/City of \_\_\_\_\_  
Nueva Ecija

Dear Mayor \_\_\_\_\_,

Greetings!

We are a team of researchers from the UPecon Foundation, Inc. based in the School of Economics, University of the Philippines, Diliman, Quezon City. We are currently undertaking *The Nueva Ecija Cardiovascular Risk Experiment*, which is part of a multi-country research consortium led by the University of Lausanne and funded by the Swiss Agency for Development and Cooperation and the Swiss National Science Foundation.

The study aims to improve prevention of cardiovascular disease (CVD) by examining how people respond to information on CVD risks and their demand for preventive care offered at rural health units/city health centers (RHU/CHC). We hope the findings of our study will help deliver more effective preventive health care and improve the health of the adult population at risk of chronic illnesses, particularly CVD.

To meet our study objectives, we ask for your cooperation in undertaking two activities in your municipality. The first is to conduct a household survey in randomly selected barangays during the period \_\_\_\_\_. The selected barangays are \_\_\_\_\_. The only thing we ask from you in this respect is your permission to survey in these barangays.

Within each of these barangays, we will be interviewing approximately 16 randomly selected households each containing at least one person aged 40-70 years. The interviews will involve asking about household composition, socioeconomic status, health, health knowledge, health behavior, health care utilization, employment and attitudes towards risk. We will also measure the blood pressure, height, weight and waist size of the person aged 40-70. Some randomly selected respondents will be informed of cardiovascular risks for people of their age, sex and risk factor profile.

Before any interview, we will seek the informed consent of the respondent, inform them of their right to stop the interview at any point, and assure them of the confidentiality of the information they will share with us.

The second activity is to organize a lottery that offers some randomly selected survey respondents the chance to win a cash prize if they attend a RHU/CHC for a physical assessment. The purpose of this is to

establish the gains from seeking preventive health care. We will deal with all of the organization of the lottery and provide the finance. From you, we ask permission to conduct the lottery and that you instruct the RHU/CHC to cooperate with us to ensure that the research is successfully completed and yields findings that can help improve the delivery of health care and, ultimately, the health of the population.

Cooperation of the RHU/CHC in the execution of the study is very important. When a survey respondent turns up at a RHU/CHC for a physical assessment, which is the condition for entering the lottery, the responsible health worker should conduct the normal risk assessment and medical checkup deemed appropriate for someone with the person's demographic and risk factor profile. The RHU/CHC is not requested to do more than it normally does. But it should also not do less.

Before a person is offered the opportunity to enter the lottery, the conditions for doing so will be very clearly explained, it will be made clearly that participation is voluntary and signed consent will be obtained. There will be no charge for entering the lottery.

We would be extremely grateful for your permission to partner with the RHU/CHC of \_\_\_\_\_ in implementing the lottery. The tasks and responsibilities of the RHU/CHC are specified in the attached terms and conditions. The involvement of the RHU/CHC will be of no cost to the municipal/city government, and we will endeavor to defray any incidental costs that arise.

We will conduct a follow-up survey in the same barangays and households after 6-7 months.

We would be extremely grateful for your permission to conduct this substantively important study that promises to deliver findings that can help improve the prevention of cardiovascular disease in Nueva Ecija and in the Philippines. In fact, unique features of the study mean that its findings can be expected to arouse international interest in the context of the growing burden of non-communicable diseases that is weighing heavily on the health systems and economies of low- and middle-income countries.

Your endorsement of the study to barangay officials and households will help ensure its success.

Rest assured, we shall share with you the results of our study so that you may consider them for your own health programs. If you have questions, please contact either one of us (Dr. Joseph Capuno or Dr. Aleli Kraft) through our telephone numbers +63 2 9279686 loc 232/201, cellphone numbers, or emails [jjcapuno@up.edu.ph](mailto:jjcapuno@up.edu.ph) or [alelik@yahoo.com](mailto:alelik@yahoo.com). Or, you may contact of our research assistant \_\_\_\_\_ . We shall endeavor to attend to your concerns promptly.

We hope for your support to our undertaking. You may indicate your permission to engage the RHU/CHC of \_\_\_\_\_ by signing the conformé below at your convenient time. Our RA will be calling your office to follow up on this request.

Thank you very much.

Respectfully yours,

Joseph Capuno, PhD  
Research co-investigator  
UPecon Foundation

Aleli Kraft, PhD  
Research co-investigator  
Upecon Foundation

CONFORMÉ

\_\_\_\_\_  
Hon. XXXXX  
Mayor of XXXXX

Date: \_\_\_\_\_

### TASKS AND RESPONSIBILITIES OF THE RHU/CHC

1. Assign a point person from among the key health personnel of the RHU/CHC who will deal with persons issued with a voucher at the survey and instructed to exchange this for a lottery ticket at the RHU/CHC on condition of undergoing a physical assessment. The ideal point person is someone who can perform a physical assessment or arrange for this (e.g. the rural health nurse or the MHO/CHO). The identity of the point person will be stated on the voucher provided to the respondent at the survey interview.
2. The point person will keep the lottery tickets and record of the lottery tickets claimed with the corresponding name, sex, age, and address of the claimant. The UPecon study team will turn over the lottery tickets and record book to the point person.
3. The point person will be provided (by the UPecon study team or the survey firm engaged by UPecon) with the names, sex, age, address and voucher number of the voucher recipient. The voucher is non-transferable.
4. When a voucher holder visits the RHU/CHC, the point person will, first, verify the name, sex, gender, age and address of the voucher holder against the list provided by UPecon.
  - a. If the voucher holder is valid, then the point person will undertake an assessment of the voucher recipient, and then determine and recommend whatever necessary medical procedure or physical examination is needed. If the voucher recipient agrees to undergo the recommended procedures or examinations, then the point person shall facilitate the undertaking of the procedures or examination. Once these are completed, then the point person will give the corresponding lottery ticket to the voucher holder and record the name, age, sex and address of the voucher holder/ticket claimant.
  - b. If the voucher holder is not in the list provided, the point person will not issue the lottery ticket.
  - c. If the identity of the voucher holder is confirmed but s/he declines to undertake the assessment or recommended medical procedures or examinations, then the point person will ask for the reason and note down in the record book the reason given. The point person will not issue the lottery ticket to the voucher holder in such a case.
  - d. The point person will note what assessment and medical procedures or physical examinations were conducted.
5. If the point person has any question or concern, he or she will contact the study team (Dr. Joseph Capuno or Dr. Aleli Kraft) through our telephone numbers +63 2 9279686 loc 232/201, cellphone numbers, or emails [jjcapuno@up.edu.ph](mailto:jjcapuno@up.edu.ph) or [alelik@yahoo.com](mailto:alelik@yahoo.com). He or she will also agree to be contacted and answer queries by the UPecon study team.
6. The point person shall endeavor to keep the lottery tickets, vouchers and record in safe and secure place.
7. By the end of the lottery intervention (\_\_\_\_\_), the point person will turn the unclaimed lottery tickets, surrendered vouchers and records over to the UPecon study team.

