Deterrents to Insurance Purchases: Distrust and Zero Aversion

Timothy Cheston, Alexandra De Filippo, Jiyoung Han,
Claudia Newman-Martin, Richard Zeckhauser

Harvard Kennedy School

I. INTRODUCTION

Despite the benefit that insurance can provide to many in the developing world, rates of take-up remain low. Prohibitive pricing has often been cited as the reason for low rates of insurance. However, even where affordable insurance packages are offered, or indeed actuarially favorable due to subsidies from governments or aid agencies, take-up rates amongst poor populations remain low.[1] Behavioral economics can help explain this underutilization. Biased assessment of probabilities (leading people to underweight moderate probabilities, thereby believing adverse events to be less likely than they truly are), status quo bias, and present bias have been shown – or are at least suspected – to play a role in reducing demand for insurance.

This paper posits that two additional behavioral factors – distrust in institutions and zero aversion – also act as deterrents to purchasing insurance. Focusing on poor populations, for whom the consequences of an adverse event are particularly severe, this paper presents the results of three experiments designed to assess the impact of these two behavioral barriers to the purchase of insurance. The first is distrust in institutions. This paper argues that individuals' unwillingness to pay present premiums to secure contingent future payoffs may be due not only to present bias but also due to distrust in institutions.[2] The second is zero aversion. Zero aversion is related to the principle that people are averse to the thought of paying for something and getting nothing in return (this behavioral propensity gives rise to sunk cost bias). As such, where given the opportunity to gain something, people will make economically unsound decisions to secure a small payoff rather than being left with nothing. Zero aversion is important in the insurance market, whereby people may be unwilling to enter an insurance contract where, in the absence of an adverse event, they will receive nothing for their insurance payments. If true, this has significant implications for the way in which insurance products should be structured and marketed.

Through a series of experiments, the authors found strong evidence that trust is critical in decisions about insurance consumption. The importance of trust was exhibited in two experiments. The first

---

[1] Some estimates suggest that insurance coverage in the developing world is at low as 5%: Lloyd's 360 Risk Insight and the MicroInsurance Centre. "Insurance in Developing Countries: Exploring Opportunities in Microinsurance." November 2009. http://www.lloyds.com/NR/rdonlyres/5CFE7CAF-0075-415C-B0F2-BEBF0323059E/0/Microinsurancereport_Nov2009.pdf

[2] We note that hyperbolic discounting could also contribute to such reluctance. Indeed, distrust by itself would produce behavior that appeared hyperbolic if, as would seem reasonable, an institution that will not pay off next period will also not payoff two periods hence, and one that will pay will pay one or two periods hence.

measured whether people's time preferences for payment depended on the trust they placed in the paying institution. As expected, the authors found that participants were more likely to a payment today in exchange for an increase in payment later a from institutions that they trusted. Busara, an organization with which participants were familiar, and had had positive experiences in the past, attracted the highest level of trust. It was also the institution for which participants were most willing to delay payment. Conversely, the District Officer was the least trusted payer, and the payer for which participants were least likely to delay payment. The Insurance Company fell in between for trust, but was little trusted. When offered the chance to increase a payoff from 140 (Kenyan shillings) to 200 in exchange for waiting two weeks, 24% more individuals would wait if Busara were paying rather than the Insurance Company. This leads to two conclusions: first, offering insurance from trusted sources may increase take-up. Secondly, in order to identify the organizations that are most trusted, familiarity matters – positive experience can be a significant determinant in effectively lowering an implicit discount rate.

In the second experiment, the authors were interested in whether people who tended not to buy insurance would change their behavior if offered insurance from a trusted source. Although a resounding 84.1% of participants had never bought insurance, 64.6% of participants purchased a microinsurance product from Busara, paid by the highly reliable M-Pesa money-transfer service, during the experiment. This affirms the conclusion that decisions about whether to purchase insurance are influenced by levels of trust in the institution from which the insurance product is being purchased.

The second experiment also explored whether the structure of insurance contracts can be improved to overcome a previously undocumented behavioral phenomenon, zero aversion. In this experiment, individuals were offered two insurance packages that had the same net payments for rain and non-rain on a future day, where the contract lasted four days. Plan A charged a premium of 100 KSH and paid 200 KSH in case of rain. Plan B required a higher premium of 125 KSH, offering a 25 KSH rebate in the case of no-rain or a 125 KSH payout in the case of rain. Given the distrust concern, and the substantial time preference for money identified in our distrust experiment, Plan A should have been substantially favored. In fact, a slightly higher percentage of subjects selected Plan B. This led the authors to hypothesize that by offering an insurance package whereby participants were paid in the event of an adverse event and given a rebate where no claim under the contract was made would result in higher take-up than a standard insurance package.

A third experiment sought to measure more purely people's acceptance of risk in two different 50-50 lotteries, with respective bottom outcomes of zero and ten, by asking an incentive-compatible question about certainty equivalents. As described below, the authors faced significant challenges in conveying probabilities to the population of interest. Given the potential implications of zero aversion for social and economic policy, the authors intend to pursue further research with different populations in order to better understand the value people will place on avoiding a zero outcome.

Understanding the psychology at play in insurance decisions would allow policymakers, development agencies, and insurance companies to combat behavioral biases and barriers to optimization. Policies to increase trust in insurers, for example, by protecting insures against the effects of insurer bankruptcy or better regulation of insurers, would arguably encourage more people to enter the market. Likewise, structuring insurance contracts to ensure that the insured *receive* a non-zero benefit from the contract – even in the absence of an adverse event – could have a significant impact on the desirability of insurance offerings. The insights gained through the experiment reported below are of value to a broad range of players in the insurance market. Properly applied, they have the potential to improve the lives of many of the world's poorest citizens.

II. MOTIVATION

This research was motivated by a desire to better understand decision-making processes, and to help policymakers, insurers, and non-profits identify better ways to offer and structure insurance to the world's poor.

While there are a rising number of microinsurance[3] providers seeking to address the needs of under-served populations, estimates indicate that as little as 5% of the potential market is covered.[4] In Kenya, national survey data reports that only 6.8% of adults in Kenya had an insurance product of any type.[5] Given that many of the world's poor are engaged in volatile industries posing significant risks – such as farming, casual labor, and manufacturing – insurance offers significant consumption smoothing benefits. It can provide for the livelihoods of farmers during times of flood or drought, and can help to cover expenses associated with a workplace injury or accident. Yet, those who most suffer the consequences of adverse events are also often those least likely to insure against those events. In lieu of formal insurance, lower income populations typically depend on financing from their communities for consumption smoothing, either taking loans from non-market sources such as family and friends, or by reducing consumption elsewhere.[6] These arrangements are typically more expensive and less dependable than formal microinsurance products.

Low insurance take-up is not limited to the developing world. The Affordable Care Act in the U.S. took the question of insurance as a right to its Supreme Court, while the bungled launch of its website exacerbated questions of trust. Only 44% of American households had individual life

---

[3] The International Association of Insurance Supervisors (IAIS) defines microinsurance as insurance that is accessed by low-income populations to protect against risks of specific life or non-life perils, managed based on insurance principles and funded by premiums: International Association of Insurance Supervisors (IAIS). "Application Paper on Regulation and Supervision supporting Inclusive Insurance Markets." October 2012.

[4] Lloyd's 360 Risk Insight and the MicroInsurance Centre. "Insurance in Developing Countries: Exploring Opportunities in Microinsurance." November 2009. http://www.lloyds.com/NR/rdonlyres/5CFE7CAF-0075-415C-B0F2-BEBF0323059E/0/Microinsurancereport_Nov2009.pdf

[5] Financial Sector Deepening Kenya. "Financial Inclusion in Kenya: Survey Results and Analysis from FinAccess 2009." July 2011. http://www.fsdkenya.org/finaccess/documents/11-06-27_finaccess_09_results_analysis.pdf

[6] Morduch, Jonathan. "Income smoothing and consumption smoothing." *The Journal of Economic Perspectives* (1995): 103-114.

insurance in 2010, the lowest rate in half a century.[7] Americans show great difficulty estimating insurance costs, as a recent survey found consumers believed the costs of insurance were nearly three times actual prices.[8] Moreover, Americans do not understand what life insurance is, with 70 percent failing a basic life insurance IQ test.[9] A New York Life Survey further finds most Americans do not have enough life insurance, relative to their own estimations, with policy values sufficient to cover three years after the policyholder's death, compared to their intended 14 years. The misunderstanding of these calculations combined with the jargon of the contracts with companies repeatedly mired in financial scandal (see AIG) has seeded broad distrust that insurance claims will pay out when the time comes. Disaggregating the effects of distrust from more pure discount rates allows policymakers to better target efforts to increase insurance coverage. Understanding how to structure contracts to increase their desirability is likewise an important endeavor for the developed and developing world alike.

III. LITERATURE REVIEW

Expected utility theory points to a limited number of factors that influence insurance take-up.[10] Assuming full information, rational actors will purchase insurance if the expected utility from having insurance exceeds the expected utility from weathering risk without it. Typically, the more risk-averse the individual, the more likely he will be to take up insurance. Yet, such conventional economic models alone do not explain the insurance underutilization found in practice. Microinsurance programs and government subsidies in developing countries have attempted to pool risk or reduce premiums, but take-up remains low. This indicates that many of the assumptions underpinning the traditional model may not hold true, and additional factors, unaccounted for in traditional models, may be critical drivers of a lack of take-up.

The first component of the classical model that may not hold in reality is the assumption that insurance purchasers are fully informed of insurance benefits. Giné et al show that lack of comprehension of insurance products may serve as the primary reason for non-adoption, followed closely by credit constraints.[11] In fact, this lack of comprehension was so strong that, contrary to what expected utility theory would predict, those who were more risk-averse were found to be less likely to take up insurance. This led the authors to conjecture that people were averse to the risk of the unfamiliar insurance offering, likely due to a poor understanding of the terms. The hypothesis that comprehension is key to take-up is furthered by a study conducted in India's Gujarat state, which showed that a financial education module to improve understanding on the value of insurance significantly increased adoption.[12]

---

[7] *LIMRA's Trends in Life Insurance Ownership Study.*

[8] *LIMRA's Trends in Life Insurance Ownership Study.*

[9] LIMRA *Life Insurance IQ Study 2012.*

[10] Raiffa, Howard. *Decision analysis: introductory lectures on choices under uncertainty.* (New York: Random House, 1968).

[11] Giné, Xavier, Robert Townsend, and James Vickery. "Patterns of rainfall insurance participation in rural India." *The World Bank Economic Review* 22.3 (2008): 539-566.

[12] Gaurav, Sarthak, Shawn Cole, and Jeremy Tobacman. "Marketing complex financial products in emerging markets: Evidence from rainfall insurance in India." *Journal of Marketing Research* 48.SPL (2011): S150-S162.

Additional assumptions in the classical model are unrepresentative of the empirical evidence as to how insurance markets operate. For instance, basis risk when crop insurance pays out solely on the weather, premiums well above actuarial value, and incorrectly calculated probabilities play significant roles in influencing the availability, desirability, and affordability of products in the market.

Behavioral economics offers a number of additional explanations for low insurance take-up. Behavioral economics posits that social norms play a powerful role in decision-making. In the context of Kenya, norms around insurance are informed by the Harambee tradition of community self-help that forms the country's official motto.[13] Harambee literally translates from Swahili to mean "all pull together" as a means to build and maintain strong social ties and community. The literature available on communal norms and insurance remains scant.[14] Similar studies in the field of entrepreneurship point to the effects of communal norms in a bi-directional manner: supportive as an informal safety against shocks and hardships, but discouraging profit maximization as those gains will be shared. In insurance, Harambee norms and ties offer potential explanations for the low take-up of formal insurance contracts, given the fallback of these informal arrangements.[15] Harambee has the additional effect of fostering a norm against buying insurance. If a person has very few friends in the community who purchase insurance, it is very unlikely that s/he would choose to enter a contract, lest s/he be the one on whom others ride freely. Conversely, where there is a norm around purchasing insurance, people are far more likely to do so.

Another prime behavioral driver of insurance take-up is trust. Dercon et al tie this to the theory-upending negative correlation between risk aversion and insurance take-up. However, trust concerns provide an explanation: an insurer's lack of credibility can make the prospect of a forthcoming payout seem risky, making the product unappealing to the risk averse.[16] Cai et al have shown that lack of trust in government-sponsored services was a bottleneck to take-up in southwest China when insuring for sows.[17] Elsewhere, Cole et al (2013) find evidence in index insurance that non-price factors like lack of trust, poor financial literary, and salience of the insurance offering were likely impeding take-up.[18] Trust can also be a function of social norms: familiarity with the insurance provider – either from its presence in the community or via recommendations from others – was a significant predictor of insurance purchases.[19]

---

[13] In Ethiopia, informal insurance is prevalent through iddirs, indigenous mutual help associations offering insurance payouts for funerals, based largely on high-trust communal self-enforcement.

[14] See Chui, A. and Chuck Kowk. 2008. "National Culture and Life Insurance Consumption." *Journal of International Business Studies* (2008) 39, 88–101

[15] Alderman, Harold and Trina Haque, 2007. "Insurance against covariate shocks: the role of index-based insurance in social protection of low-income countries of Africa," World Bank Publications, The World Bank, 6736

[16] Dercon, Stefan, Jan Willem Gunning, and Andrew Zeitlin. "The demand for insurance under limited credibility: Evidence from Kenya." *International Development Conference, DIAL.* 2011.

[17] Cai, Hongbin, et al. *Microinsurance, trust and economic development: Evidence from a randomized natural field experiment.* No. w15396. National Bureau of Economic Research, 2009.

[18] Cole, Shawn, Xavier Giné, Jeremy Tobacman, Robert Townsend, Petia Topalova, and James Vickery. "Barriers to household risk management: evidence from India." *American Economic Journal. Applied Economics* 5, no. 1 (2013): 104.

[19] Giné, Xavier, Robert Townsend, and James Vickery. "Patterns of rainfall insurance participation in rural India." *The World Bank Economic Review* 22.3 (2008): 539-566.

Others have examined insurance take-up through the frame of Prospect Theory, which posits that, contrary to expected utility theory, people adopt risk-seeking attitudes when facing losses and risk-averse attitudes when facing gains.[20] Ito and Kono find that the tendency to seek risk in the loss domain may be a partial explanation for low insurance take-up.[21]

The International Association of Insurance Supervisors suggests that the perception of insurance as a 'sunk expenses' dissuades people from purchasing insurance.[22] In layman's terms, this is tantamount to the attitude: 'I paid for it, now I should get to use it.' This hypothesis is related to the concept of zero aversion explored in this paper – paying for insurance that is never used is inherently unattractive. Thus, despite the reduction of risk and smoothing of consumption having inherent utility, people place relatively little value on these benefits in the face of a perception that for the purchase of insurance, on the vast majority of occasions they will receive zero.

While the demand side of insurance has been much explored through the behavioral lens, the authors find two gaps in the literature. While mistrust has been identified as a factor that could affect take-up, we developed and present a means to disentangle distrust from time preference and risk aversion. Second, we posit that zero aversion, a heretofore undocumented phenomenon, has the potential to be a behavioral driver.

IV. METHODOLOGY

Structure

To better understand low insurance take up rates in developing countries, this paper tests for distrust in institutions and zero aversion through three randomized experiments:

1. Time Preference and Distrust
2. Zero Aversion – Applications in the Insurance Market
3. Zero Aversion – Lottery and Certainty Equivalents

The first experiment is designed to elicit time preferences for a menu of institutions, with differences due to trust that a future payment would be received. The second and third experiments are aimed at testing if participants exhibit zero-aversion in applied and abstract contexts. The authors partnered with the Busara Center for Behavioral Economics in Nairobi, Kenya to conduct the experiments referenced in this paper. Swahili speaking field officers with vast experience conducting field and lab experiments implemented all the experiments in Kenya on behalf of the authors.

---

[20] Kahneman, Daniel, and Amos Tversky. "Prospect theory: An analysis of decision under risk." *Econometrica: Journal of the Econometric Society* (1979): 263-291.

[21] Ito, Seiro, and Hisaki Kono. "Why Is the Take-Up Of Microinsurance So Low? Evidence from a Health Insurance Scheme in India." *The Developing Economies* 48.1 (2010): 74-101.

[22] International Association of Insurance Supervisors (IAIS). "Application Paper on Regulation and Supervision supporting Inclusive Insurance Markets." October 2012.

Subject Population

The experiments were conducted in Kibera, the largest informal settlement in East Africa. Subjects for the three experiments were recruited from Busara's subject pool. Busara's subject pool includes roughly 5,000 individuals who are recruited periodically from informal settlements around Nairobi and the University of Nairobi.

The experiments in this study involved 196 low-income Kibera residents, some of them illiterate, recruited by phone to attend a community hall in Kibera. Upon arrival, field officers explained the nature of the experiments, asked subjects to sign a consent form, and delivered the questions required by three experiments in a paper-based format. The order in which the three experiments were asked was randomized to prevent the questions from one experiment from biasing the answers to other. Each participant was engaged for approximately 20 minutes.

At the end of the exercise, field officers paid participants a participant fee of 300 KSH (US$3.33 at the time of the experiment) and any additional payouts they accumulated throughout the experiment; most payments were delivered through M-Pesa, a trusted and popular money transfer system in Kibera. Some experiments required cash payments, as described below.

Experiment Design

This section describes in detail each experiment, including the hypotheses tested, a description of the literature motivating the research design, and the methodology used.

Experiment 1: Time Preferences & Distrust in Institutions

This first experiment aimed to measure the relative trust of subjects in the following institutions:
1- Busara, serving as a benchmark
2- Pan Africa insurance company, representing a large player in the insurance market
3- Equity Bank, representing the banking sector
4- The district officer, representing the government

By comparing participants' preference for delaying payment with various institutions, the authors can infer how the source of payment affects participants' risk-appetite and general decisions regarding earnings. At the beginning of the experiment, participants were asked how reliable/trustworthy they believe each of these institutions to be. The authors' prior was that participants' previous favorable experience with Busara honoring payments and following through with extensive field tests should have built a high level of trust in the organization. If Busara is the most trusted institution in the sample, then Busara can serve as a benchmark to measure the relative level of trust in other organizations. This experiment explored two hypotheses:

Time Preferences & Distrust in Institutions Hypotheses
H₁: Kibera residents are more likely to choose a later, larger payment when the payer is one in which they confer relatively high trust.
H₂: Despite issues of risk and trust, Kibera residents exhibit a bias towards earlier payments and will consistently choose the earlier, smaller payment regardless of payer.

In order to test for relative distrust in institutions, participants received a series of questions regarding their preference for a series of binary choices between smaller earlier payments and larger later payments from various institutions. Assuming that, on average, individuals are risk averse, the authors used the Multiple Price List (MPL) method to measure time preferences.

Experiment Design: Time Preferences & Distrust

Participants were asked to make a series of binary choices between smaller earlier payments and larger later payments. These so called Multiple Price Lists (MPL) are organized in order of increasing gross interest rate[23]. The price lists were presented in the following format:

Table 1: Multiple Price Lists for Experiment 1
Which payment from [insert name of payer] would you prefer?

This payment today	OR	This payment in two weeks
KSH 180		KSH 200
KSH 160		KSH 200
KSH 140		KSH 200
KSH 120		KSH 200
KSH 100		KSH 200
KSH 80		KSH 200

Each question implies a different discount rate, in increasing order. The point in the price list where subjects switch from earlier payments to later payments provides information about the person's discount factor. The table below lists the implied discount rate per question.

Table 2: Implied Discount Rate per MPL Question

[23] Maribeth Coller and Melonie B. Williams. Eliciting individual discount rater. Experimental Economics, 2:107–127, 1999 and Glenn W. Harrison, Morten I. Lau, and Melonie B. Williams. Estimating individual discount rates in Denmark: A field experiment. American Economic Review, 92(5):1606– 1617, 2002.

Payoffs expressed in Kenyan shillings (KSH)

Payment Today [X(t)]	Payment in Two Weeks [X(t+k)]	Implied Discount Rate
180	200	11%
160	200	25%
140	200	43%
120	200	67%
100	200	100%
80	200	150%

After making their MPL decisions, participants were asked to rank the four institutions in the order in which they trusted them. This gauged relative measures of trust between the four institutions from "Trust Most", "Trust Second", "Trust Third" and "Trust Least".

Organization of Participants: Participants were told that they had been selected to receive an immediate payment or a promised future payment via M-Pesa from one of the following institutions: Busara, the Pan Africa Insurance Company, Equity Bank, and the government. By phrasing the question vaguely, the authors were able to ask non-hypothetical questions to participants without engaging in deception. Additionally, using Busara as the payment source eliminated any potential transaction cost involved in collecting a payment from either institution. However, the authors recognize the risk that, given the high trust conferred on M-Pesa as a reliable payment vehicle, this approach would increase participants' trust and make some people more likely to delay the payment. Although this effect could potentially attenuate relative differences in trust, the authors preferred this conservative approach. To mitigate this risk, field officers clearly explained to participants that a representative from each organization must remember to make the future payment through M-Pesa without a further reminder, emphasizing the human element.

Participants answered one MPL per institution; this means that participants answered 6 questions per institution, or a total of 24 questions. While the questions in a single MPL were be asked in order, the order in which the institutions were presented will be randomized to avoid systematic bias from a particular sequence of institutions.

Payment: Participants were explicitly told that they would only be paid for only one choice out of the 24 questions but they did not know at the time they are making the decisions which choice would be paid out. Participants were told that at the end of the experiment the field officer would randomly select one institution and payment amount based on the participant's responses. This was done to guarantee that the participant was thinking critically about each option while lowering experiment costs. After recording a response for all 24 questions and before randomly selecting a choice for payment, participants were offered the option to get a payment from Busara right now. All participants chose this option.

Experiment 2: Zero Aversion – Insurance Take-up

The second and third experiments aimed to elicit participants' level of zero aversion through two different approaches. In field pilots (results not reported), when faced with a choice between a small certain payment or a bet with higher expected value but a downside of zero, Kibera residents would almost invariably choose the small but certain payment. Conversely, when given the choice between a small certain payment and a bet involving a non-zero downside, residents were more likely to take the bet (even where the expected value of the bet was lower than the certain sum). The prevalence of 'zero aversion' may be a significant determinant of economic decision-making.

This first experiment tested for zero aversion in an applied context, insurance against rainfall. This payoff event was chosen because of the inherent randomness of weather, and because rain could potentially cause property damage and reduce the economic opportunities of Kibera residents.

The specific goal was to study whether participants are zero-averse when making insurance decisions. To accomplish this, the authors randomized subjects so that they were offered two different contracts to insure against rainfall.[24] Treatment 2 offered a rebate in case of no rain in exchange for an additional premium. The ultimate payments from the two policies were identical, but the rebate contract was dominated given positive time preference and trust concerns (future payoffs might not be made). The hypotheses tested though this experiment are:

Zero Aversion – Insurance Take-up Hypotheses
H₁: A less actuarially fair insurance contract will be at least as desirable as a more actuarially fair contract if it offers a rebate in the event of no adverse event.
H₂: Kibera residents will demand a very low level of insurance.

Experiment Design: Zero Aversion – Insurance Take-up

Organization of Participants: Participants were randomly assigned to two treatment groups. Both groups were offered insurance against rainfall but the contracts were structured differently: one included a rebate for part of the initial premium payment in case the adverse event (in this case rainfall) did not occur and the other lacked the rebate component. The insurance offering a rebate was more expensive than the insurance without a rebate. As a control, all participants were asked at the beginning of the experiment if they had ever purchased insurance.

Treatment 1 – Plan A: Lower Premium, No Rebate

The insurance contract in Treatment 1 emulates a typical insurance contract. Concretely, participants were asked if they wanted to purchase insurance against the chance that it would rain four days after the experiment for a premium of 100 KSH. In the event that it rained on the pre-determined day, participants received 200 KSH. Otherwise, they received 0 KSH. Then, the field officers recorded whether each participant had decided to enter into the insurance contact.

---

[24] The probability of rainfall on a specific day during this season in Nairobi is 43-48% according to *The Weather Channel*.

Treatment 2 – Plan B: Higher Premium, Rebate

The insurance contract in Treatment 2 includes an additional insurance premium of 25 KSH in the initial price, but participants get 25 KSH if the event they are insuring against does not materialize. This way they are guaranteed a non-zero outcome. Concretely, participants were given the opportunity to purchase insurance against the chance that it would rain four days after the experiment for a premium of 125 KSH. In the event that it rained on the pre-determined day, participants received 225 KSH. Otherwise, they received 25 KSH. Thus, Treatment 2 yielded the same ultimate net payoffs, assuming that the payer was trustworthy. Field officers recorded whether each participant had decided to enter into the insurance contact.

From the perspective of participants, payouts depend on the likelihood of rain and Busara's trustworthiness. Table X below summarizes the payouts for participants given that it rains or nor on the pre-determined day and that Busara, the organization offering insurance, carries through with its promise of delivering payment in the future.

Table 3: Comparison of Three Possible Insurance Arrangements
Payoffs expressed as [Immediate, Net After Four Days]

Outcome	Busara's Trustworthiness	No Insurance	Plan A Insurance	Plan B Insurance
No rain	Trustworthy	[0,0]	[-100, -100]	[-125, -100]
	Not trustworthy	[0,0]	[-100, -100]	[-125, -125]
Rain	Trustworthy	[0,0]	[-100, 100]	[-125, 100]
	Not trustworthy	[0,0]	[-100, -100]	[-125, -125]

Payment: In both plans, participants had to pay the insurance premium out of pocket with the payments received from the prior experiments carried out during the day. This was to emulate real insurance contracts, without having the subjects walk away having lost money. Participants were told that they would receive an automatic payment through M-Pesa one week after the experiment according to the contract they had chosen if it had rained on the pre-determined day. The payment was conducted via M-Pesa to minimize the transaction costs of taking up the insurance contract.

Analysis: Plan A was definitively more attractive for a rational participant, since it incurred both a lesser payment up front and a smaller loss of money given nonpayment in the future. Particularly given the strong trust concerns found in Experiment 1, possibly intermixed with strong pure time preference,[25] we would expect a much larger percentage of Treatment 1 subjects to take the insurance.

Plan B, however, had a potential purely behavioral advantage: it paid off 25 KSH absent rain, whereas Plan A paid 0. Therefore, if even roughly as many subjects offered Plan B took the insurance as those offered Plan A, we would conclude that there was strong zero aversion.

---

[25] Thus, even with Busara, the most trusted institution, only 61% of subjects chose to receive 200 KSH in two weeks as opposed to 140 KSH immediately.

Experiment 3: Zero Aversion – Lottery and Certainty Equivalents

This second experiment on zero aversion tested the concept in a more abstract context. The authors asked participants for their certainty equivalents for two lottery tickets with different payouts: one ticket included a zero-downside outcome and the other guaranteed a minimum payout of 10 KSH. This experiment tested the following two hypotheses:

Zero Aversion – Lottery Hypotheses
H₁: Participants are more willing to accept a risk if offered a lottery ticket with a non-zero downside.
H₂: Participants exhibit risk-seeking behavior when guaranteed a downside above zero.

Experiment Design: Zero Aversion -- Lottery

Organization of Participants: All participants were asked for their certainty equivalent to both lottery tickets, but they received only one question at a time. To avoid biasing participants' answers, the order in which the questions were asked was randomized. This was accomplished by randomly assigning participants to two treatment groups: group 1 answered the question with a non-zero downside first, while treatment 2 answered the question with a potential zero downside first.

For both questions, participants were told that that their lottery winnings depended on the flip of a coin. The payoffs for each group were as follows:

Zero Downside Lottery	Participants receive 0 KSH for heads and 75 KSH for tails.
Non-Zero Downside Lottery	Participants receive 10 KSH for heads and 85 KSH for tails.

By receiving the certainty equivalent, x, from each participant, or the minimum amount of payoff that the participant would need to receive to be indifferent between that payoff or the respective coin toss, the participant's risk aversion could be imputed. Then a non-parametric two-sample rank-sum test could be used to calculate whether the two lotteries had subjects who were equivalently risk averse, against the alternative hypothesis that one lottery had subjects more risk-averse than the other. It was intended to assess results using both a constant–risk-aversion and constant-relative-risk- aversion utility function.

During field tests, authors recognized that subjects often claimed a certainty equivalent above the expected value of the lottery (37.5 for the zero downside question and 47.5 KSH for the non-zero downside question). While this would indicate risk-seeking behavior, it became clear that subjects had a hard time understanding the concept of a certainty equivalent. There was also the possibility that subjects thought that they were in some sort of bargaining situation. To mitigate these risks, the authors added an additional component to the research design. Before the start of the experiment, field officers placed an envelope at the front of the room with an amount equal to the certainty equivalent for each question inside. Participants could not assess the amount of money inside the envelope.

Prior to flipping the coin, field officers informed participants that a 'randomly chosen amount of money' had been placed in the envelope at the front of the room and offered them the opportunity to exchange the lottery ticket for the amount in the envelope. Then, participants were asked, "What is the smallest amount of money that you would accept in exchange for your lottery ticket?" If the amount indicated by the participant was less than or equal to the amount in the envelope, they received the envelope and did not play the lottery. If the amount indicated was above the value in the envelope, participants played the lottery. They could also choose to play the lottery directly. This procedure is well known to be incentive compatible.

Once participants in each treatment group had stated their certainty equivalent or played the lottery for the first question, field officers repeated the exercise using the question they had not yet asked. Results below only include first answers, due to possible influences on the second answer from the first.

Payment: Given the need to use an envelope with cash for this experiment, the payouts for this portion of the experiment were delivered in cash. Participants were given the payouts for both questions.

Analysis: In practice, the results were so unreliable that it was clear that most subjects did not understand some element of the certainty equivalent and envelope exchange provisions. Thus, we proceeded no further with the analysis.

V. DISCUSSION & RESULTS: TIME PREFERENCES & DISTRUST IN INSTITUTIONS

Experiment 1 – Time Preferences & Distrust in Institutions

This experiment found that significantly more people delayed payments with more trusted payers, suggesting that decisions around investments are influenced not only by time preference, but also by perceptions of the paying institution. Specifically, this experiment found that:

- Significantly more people delayed with the "most trusted" Busara than Equity Bank or the Insurance Company until the choice is 80 KSH today vs. 200 KSH in two weeks. This suggests that even strong institutions with good public records will have future payments discounted more than organizations that have both good records and are familiar. This disparity was also true between Busara and the Insurance Company.
- Significantly more people delayed with Busara than the "least trusted" District Officer regardless of the premium given for waiting.
- There was no statistically significant difference in the number of people delaying payments between Equity Bank and the Insurance Company.
- Significantly more people delay with Insurance Company than District Officer except when the choice was 180 KSH today vs. 200 KSH in two weeks.

- When controlling for trust rankings, participants were significantly more likely to delay payments with institutions they professed to trust the most than they would with others. Similarly, participants were significantly less likely to delay payments with institutions they professed to trust the least than they would with others.

Table 4: Delayed Higher Payment Choices in Experiment 1
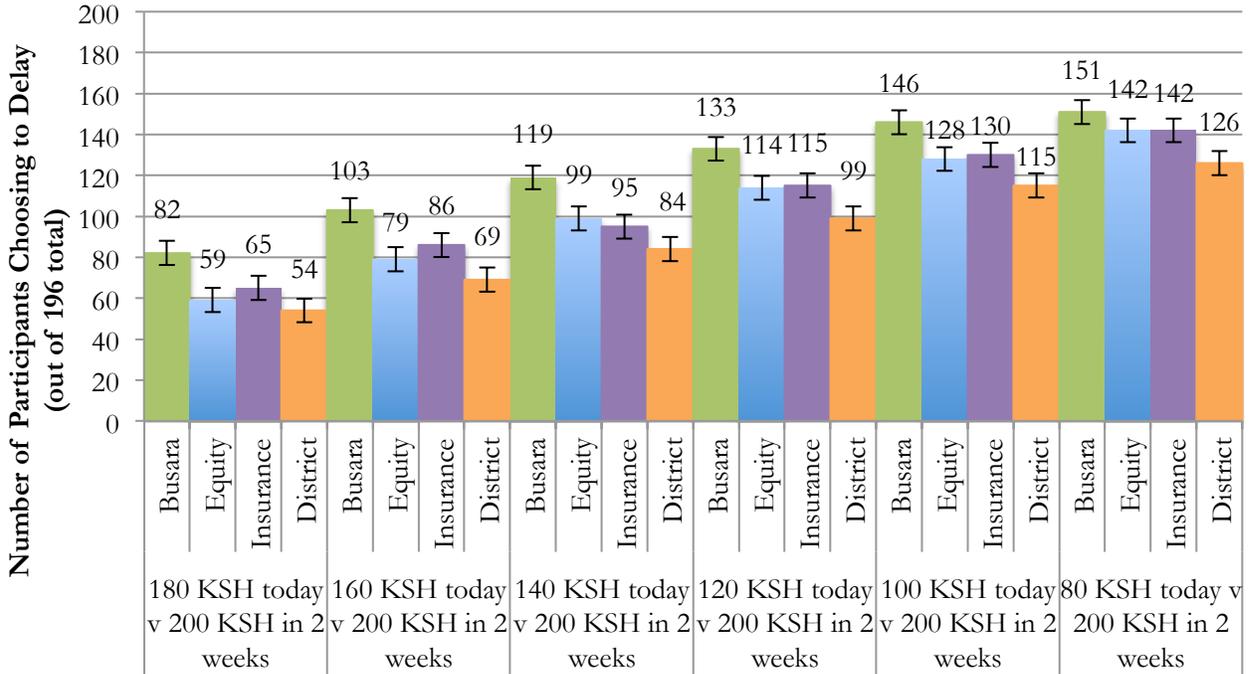
Even with highly trusted Busara, only half the participants would exchange a present payment for one promised in two weeks for a 25% increase in payoff, and only three fifths would wait for a 43% increase. For other institutions, far fewer people took the future payment.

This extreme present bias is a critical insight for those offering insurance, because insurance contracts offer nothing like this return with regard to the time value of money, even if assuming only a modest discount rate after the big initial bump. Thus, if people understood risk perfectly, for reasonable risks and reasonable risk aversion, and exhibited these levels of time preference, with distrust as a strong motivating factor, it would seem reasonable not to insure.

Analysis also showed that the order in which participants were asked about each institution mattered. For example, the average number of delays with Busara when encountering Busara first (3.29) is lower than the average number of delays with Busara when encountering it last (4.21) after having answered questions on other institutions (p=0.07). This suggests that people may be more likely to delay payments with an institution if having encountered other "less trusted" institutions first. Priming people to think in relative terms may therefore be consequential. This trend is neither significant nor monotonic for Equity Bank. The difference in average delays for the insurance company among those who encountered it first (3.65) versus those who encountered it as the fourth institution (2.43) is significant (*p=0.01*), though this decrease is not monotonic across the entire sequence.

While it may be expected that people would become more in favor of immediate payments for a less trusted institution after seeing "more trusted" institutions first, this declining willingness to delay is not seen for the district officer. The delays are not monotonic across the district officer sequence. The difference between people who encounter the district officer as the first institution (2.06) versus those who encounter it as the third (3.32) is significant (p = 0.01), though not versus those who encounter it as the last institution (2.68).

Though we made no attempt to connect results on ordering of institutions to insurance itself, these results suggest that when offering an insurance product, or indeed any product with a delayed payment, the consideration and timing of alternative offers may matter.

Average Trust Score: To make revealed trust rankings directly comparable across the subject pool, a score was coded for each individual: the individual was allotted a 3 for an institution if he/she selected "Trust Most", 2 if "Trust Second", 1 if "Trust Third", and 0 if "Trust Least". The difference between the mean scores is statistically significant at the 1% level between each institution with the exception of between the insurance company and district officer (this difference in means was not statistically significant, though people professed greater trust in the insurance company).

Table 5: Average Trust Scores for Each Institution in Experiment 1

	Observations	Mean Trust Score	Std. Dev.	Min	Max
Busara	196	2.66	.61	1	3
Equity	196	1.84	.84	0	3
Insurance	196	0.82	.81	0	3
District	196	0.68	.81	0	3

Average Discount Rates: Each individual's institution-specific discount rate was calculated following Table 2.[26] All institutional average discount rates were statistically significantly different from each other at the 1% level except for Equity vs. District (p = 0.05) and Equity vs. Insurance (p = 0.99)

Table 6: Average Discount Rates for Each Institution in Experiment 1

	Observations*	Mean Discount Rate	Std. Dev.	Min	Max
Busara	195	60.6%	0.58	11%	151%
Equity	190	74.4%	0.60	11%	151%
District	193	84.3%	0.62	11%	151%
Insurance	189	73.6%	0.60	11%	151%

Some observations do not tally to the full 196 in the sample because a handful of participants gave somewhat nonsensical answers, like delaying payment on 180 vs. 200 but not delaying 140 vs. 200.

---

[26] If someone delayed all payments, he would have an implied discount rate of <11%. However, we do not have any information on payouts for beyond 180ksh on the downside. To be conservative in estimating average discount rates, we coded anyone delaying all payments as having a discount rate of 11%. Similarly, not delaying any payments implies a discount rate higher than 150%, though as we don't have any information on payments beyond 80ksh on the downside, anyone who delayed all payments was coded to have a discount rate of 151%.

VI. DISCUSSION AND RESULTS: ZERO AVERSION

Experiment 2 – Zero Aversion: Insurance Take-up

The sample population reported a high level of knowledge of insurance, though very low past take-up (Table 7). While 91.3 percent of participants stated they knew what insurance is,[27] only 15.9 percent had purchased insurance previously. A resounding 82.6% of those who were aware of insurance offerings had never bought insurance.

Table 7: Sample Exposure to and Previous Purchasing of Insurance

	Number	Percentage
Doesn't Know What Insurance Is	17	8.7
Knows What Insurance Is	178	91.3
Has Never Bought Insurance	164	84.1
Has Bought Insurance Before	31	15.9
Total	195	100.0

When offered an insurance plan against rainfall in Experiment 2, out of the overall sample 64.6 percent took up insurance. The offerings of both treatment groups thereby far exceeded the share of the sample that had taken up insurance in the past.

As described above, Plan A on objective grounds is notably superior to Plan B, and should have had a higher take-up rate. In fact, Plan B's take-up rate was slightly (though far from significantly) higher. The authors are presently developing a method to predict the expected difference in take-up rates utilizing the results from Experiment 1. That can serve as a benchmark to judge the strength of zero aversion, the behavioral element that favors Plan B.

Table 8: Experiment 2 - Zero Aversion Insurance Take-Up Results

	Lower Premium, No Rebate Insurance Plan A	Higher Premium, Rebate Insurance Plan B	Total
Takes Up Insurance	60 (63.8%)	66 (65.4%)	126
Does Not Take Up Insurance	34	35	69
Total	94	101	195

---

[27] We did not test their knowledge of insurance, nor did we ask about alternative financial instruments, such as savings accounts. Such inquiries would have revealed much more as to participants' true understanding of insurance.

Apart from zero aversion, it is intriguing that so many subjects in either treatment took up insurance, particularly since it was slightly actuarially unfavorable, and strongly unfavorable given the trust/discounting concerns assessed in Experiment 1. As opposed to ordinary insurance, the experiment dealt with house money to be paid from the most trusted source (Busara via M-Pesa). It is also possible that subjects significantly overestimated the likelihood of rain, perhaps if rain is salient and brought the availability heuristic into play. Finally, this could have merely represented risk preferring behavior, as is consistent with findings for many subjects in our pilot studies, and in Experiment 3 (accepting its results). Rainfall outcomes may not be inherently random, where forecasting and seasonal patterns may allow for non-random prognostications to be possible four days in advance. While rainfall is only 43-48 percent likely in December in Nairobi, the daily chance of rainfall varies; experience in Kibera indicates rain frequently falls many days in succession. The salience of whether or not it had just rained on the day of or before the survey also present non-random elements of availability bias. Asking each respondent the chance he thinks it will rain in four days – unfortunately not asked -- may help isolate these information asymmetries.

Experiment 3 – Zero Aversion: Lottery

The first result of the zero aversion lottery stresses the difficulty faced by the sample population in thinking probabilistically. For the zero downside lottery (equal chance of 0 and 75 KSH), 28.2 percent of respondents gave certainty equivalents above 75, the top possible payoff. For the non-zero downside lottery (equal chance of 10 and 85 KSH), 45.6% answered above 85, the top positive value. For both lotteries, another roughly ten percent of respondents answered with either the bottom or top value. Moreover, in both lotteries, individuals providing interior answers were roughly two and a half times as likely to be risk seeking as risk averse. Such answers, whatever their source, would hardly make insurance purchases desirable.

The close parallels of results outside of the parameters across lotteries highlights the broader lack of understanding of certainty equivalents and the expected value of each lottery.[28] The findings support Giné et al (2008) in the broader lack of comprehension of the probabilistic trade-offs characteristic of the larger insurance field. At the extreme, responses received of 500 KSH or 1,000 KSH reflect less on risk-taking behavior than basic miscomprehension of the terms and possible outcomes in an attempt to "game" the experiment. The results affirm that many of our subjects did not respond with a combination of comprehension and rationality when evaluating lotteries. It is conceivably suggestive that that only 28.2% expressed a certainty equivalent above the top payoff with the zero

---

[28] The lack of comprehension to some extent is the result of the complexity of the question asked. The inclusion of the randomized envelope value served as an effective methodological instrument to incentivize respondents to minimize their certainty equivalent and to move the experiment from the hypothetical to real values, though proved ineffective in actually motivating true risk-averse values in practice. Future experiments may examine whether longer scripts serve to complicate probabilistic thinking and choice to result in a smaller range of resulting values, as round figures predominated (ex. 50, 100) among respondents, regardless of implications of risk choice.

downside lottery, whereas 45.6% did so for the non-zero downside lottery. This is consistent with zero aversion, albeit within the context of severe misunderstanding. We conjecture that the overwhelmingly abstract nature of the questions involving certainty equivalents and envelope exchange fostered misunderstanding.

Table 9: Experiment 3 – Relative Risk Aversion & Understanding the Question

	Below Bottom Value	At Bottom Value	Interior but Risk Averting	Interior but Risk Taking	At Top Value	Above Top Value	Obs
Zero Downside Lottery (0/75 KSH)	0 (0%)	1 (1.4%)	12 (16.9%)	32 (45.1%)	6 (8.5%)	20 (28.2%)	71
Non-Zero Downside Lottery (10/85 KSH)	1 (1.8%)	3 (5.3%)	7 (12.3%)	17 (29.8%)	3 (5.3%)	26 (45.6%)	57

Our general conclusion is that our subjects had a very poor comprehension of this experiment, and we draw no inferences from its results.

VII. CONCLUSION

Participants substantially distrusted institutions that might be involved in offering insurance arrangements, with large percentages preferring immediate payment as opposed to a significantly higher payment two weeks hence. Given that insurance requires an upfront premium in return for a contingent payment later, such preferences would strongly discourage insurance purchases.

Interestingly, more than three fifths of participants did take up an insurance policy with Busara with payment through M-Pesa. This insurance required an immediate premium payment up front (albeit using house money) in exchange for a slightly actuarially unfair payment contingent on rain four days hence. That subjects chose insurance at all could reflect misestimating of the rain probability (say because rain is more salient than non-rain) or risk preferring behavior.

The insurance take-up experiment had two alternative forms. The less attractive version, Plan B, charged a higher up-front premium, but provided a payment in both the rain and non-rain states that equaled the premium difference. Plan B is inferior both in terms of time preference and higher risk of loss given untrustworthy behavior. In fact, Plan B had slightly higher take-up, as would be predicted if zero aversion plays a prominent role.

The third experiment presented in this paper showed that participants had little ability to think clearly about the certainty equivalents. One clear implication of the three studies is that it would be misguided to model insurance purchases using traditional decision theory models, where trust is assumed and a zero payoff gets no special attention.

That said, the first two experiments do have significant implications when attempting to encourage poor individuals in the developing world to purchase insurance. First, it is extremely important to have a well trusted institution offer the insurance. These individuals require significant returns if they are to give up present monies to secure greater payments in the future. What appears to be severe present bias may really be due to distrust in the future paying institution. Second, the presence of zero aversion would indicate that subjects should receive some payment – in effect a rebate – even if the insured against event does not occur.

Do the phenomena of trust and zero aversion apply in the developed world as well? The answer to the first is likely yes. During the 2008 meltdown, AIG – one of the world's most prominent insurance companies – would have gone bankrupt had it not been for a bailout that ultimately reached $182.3 billion. MetLife was recently identified by the Financial Stability Oversight Council as "systemically important," implying that a run on the company could threaten the financial system. In 1999, MetLife had paid policyholders $1.7 billion to compensate them for abusive practices associated with promises of "vanishing premiums," which in fact never vanished. Many other insurance companies also made major payments. And there is always the question as to whether insurance companies can cover claims in cases of a widespread disaster from an aggregate risk, such as a major terrorist event or a massive natural disaster.

Future experiments will test for the presence and power of zero aversion in both the developed and developing world. It is important to note, however, that many insurance policies do pay dividends to policy holders quite apart from any insured against events. We also note the corporate dividend puzzle, which is prominent in finance: companies pay dividends although using the same monies to repurchase shares would be more favorable tax-wise for investors. This practice could reflect companies anticipating investors being zero averse.

The overriding conclusion from this research is that poor individuals in developing nations make insurance decisions that depart substantially from what prescriptive decision theory would advise. Those designing insurance programs should take account of the behavioral propensities that may be driving these individuals' choices.