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Saving the Lemmings

Testing and analyzing social norms from a behavioral economics viewpoint

A lemmingek megmentése

A társadalmi normák viselkedés-közgazdaságtani elemzése és tesztelése

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“Humans are not exactly lemmings, but they are easily influenced by the statements and deeds of others.”

(Richard Thaler & Cass Sunstein)

Introduction

Why do college students drink alcohol and do drugs? How was it possible for the dysfunctional socialist regime to survive for so long? Why do people believe the urban legend about lemmings committing mass suicide by jumping off a cliff? And most importantly: what does economics have to say about all this?

According to traditional economic theory, the rational, utility maximizing individual – unless finding it personally beneficial – does not care about what others think or do. In real life, however, it is easy to find instances when people have huge effects on each other, and many a time we simply follow the herd. The Harry Potter craze and the thriving fashion industry are only two of the numerous spectacular and amusing examples; however, it should never be forgotten that such terrible occurrences as the rise of the Nazi Party was the result of some very similar processes. Even though psychologists and sociologists have long analyzed the power of norms (eg. Sherif, 1937), economists have only recently discovered this effective influencing tool.

This paper explores the influencing power of norms, and how we might use them in order to generate positive economic and social changes. The inspiration came primarily from economist Richard Thaler’s and legal scholar Cass Sunstein’s best-selling book, *Nudge* (2009), and their theory of libertarian paternalism: policies that nudge people toward better decisions without eliminating their freedom of choice. In the chapter *Following the Herd*, they argue that among the most influential nudges are social norms. However, exactly because of the great impact they might make, one has to be careful with norms – it is just as easy to create a positive spiral, as it is to start a vicious circle. In order to understand how influencing might work in this scenario, let us consider the following train of thought.

1. One is influenced by others’ behavior, which most of the times means that
2. one desires to conform to the majority. This is either because one thinks many people cannot be wrong, or because one feels pressured by others.

3. However, oftentimes, people misperceive others' behavior. In social psychology, the term "pluralistic ignorance" means that people falsely believe that others' actions are guided by different motivations than their own.
4. Therefore, they conform to the misunderstood norm – which, if prevails for long enough, will become the norm indeed.
5. Consequently, if we correct the misperceptions, we can prevent inadequate conformity.

The correction of misperceived norms is the core of H. Wesley Perkins' and Alan Berkowitz's Social Norms Marketing, also called as the Social Norms Approach (Berkowitz, 2005). They propose that in cases where people overestimate the prevalence of an anti-social behavior – such as binge drinking and homophobia – the simple marketing of the true, smaller prevalence could change behavior for the better.

In this paper I will present an experiment in which I explored the effectiveness of the social norms method with respect to drug abuse at Trinity College. Trinity College (Hartford, CT) is a highly selective liberal arts college in the New-England area, where students are under considerable academic pressure. Maybe as a consequence, prescription stimulants, such as ADHD medications are commonly abused among students in order to be more productive. Even though the prevalence of the abuse is already high, I hypothesize that students systematically overestimate the popularity of such drugs, and thus they are inclined to take it even if normally they would not. I also predict that such misperceptions are stronger in a small, tightly knit community, such as a fraternity, where the urge to conform is stronger.¹ After exploring these misperceptions, I will examine the effects of an intervention, which was designed to correct the misperceptions.

¹ Fraternities (frats) and sororities are social organizations for undergraduate students in American colleges, in which members spend considerable time together: they often live, dine, study and party in a group. Because the names of these houses usually consist of Greek letters, they are often called 'Greek letter organizations' or 'Greek houses'.

This essay has been divided into two main chapters. First, in the Literature Review I will introduce the most important theories of and findings about social norms, and then in the Research section I will present my experiment. The literature review starts by explaining how social norms are used in economics. Then I differentiate between two types, injunctive and descriptive social norms based on Cialdini (2007) and Bicchieri (2006). Next, I present psychological reasons and game-theoretic explanations of why people want to conform to norms, and I will show that these reasons are different depending on whether it is an injunctive or a descriptive norm in question. Afterwards, I introduce two more reasons for conformity: information and peer pressure. Then, I explain how pluralistic ignorance and the availability heuristic contribute to the formation of misperceptions about norms, and I show how Social Norm Marketing might alleviate the problem by correcting misperceptions. Finally, I present problems of the social norms approach: I will draw attention to the mixed evidence researchers found about its effectiveness, and the way one can avoid the boomerang effect.

The second big chapter is about the research I conducted in the spring of 2012 at Trinity College (Hartford, CT), with the wonderful help of Professor Arthur Schneider from the Trinity College Economics department.² The experiment is an application of a social norms intervention to the non-medical use of prescription stimulants (ADHD medications) by college students. First, I explain the role of ADHD medications in and outside a college setting, and the importance of the question. Then I describe how the experiment was conducted, and I present my data. Afterward, I explain my hypotheses, and at the end I analyze the results.

² I would also like to thank Professor Nicole Dudukovic from the Psychology department for her outside support and insightful advice.

Literature review and Methodology

Social Norms in Economics

An accentuated use of social norms in economic analysis might seem peculiar at first, but it should come as obvious once we remember that economics is a social science. Indeed, Adam Smith, regarded as the father of modern economics by many, recognized early on the importance of social interactions. As Levitt and Dubner (2006) point it out, in his book *The Theory of Moral Sentiments* in 1759, Smith was primarily concerned with questions such as “How would one person’s seemingly innocuous choice, good or bad, affect a great number of people down the line?” (Levitt & Dubner, 2006, p.13), and in general, he was fascinated by “the friction between individual desire and societal norms” (p.13).

Two hundred and fifty years later, we are still amazed by the magnitude of the impact social-psychological interactions can have on our economy. In his book *The Subprime Solution* (2008), Robert Shiller argues that the “subprime crisis was essentially psychological in origin, as are all bubbles” (p.24). Introducing his concept of social contagion, he emphasizes that the core of the problem was that we failed to recognize the “epidemic of irrational public enthusiasm for housing investment” (p.4). Everyone considered the enthusiasm justified simply because others accepted it, which launched a spiral that was bound to end in a bursting bubble.

However, society can also benefit from people’s perception of what others do and accept. A typical example is resource conservation and preservation of the environment. Cialdini (2007) used social norms to convince hotel guests to reuse their towels. In his experiment he compared the effects of four ways to request guests to reuse their towels. He asked a hotel to communicate four different messages on the cards they place in bathrooms: (1) „HELP SAVE THE ENVIRONMENT”, (2) „HELP SAVE RESOURCES FOR FUTURE GENERATIONS”, (3) „PARTNER WITH US TO HELP SAVE THE ENVIRONMENT”, and (4) „JOIN YOUR FELLOW CITIZENS IN HELPING TO SAVE THE ENVIRONMENT”. While the first three cards had no significant differences in effectiveness, the last one, which emphasized that the majority of the guests reuse their towels, increased reuse by 28.4% compared to the other three messages.

There are several other examples of social norms enhancing environmental consciousness and making the world a more livable place in general. For instance, people tend to voluntarily reduce their water consumption during droughts, similarly to reducing energy use to mitigate the energy crisis (Train, McFadden, & Goett, 1987). Social norms are also the driving force behind volunteer work, which in the U.S. – according to the estimates of Weisbrod (1988) – is as large as \$74 billion annually.

Dan Ariely (2008), Israeli American psychologist and behavioral economist emphasizes the importance of social norms at the work place. In his New York Times best seller book, *Predictably Irrational*, he stresses that creative work, especially one that necessitates a great deal of commitment, depends not as much on salary as on social norms. “Police officers, firefighters, soldiers – they don’t die for their weekly pay. It’s the social norms – pride in their profession and a sense of duty – that will motivate them to give up their lives and health” (p.84). This idea has profound implications for incentivizing enthusiastic work in the age of an economic crisis, when financial compensation might be harder to offer. “Money, as it turns out, is very often the most expensive way to motivate people. Social norms are not only cheaper, but often more effective as well” (p.86).

There is one additional use of social norms that might be especially valuable in Hungary: their potential to improve tax compliance. The degree of tax evasion is markedly high in Hungary: Tonin (2011) uses the statistics by ECONSTAT in 1999, according to which “56% of the households interviewed in a survey claim that in their neighbourhood, employers are declaring the minimum wage to the tax authority, while unofficially paying additional wages”. Luckily for Hungarians, social norms might alleviate the problem. Coleman (1996) describe an experiment in which the taxpayers of Minnesota were divided into four groups and given different messages. The first group was educated about the good causes their taxes are used for; the second was warned about the punishments non-compliers might face; the third was told how to get help if one finds tax forms puzzling; and the fourth was informed that most people “report correctly and pay voluntarily 93 percent of the income taxes they owe” (Coleman, 1996, p.51). Coleman (1996) found that, unlike the first three interventions, which had no significant effect, the fourth message was successful in increasing compliance – and in that, we can find an apparent similarity with the towel-experiment.

It is my hope that this section has provided extensive evidence for the existence of the impact of social norms on behavior, and on economic behavior in special. However, a detailed analysis of *why* this might be true is yet to come. In the words of Matthew Rabin (1993), “[b]y modeling such emotions formally, one can begin to understand their economic and welfare implications more rigorously and more generally” (p.1282).

Injunctive versus Descriptive Norms

In this section I make the crucial distinction between two types of social norms: injunctive and descriptive norms. According to Cialdini (2007), injunctive social norms refer to “one’s perception of what others believe to be appropriate conduct”, while descriptive social norms “refer to one’s perception of what most others actually do”.³ For instance, one might desire to comply with tax regulations because she knows this is what society would expect her to do (although she knows many people cheat), while she reads Harry Potter books because she believes this is what most of her peers do (although she does not think her refusal to read would be sanctioned). However, as Bicchieri (2006) emphasizes, there is no “intrinsic property” of a norm that defines whether it is injunctive or descriptive – instead, it is what expectations people have towards that particular behavioral pattern (p.29). While in most cultures a shaved head is no more than a fashion some men follow, in certain religious circles it can be a social norm enforced by punishing the transgressors.

Even though injunctive and descriptive norms oftentimes go hand in hand, a considerable difference between them is the reasons behind people’s decision to conform to each. Therefore, let us now consider models of conformity.

Conformity

Conformity has been well documented in the social-psychological literature since the 1930s, when psychologist Muzafer Sherif (1937) provided experimental proof for people’s efforts to converge their opinions. Later on, Solomon Asch (1955) carried out similarly substantial experiments in the topic, and proved that people often change their answers even to the easiest questions, provided that they see a unanimous wrong answer by the others. This puzzled psychologists and economists alike: why would a rational human being say that black

³ Bicchieri (2006) makes a similar distinction, but instead of *injunctive* norms, she uses *social* norms. For the sake of clarity, I will use Cialdini’s terminology, and restrict the term „social norm” to the general expression, which has two sub-categories: injunctive and descriptive social norms.

is white and white is black 20-40% of the times, simply because complete strangers – who are more than unlikely to revenge dissent – said so?

An exciting theory for people’s conformity in general is the ‘spotlight effect’, a term coined by Gilovich, Medvec and Savitsky (2000). This describes the common misperception that we believe others pay close attention to what we wear, and they will immediately notice if we have a stain on our shirt. The results of the Gilovich et al. (2000) study, however, suggest that people overestimate the extent to which others take notice of them by as much as 25%.

Conforming to Injunctive and to Descriptive Norms

As I mentioned above, the reasons behind conformity to injunctive and to descriptive norms is one of the crucial differences between these two norms. Conformity to injunctive norms usually conflicts our self-interest, yet we do it because we fear punishment or feel pressured by others; on the other hand, we conform to descriptive norms because it is explicitly good for us (Bicchieri, 2006).

Although my further analysis predominantly focuses on descriptive norms, it will provide comparative insight to have a glance at how injunctive norms function. Bicchieri (2006) gives an elaborate game-theoretic explanation of how injunctive norms transform a mixed-motive game (such as a prisoner’s dilemma) into a coordination game by altering players’ expectations about the other’s expectations and preferences (p.26). Her theory, in a nutshell, is the following. While a usual prisoner’s dilemma with “self-interested” players (Table 1) will result in a unique Nash equilibrium, the same game played by “norm-follower” players (Table 2) has two strict Nash equilibria. In both tables the Pareto efficient outcome is {Cooperate-Cooperate}, and the Nash equilibria are marked with red.⁴

		Others	
		Cooperate	Default
Self	Cooperate	3, 3	1, 4
	Default	4, 1	2, 2

Table 1: Self-interested interaction

⁴ The numbers in the tables represent payoffs, with 4 being the best and 1 being the worst.

		Others	
		Cooperate	Default
Self	Cooperate	4, 4	1, 2
	Default	2, 1	3, 3

Table 2: Norm-follower interaction

It is visible that while a self-interested interaction will always be sub-Pareto, the norm-follower interaction has the potential to reach Pareto efficiency. The reason for this is that the norm-follower has different preference ordering over the outcomes from the self-interested player. The self-interested represents the standard disposition to prefer the situation that offers greater benefit for the individual ($DC > CC > DD > CD$); the norm-follower, on the other hand, likes to reciprocate others' gestures, but if cooperation were impossible, she would rather be the "crook" than the "sucker" ($CC > DD > DC > CD$). Therefore, by increasing the possibilities of the other player choosing the cooperative strategy, the norm creates better incentives for the self to cooperate, resulting in higher social welfare – even if they are not fully in line with a narrowly defined self-interest.

Conformity to descriptive norms, however, always aligns with self-interest. Speaking the same language as my fellow citizens eases my communication, wearing the trendiest clothes makes me feel good about myself, and copying the homework most of my classmates handed in saves my time and energy if I believe a consensus might signal the correct answer. In none of these situations do I fear the community's punishment even if I decide to deviate, and at the same time, I do not expect a roar of approval if I comply. Bicchieri (2006) contrasts this with injunctive norms, and calls it the *unilateral* nature of descriptive norms: "though we may have come to expect others to follow a regular behavioral pattern, we do not feel any social pressure to conform" (p.30).

To represent unilateral expectations in a game theoretic setting, Bicchieri (2006) takes the example of how the miniskirt became fashionable in the 1960s (p.31-33), represented in Table 3. Initially it was only a few trendsetters (Mary Quant and some celebrities) who were wearing miniskirts (M), while the average woman possessed long skirts (L) and a pair of jeans (J). This woman would like to be fashionable, therefore her payoffs are greater whenever she wears the same as the trendsetters; however, since she does not own a miniskirt yet, she would have to invest in one, for which reason her payoff at $\{M;M\}=1$ is lower than at

$\{L;L\}=\{J;J\}=2$. The trendsetters, on the other hand, are hip and extraordinary, whose sole concern is that they want to wear miniskirts – whether or not the average woman follows, they do not care: hence their payoffs depend exclusively on what they wear. Clearly, imitation is a one-sided coordination problem, which in this case has one Nash equilibrium: $\{M;M\}$, marked with red.

		Trendsetters		
		M	L	J
Average woman	M	1, 2	0, 1	0, 1
	L	0, 2	2, 1	0, 1
	J	0, 2	0, 1	2, 1

Table 3: Imitation: fashion-game

Bicchieri (2006) notes an interesting feature of this example, which will be especially important for our later analysis: “often it is the *perception* of a critical mass, rather than a real critical mass, that tips the balance in favor of the new behavior. A small but vocal minority, or an endorsement by some celebrity, may thus be enough to induce a change in mass behavior” (p.31; emphasis in original). Nevertheless, before turning to this analysis, let us consider a number of further reasons for conformity.

Information and Peer Pressure

Thaler and Sunstein (2009) argue that the two main reasons behind conformity are (1) the information others’ opinion carry, and (2) a real or imaginary peer pressure.

In uncertain situations, when we lack the sufficient amount of information for a steady decision, or when the gathering of information would be too costly, we might decide to follow others because we presume that the majority knows the most effective behavior. When, in a foreign city I do not know which restaurant to have dinner in, I might just choose the most crowded one, since I think many people cannot be wrong. However, if everyone has the same train of thought, this might result in an ‘information cascade’, which means that “all actors depend on the choices of one (or a few) first mover(s), and those choices may or may not be good ones” (Bicchieri, 2006, p.30).

The other reason, peer pressure, can be the most easily documented in a school setting. Sacerdote (2001) used econometrics to measure peer effects in randomly assigned roommates

in Dartmouth, an American college. He found strong correlates between the academic performances (measured by the grade point average, GPA) of roommates. Furthermore, his results show that apart from the roommate, many others who live in the dormitory, have significant effects on a student's life: fraternity membership is influenced by dormmates' decisions. Thaler and Sunstein (2009) go as far as suggesting that "maybe parents should worry less about which college their kids go to and more about which roommate they get" (p.55).

Pluralistic Ignorance and the Availability Heuristic

So far, we have proved the intuitively obvious statement that people conform to norms. The issue becomes particularly interesting at the point where we start examining what happens when they *think* they are conforming to the norm, but in reality that norm does not exist.

In social psychology, situations where people have misperceptions about others' behavior or the reasons behind their behavior, is called 'pluralistic ignorance' (Katz & Allport, 1931). In other words, people have a tendency to falsely believe that others are more dissimilar to them than they actually are. Educational examples are the acceptance of an oppressing regime, or the lack of dissent when someone makes a homophobic comment at a party. Although many people might disagree, they are afraid of saying anything because they believe that the reason why no one is confronting the bully is that they all agree with him. Afraid of being alone with their non-homophobic view, the tolerant majority remains silent, while the narrow-minded minority shamelessly declares its bigoted opinion.

Matters are made worse by the "availability heuristic", another term used in cognitive psychology, which describes that we often judge the probability or the commonness of an occurrence by how easily instances of it are brought to mind. For example, people tend to overestimate the probabilities of more extraordinary forms of death (such as shark attacks, homicide, or airplane accidents), because this is what they hear on the news; on the other hand, they underestimate the dangers they face from diabetes or breast cancer.

The media plays a crucial role in distorting perceptions: due to the highly competitive nature of the media industry, TV- and radio channels, newspapers, and blogs often try to attract audience by attempting to surpass each other in showing abnormally dramatic events that might interest the public, a general wisdom called "if it bleeds it leads". This race to the (intellectual) bottom results in people systematically overestimating the extent to which their

peers engage in anti-social behavior: we have exaggerated information about the number of teenage pregnancies, the extent of drunk-driving, drug-use, and binge-drinking, not to mention how the news intensify our perception of the crime rates committed by minorities.

It is important to note that all too often distorting happens accidentally – what is more, as a result of the actions of benevolent policy makers and program developers. Cialdini (2007) highlights the fact that while advertisers and marketing specialists are well aware of how to manipulate the public to buy a product by emphasizing how commonly it is used, policy makers fail to grasp the persuasive potential in descriptive norms. A common mistake is that they try to induce people to stop following a certain destructive behavior by emphasizing that the problem is rampant, which is the opposite of what they should do. If a teenager reads in every newspaper that hundreds of kids use drugs, sooner or later she will feel like she is missing out on something. “Indeed, by normalizing the unwanted activity, the message stands a good chance of backfiring” (Cialdini, 2007, p.266).

As a result, people will want to conform to the incorrectly perceived norm, thus they adjust their behavior for the worse, and the anti-social behavior will indeed become widespread. We all know that the road to hell is paved with good intentions.

Correcting Misperceptions: Experimental Evidence

Social Norms Marketing (SNM) was designed to counteract the above-mentioned self-fulfilling prophecy by providing people with information about the true magnitude of the problem behavior. According to Schultz et al. (2007), these “campaigns seek to reduce the occurrence of deleterious behaviors by correcting targets’ misperceptions regarding the behaviors’ prevalence” (p.429). The term Social Norms Marketing was coined by H. Wesley Perkins and Alan Berkowitz in the 1980s, and it applies standard marketing techniques to publicize healthy behavior. Thus, it is important to note that SNM is not set to correct *norms*, but to correct *misperceptions* about the norms.

The experiments with towel-reuse (Cialdini, 2007) and tax compliance (Coleman, 1996) are only two of numerous examples proving the efficacy of this method. According to Berkowitz (2005), “social norms interventions have been successful in reducing alcohol and tobacco use in college and high school populations, and has promise as an intervention to address violence and social justice issues” (p.2). Campuses that achieved a reduction of 20% or more in binge drinking include Western Washington University, University of Arizona, Northern Illinois University, Hobart and William Smith Colleges and Rowan University (as

documented in Berkowitz, 2005). The Social Norms Center website (www.socialnorm.org) provides even more examples. Several institutions have recognized the widespread applicability of social norms campaigns, thus currently they are funded by the U.S. Department of Education, the Department of Justice, the Centers for Disease Control, state health departments, and private foundations.

Issues: Mixed Evidence and the Boomerang Effect

In spite of the widespread applications of Social Norms Marketing, Schultz et al. (2007) draw attention to the mixed evidence for the effectiveness of these programs. They highlight that while there are several confirming studies, many provide no evidence for success whatsoever (for a detailed list, see Schultz et al., 2007).

Even more disturbingly, certain studies found that social norms interventions *increased* the prevalence of the behavior it was designed to reduce (see Schultz et al., 2007). In the paper *The Constructive, Destructive, and Reconstructive Power of Social Norms*, Schultz et al. (2007) suggest that this is due to a “boomerang effect”. While most people overestimate the magnitude of anti-social behavior, some people in fact underestimate it, and since a SNM campaign reaches everyone, it makes the ‘underestimators’ (those people who already abstain from anti-social behavior) realize their naiveté, and they might decide to engage in the unwanted behavior in order to conform. If the ‘underestimators’ outnumber the ‘overestimators’, the SNM campaign can have an overall adverse effect.

In order to eliminate this boomerang effect, Schultz et al. (2007) recommend that an injunctive message be added to the descriptive information during the intervention. In the field experiment in which they studied household energy consumption rates, they measured the effectiveness of an additional injunctive message, which suggests society’s approval. First, they determined whether a household consumed more or less energy than average, and then they randomly assigned each household to one of two groups: those who received only a descriptive message, and those who received an additional injunctive message (thus creating a 2x2 matrix, as in Table 4). The descriptive message only stated the average energy consumption rate in the neighborhood and that of the particular household. But for those who received an injunctive message as well, a happy face (☺) was drawn if the household’s consumption rate was smaller than average, and a sad face (☹) if it was higher. Finally, they studied how the households’ consumption changed after receiving the messages.

		Household's energy consumption	
		Above average	Below average
Received message	Descriptive	Decreased	Increased
	Descriptive + Injunctive	Decreased	Stayed the same

Table 4: The change in households' energy consumption rates

Their findings (summarized in Table 4) prove that while sending a descriptive message in isolation reaches its goal for households who had previously engaged in unwanted behavior, it also has an adverse effect on those who had already been acting in the suggested way. Schultz et al. (2007) named the first (desirable) impact the “constructive potential”, and the second (undesirable) impact the “destructive potential” of descriptive social norms. The experiment also shows how adding an injunctive message can help eliminate this destructive effect. According to their results, the descriptive message with the additional sad face motivated those who consumed above-average energy to cut back on their consumption, and the additional happy face managed to get below-average consumers to remain on the desirably low rate. This latter they called the “reconstructive potential” of social norms.

In this literature review I intended to highlight the theories and practices about social norms that will be of paramount importance to understand the following research. First I proved that social norms have a place in economic analysis by showing that many of the greatest economists have used them to study or influence behavior, may it be of economic or of non-economic nature. Then I defined injunctive and descriptive norms based on the terminologies of Cialdini (2007), and on the ideas of Bicchieri (2006). In the next section I showed evidence for conformity from the experimental psychology literature, and I introduced the idea of the spotlight effect. I presented how reasons behind conformity differ in the cases of injunctive and of descriptive norms by describing some of Bicchieri's (2006) game-theoretic models. Then I showed how information and peer pressure might result in conformity, and I presented the robust findings of Sacerdote (2001). Afterwards, I explained how pluralistic ignorance and the availability heuristic play a role in the misperception people form about norms, and then I demonstrated how Social Norm Marketing campaigns might counteract the vicious circle by correcting misperceptions. Finally, I presented the concerns of Schultz et al. (2007) regarding the destructive power of social norms, and I showed how we might prevent the boomerang effect. In the next chapters, I will present how I applied this knowledge to the abuse of ADHD medications.

Research

The current chapter presents the field experiment I conducted in the spring of 2012 at Trinity College (Hartford, CT), with the wonderful help of Professor Arthur Schneider from the Trinity College Economics department. The objective of the experiment was to apply the Social Norms Approach to a domain where – as far as I know – it has not been applied yet: the non-medical use of prescription stimulants by college students. Therefore, in this section I will (1) explain what ADHD medications are and why they might be abused; (2) then I will describe the course of the experiment (3) and my data, (4) I will present my hypotheses, and (5) finally I will show my analysis testing both pluralistic ignorance and the effect of a social norms marketing campaign.

The Abuse of Prescription Stimulants

Patients of Attention-Deficit Hyperactivity Disorder (ADHD) are described by Barkley (1997) as individuals “who are excessively active, are unable to sustain their attention, and are deficient in their impulse control to a degree that is deviant for their developmental level” (p.3). In his book *ADHD and the Nature of Self-Control*, he mentions that “[a]pproximately 3-7% of school-age children are believed to have this disorder” and that “such children are at risk for a variety of negative outcomes across childhood and into adolescence and adulthood” (p.3).

ADHD can be treated by a variety of psychostimulant medications, of which the most popular ones are Adderall (mixed-salts amphetamine), Ritalin (methylphenidate), and Dexedrine (dextroamphetamine) (McCabe, 2005). By increasing the dopamine level in the brain, these medications increase alertness and productivity, while also affecting the so-called mesolimbic “reward” pathway, which is thought to be responsible for the feeling of reward and euphoria. The effects and structure of Adderall, Dexedrine and Ritalin are similar to MDMA (Ecstasy) and Cocaine respectively, and because they have high abuse potential and dependence liability, all three of them are Schedule II drugs in the U.S (Genetic Science Learning Center, 2012). The side-effects include dizziness, nervousness, increased heart-rate, headache, weight-loss, and they are not advised for persons with cardiac or mental illnesses. Nevertheless, ever since the mid-1990s, researchers have become more and more aware of the increase in the number of such prescriptions due to the rise of ADHD diagnoses (DeSantis, 2008).

A relatively recent concern, however, is that the widespread nature of these prescription drugs among children and young adults makes them fairly easily available even for those who are not prescribed, and therefore it gives rise to drug abuse in schools and especially in colleges. Stimulants of this sort are the perfect drugs for students who are academically ambitious but do not wish to give up other aspects of their lives, such as sports, student societies, or parties. In a study by DeSantis et al. (2008), 66% of the students who admitted the illicit use of stimulants said that they take them “to help concentrate”. Many of them reported an ability “to study for longer periods of time”, “to focus on a single task without distraction”, and they “claimed that stimulants made them more productive”. Apart from their academic use, stimulants, when combined with alcohol, are also believed to make people “funner and funnier”.

The most extensive study examining the prevalence of non-medical use of Adderall, Ritalin and Dexedrine was conducted by McCabe et al. (2005) in 2001 on a representative sample of almost 11,000 randomly selected students from 119 colleges across the U.S. They found that only 6.9% of the students reported trying these drugs at least once in their lives, 4.1% reported past year use, and a mere 2.1% reported taking them in the past month. However, they also found that prevalence is significantly higher in certain subgroups. For one thing, a college is more likely to have students who take illicit stimulants if it is among the most competitive non-commuter colleges in the North-east. Besides, a student is more likely to take these drugs if he is white, male, part of a Greek house (fraternity or sorority), and has a grade point average (GPA) of B or lower. McCabe et al. (2005) also found a high correlation between ADHD medication abuse and other substance abuse: those who reported past-year stimulant use “were ten times more likely to report marijuana use”, “over 20 times more likely to report cocaine use”, and “over five times more likely to report driving after binge drinking”. In my experiment, I intended to test a number of hypotheses based on the results of McCabe et al. (2005).

Description of the Experiment

The research focused on exploring pluralistic ignorance and comparing the effects of descriptive social norms between students who are and are not part of Greek houses. A detailed exposition of the hypotheses will be given in the subchapter *Hypotheses*.

The experiment consisted of three parts: a baseline survey, an intervention, and a final survey. Both surveys were anonymous and participants were allowed to skip any questions. Both surveys and the intervention were completed via the Internet, on the websites www.surveymonkey.com, and www.prezi.com, respectively. Even though the surveys were anonymous, because I hoped to use two-period panel data for analyzing the difference between the initial and the second survey, I had to ask the participants to provide a code that would on the one hand help me match their answers, but on the other hand it would not make me able to identify them personally. Therefore, participants provided a 6-digit code, which consisted of their fathers', their mothers' and their own two-digit birthday. The baseline survey can be found in Appendix 1, and the follow-up survey in Appendix 3.

The baseline survey was aimed at exploring students' attitudes towards the abuse of ADHD medication. First, they were asked a number of general sociological questions, such as age, gender, and whether they are part of a fraternity / sorority. Second, they were asked whether they are prescribed any of the ADHD medications and whether they have ever tried them. If they said yes to this latter, they continued on the second page of the survey, which explored the frequency of and the reasons behind their abuse, and the side-effects they had experienced. If they said no, the survey skipped the second part and immediately jumped to the third page, which was thus completed by both the users and the non-users. This, on the one hand, asked several questions about their lives in general (such as how often they go out, or how much they care about their academic performance), and on the other hand, – most importantly – it explored their judgment of the prevalence of stimulant abuse on campus, and whether they disapproved of those who do it. It was also in this section that I asked whether they were planning on taking any of these medications in the following 30 days.

At the end of the baseline survey they were asked to watch a short presentation titled “The illicit use of ADHD medications among college students”, which provided information – primarily from McCabe et al. (2005) – about the prevalence of prescription stimulant abuse nation-wide. The exact wording can be read in Appendix 2, and the presentation can be found at <http://prezi.com/szvjoj8j-zhl/intervention-3/>. The very last page of the baseline survey included three questions that checked whether they had watched the presentation, because those who skipped this part could have biased the results.

The follow-up survey was conducted approximately 30 days after the baseline and the intervention. Participants were asked to provide the same 6-digit code as before, and the

questions were identical to the baseline survey, with a couple of minor exceptions: questions no. 7-10, asking about fraternity membership, ethnic origin, citizenship, and GPA were dropped (because they did not change anyway), and the whole intervention part was of course left out.

Description of the Data

The participants were all students of Trinity College (Hartford, CT) which, according to the McCabe et al. (2005) study, possesses all the characteristics of a school with abundant potential for ADHD medication abuse: it is a highly selective, non-commuter liberal arts college in the North-east. Furthermore, Trinity College is among the few liberal arts colleges that still have a buzzing Greek life, and thus I was able to investigate whether the members of such houses, i.e. fraternities or sororities, are more prone to pluralistic ignorance and to the social norms effect than others.

The problem with including “member of a fraternity or sorority” as an explanatory variable is self-selection. According to Wooldridge (2002), the self-selection problem arises “when a binary indicator of participation might be systematically related to unobserved factors” (p.239). Since joining a frat is not a random decision, self-selection can make this independent variable endogenous, and bias its β . One solution can be to create a multiple regression analysis in which we control for all possible correlating factors – hence the multitude of my variables.

Numerous students completed the questionnaires, but I had to discard those who forgot or changed their 6-digit codes. At the end, I had 58 participants who provided sufficient answers to both of the surveys under the same ID.

The mean age was 20.12, and approximately 25-25-25% of them were 20, 21, and 22 year-olds. The female-male ratio was about 30%-70%, and 64% of the respondents were juniors or seniors.⁵ Their ethnicity and citizenship was almost homogeneous, with the vast majority being white Americans. Their GPA, however, varied considerably, from 2.5 to 3.9,

⁵ In the U.S. four-year school system, these mean the last two years of college. From first to fourth years, classes are called: Freshman, Sophomore, Junior, and Senior.

with the mean being 3.35 (Figure 1).⁶ Finally, 31% of them were part of a Greek house, 28% being a member of a fraternity and the remaining 3% of a sorority.

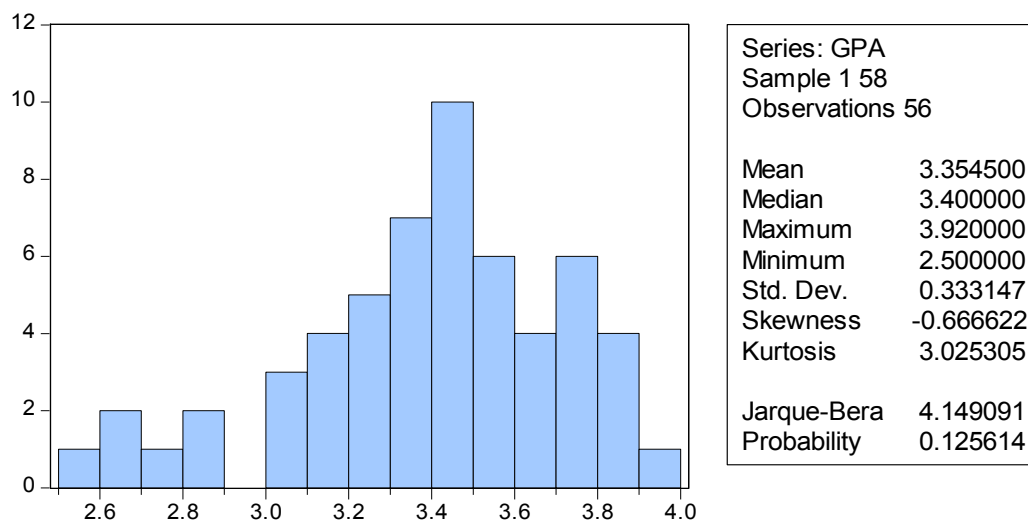


Figure 1: Histogram of GPA of the 58 students in the sample

As for the prevalence of prescription stimulant abuse, I found that even though out of the 58 people only 4 reported ever being prescribed Adderall, Ritalin or Dexedrine, as many as 32 of them admitted ever using at least one of these medications. This means that 48% of the respondents abused ADHD medications at least once in their lives. More precisely, within the past year, out of the 32 users, 11 reported using it 1 or 2 times / year, and 13 reported 1 or 2 times / month (Figure 2). Within the past 30 days, out of the 32 users, 13 reported not using it, and 10 reported using it 1 or 2 times (Figure 3).

To the question “Would you still take Adderall, Ritalin or Dexedrine if nobody on your campus took it (without a prescription)?”, out of the 32 users, 23 answered Yes (they would), 8 answered No (they would not), and 1 left it blank. Therefore, while the phenomenon is not negligible, most people still do not consider themselves influenced by others’ behavior – which finding is in line with what Cialdini (2007) calls the “underappreciated” influence of descriptive social norms.

⁶In the U.S. college system, the letter grades (A B C D and F) are converted into numerical values when calculating one’s GPA, which can range from 1.0 to 4.0, with a straight A being 4.0.

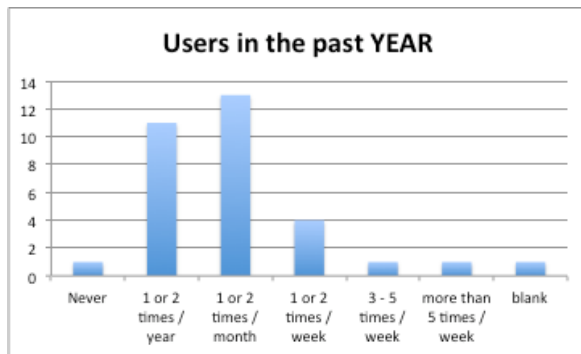


Figure 2: Users in the past year

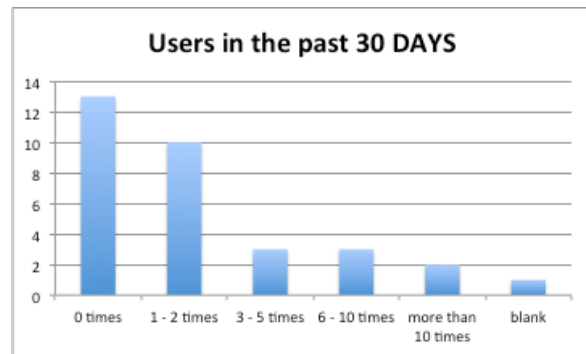


Figure 3: Users in the past 30 days

Hypotheses

The framework underlying my analysis can be summarized in the following four statements, all of which were explained in more detail in the literature review.

1. Perceived descriptive social norms influence people's decisions.
2. People want to conform to the perceived descriptive norm.
3. There is pluralistic ignorance, i.e. people misperceive others' values and behavior.
4. According to the Social Norm Approach, an intervention correcting misperceptions can reduce conformity to the misperceived descriptive norm.

According to the above statements, my hypotheses regarding prescription stimulant use by the students of Trinity College are the followings:

1. Own consumption of prescription stimulants depends on own characteristics (such as gender, class, GPA, personal approval of those who use such drugs), *as well as* on perceived approval and perceived frequency of use by others.
2. The variables concerning perceived approval and frequency of use by others have a positive effect on own consumption.
3. Pluralistic ignorance predicts that students overestimate (1) the extent to which others approve of the non-medical use of ADHD medications, and (2) the frequency by which others use such drugs.
4. The intervention (1) corrects the above misperception, and (2) reduces students' desire to consume prescription stimulants.

As a final prediction, I assumed that all the above are more emphatic in a tightly knit community, such as in a fraternity or a sorority. At first glance, this seems correct: the relative proportions of those fraternity members and non-members who have tried (users) and have not tried (not users) ADHD medications illegitimately are presented in Figure 4. According to the chart, frat members are more likely to abuse these drugs than non-members, which will be one of the most important hypotheses I will test in the next section.

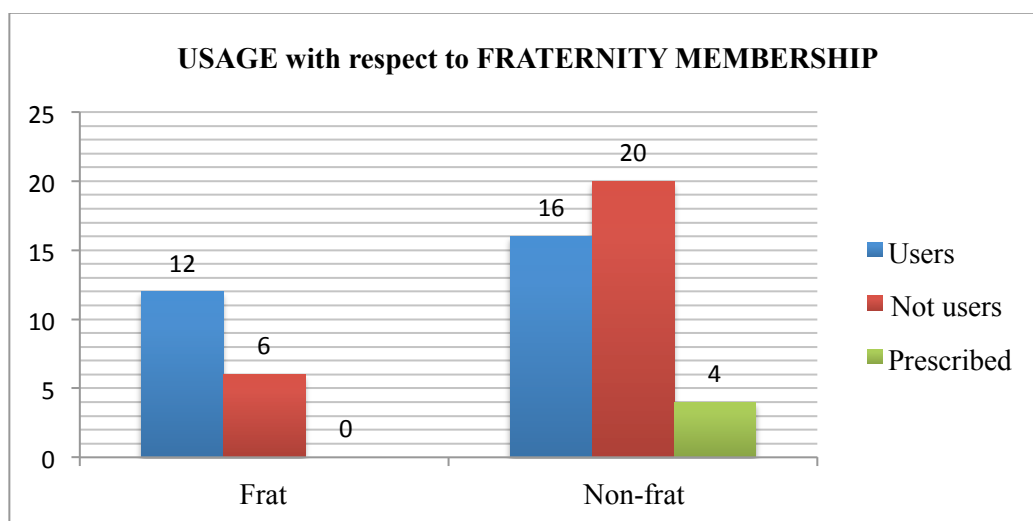


Figure 4: Usage with respect to fraternity membership

Findings and Analysis

In this section I present the results of the experiment. First, I will test whether there is pluralistic ignorance concerning ADHD medications; then I will examine the determining factors of trying out and of regularly using prescription stimulants, with special focus on the impact of fraternity membership; finally, I will assess the effectiveness of the intervention. In order not to break the flow of the reasoning, I do not report all the statistical analyses and regressions in the text – nevertheless, they can be found at Appendix 4.

i. Pluralistic ignorance

Let us start the analysis by examining pluralistic ignorance concerning the approval of the non-medical use of ADHD medications. I measured this by asking the student's own opinion, and what she thought the typical student's opinion was about those who take such medications without a prescription (questions 28 and 29 in the baseline survey). The null hypothesis of no pluralistic ignorance would predict that on average, the extent of own

approval and what everyone thinks of others' approval should be the same (approval measured on a scale of 0 to 6). However, the mean of own approval (me_approve) is 2.638, while the mean of perceived social approval (others_approve) is 3.397. If this is a significant difference, it means that while independently everyone is slightly disapproving of stimulant abuse, everyone believes that others are rather approving of it. Using the Wilcoxon (Mann-Whitney) signed-rank test (Appendix 4/a), I found that this null of no pluralistic ignorance can be rejected at a 1% significance level ($p=0.0036$). It is thus proven that students tend to overestimate the extent to which their peers approve of stimulant abuse.

As for the prevalence of stimulant abuse on campus, pluralistic ignorance can be estimated by asking students whether they believe their friends' frequency of use to be less, the same, or more than their own (question 27 in the baseline survey). The null hypothesis of no pluralistic ignorance would predict that on average they should believe that most of their friends take ADHD medications about as often (or as rarely) as they do. This null would translate into a mean of 1 in Figure 5. The mean, however, is 1.172, which suggests that every student says that *others* take drugs more often. I used a t-test to see whether this difference is significant (Appendix 4/b), and I found that on a 5% significance level the null can be rejected, if the alternative hypothesis is that the mean is greater than 1 ($p=0.029$). Therefore, students do overestimate the prevalence of stimulant abuse at Trinity College.

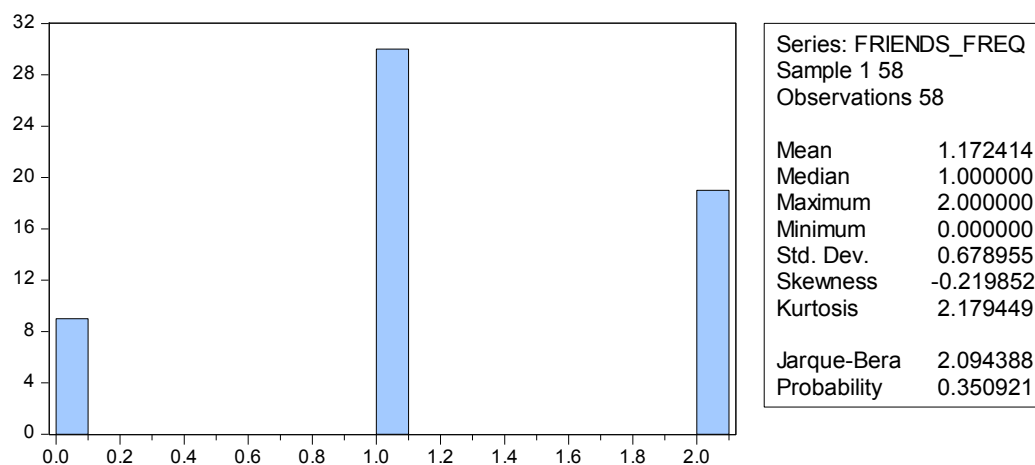


Figure 5: Frequency of answers to the question how often their friends abuse ADHD medications: less often (0), as often as (1), or more often (2) than the respondent.

ii. Determining factors of whether student has ever tried ADHD medications

According to my hypothesis, fraternity membership has a significant effect on whether one tries ADHD medications or not, and Figure 4 seems to back this assumption. In order to test whether the proportions reported in Figure 4 are significantly different (i.e. frat members tend to be users, while non-members tend to be non-users), I used test of proportions with a null hypothesis of no difference between the groups, and the alternative being that there are more users in a fraternity (Appendix 4/c). The result is ambiguous: I found $p=0.0616$, which means that while on 10% the null can be rejected, on 5% it cannot.

This ambiguous finding calls for a deeper investigation of the determining factors of the illegitimate use of stimulants. Clearly, fraternity membership is related with a great number of characteristics, such as ethnicity, citizenship, GPA, the frequency of going out and partying, the extent of caring about academic achievement, and so on. Therefore, I created a probit regression with the dependent variable being whether or not the student has ever used prescription stimulants, and I included numerous independent variables (Appendix 4/d). It has to be noted that because 90% of the respondents were white and 95% of them were Americans, ethnicity and citizenship had to be excluded from the regression.

The results of this first regression are rather disappointing: even though the R^2 is relatively high (0.489), only one variable is significant at the 5%, and two at the 10% level. Therefore, I created a correlation matrix and one by one excluded those variables that either correlated with too many others, or were outstandingly insignificant. I ended up with a regression (Appendix 4/e) that still has $R^2 = 0.470$, and yet out of the 10 explanatory variables 6 are significant: one at 1%, 2 at 5%, and 3 at 10%. However, since these estimated coefficients are complicated to interpret, I had to compute the marginal effects separately (Appendix 4/f). The most important results – including the marginal effects and the levels of significance – are presented in Table 5.⁷

⁷ Since the first regression was useless, I did not even bother computing the marginal effects.

Dependent variable: EVER_USED	
Explanatory variables	Last regression (R2=0.470)
FRAT	0.2057
CLASS	0.1422 *
CARE_EDU	-0.3083
FRIENDS_FREQ	-0.1959
OTHERS_FREQ	-0.1453
LEGALIZE	0.3233 *
ME_APPROVE	0.1825 **
OTHERS_APPROVE	-0.1745 *
OTHERS_TRIED	0.0138 ***
PARTY	0.2602 **
*= p-value < 10% **= p-value < 5% *** = p-value < 1%	

Table 5: Marginal effects and significance levels of the last regression run on binary dependent variable EVER_USED measuring whether the student has ever tried ADHD medications

The above table seems to confirm the first hypothesis, i.e. own consumption depends on own characteristics as well as on perceived approval and perceived use by others. For instance, if a student is one class-year above another (CLASS), then ceteris paribus he will be 14% more likely to try medical stimulants. Those who believe ADHD medications should be made available for everyone (LEGALIZE), are more than 30% more likely to use them, ceteris paribus. Personal approval (ME_APPROVE) and their frequency of going out (PARTY), both correlate positively with usage. Interestingly, if a student thinks others are more approving of the abuse (OTHERS_APPROVE), then she will be less likely to try it, ceteris paribus. The single most important observation to emerge from this table, however, is that the only variable significant at 1% is what one believes to be the percentage of students who have already used such medications (OTHERS_TRIED).⁸ If two students are the same in every respect except that one thinks that there is 10 extra percent of students who have tried Adderall, she will be 13.8% more likely to try it herself than her peer. This result, taken together with the above proven existence of pluralistic ignorance, makes plenty of room for a social norms intervention.

⁸ Question 24 in the baseline survey: In your opinion, what percentage of the students on your campus have used Adderall, Ritalin or Dexedrine at least once in their lives?

Before turning to the intervention, let us examine the question of fraternities. Contrary to Figure 4, the regressions summarized in Table 5 suggest that fraternity membership has no significant effect on whether or not a student takes ADHD medications. This is confirmed by the fact that even when the probit regression was run with FRAT as a single explanatory variable, its p value was still 0.2370, which suggests that fraternity membership alone does not influence stimulant abuse. However, it cannot be forgotten that fraternity membership significantly correlates with a number of variables that are predictors of illegitimate use. To prove this, I ran a regression that had fraternity membership for dependent variable, and I found that at 5% level PARTY, OTHERS_TRIED, and FRIENDS_FREQ were significant (Appendix 4/g). This is important because it suggests that members of Greek houses hold community in high regard, but they are particularly prone to pluralistic ignorance.

iii. Effectiveness of intervention

The influence of the intervention, which corrected students' misperceptions concerning the prevalence of stimulant abuse, can be measured by several methods. First, I wanted to see whether the answer to the question 'In your opinion, what percentage of the students on your campus have used Adderall, Ritalin or Dexedrine at least once in their lives?' decreased significantly. In the baseline survey the mean of the guesses was 65.59%, while in the follow-up survey this was 49.88%. According to the Wilcoxon signed-rank test (Appendix 4/h), these percentages are significantly different at 1%, which means that students have lowered their predictions of how many of their peers have ever tried prescription stimulants. Therefore, the intervention – however short it was – corrected the misperceptions, which can be considered a great success.

Second, we can run the same Wilcoxon signed-rank test regarding own approval and social approval as in the first subsection (Appendix 4/a), only this time with the answers of the follow-up survey (Appendix 4/i). The results suggest that pluralistic ignorance has decreased, but it has not been eliminated. With a $p=0.0133$, the absence of pluralistic ignorance can be rejected at 5%, but it cannot be rejected at 1%. This is better than the p-value of 0.0036 of the first survey.

Finally, in order to test whether the intervention has reduced students' desire to abuse prescription stimulants, we can make three comparisons. Both in the baseline and in the follow-up survey, respondents were asked to tell how many times they had taken ADHD medications in the previous 30 days, and how many times they were planning on taking them

in the following 30 days.⁹ Therefore, we can compare the average frequency of usage in the past 30 days given in the baseline and in the follow-up survey; and we can compare the average frequency of planned usages before and after the intervention. In addition, since the follow-up was 30 days after the first survey, we can also compare planned frequency in the baseline, and past frequency in the follow-up. The intervention can be said to have reduced students' longing for ADHD medications if the followings are true:

- Past usage in baseline is greater than past usage in follow-up, or
- Next usage in baseline is greater than next usage in follow-up, or
- Next usage in baseline is greater than past usage in follow-up.

Alas, my experiment did not detect any evidence for this kind of impact of the intervention. As it can be seen in Figure 6, instead of decreasing, the prevalence of stimulant abuse increased – or remained unchanged, at best – after the intervention.

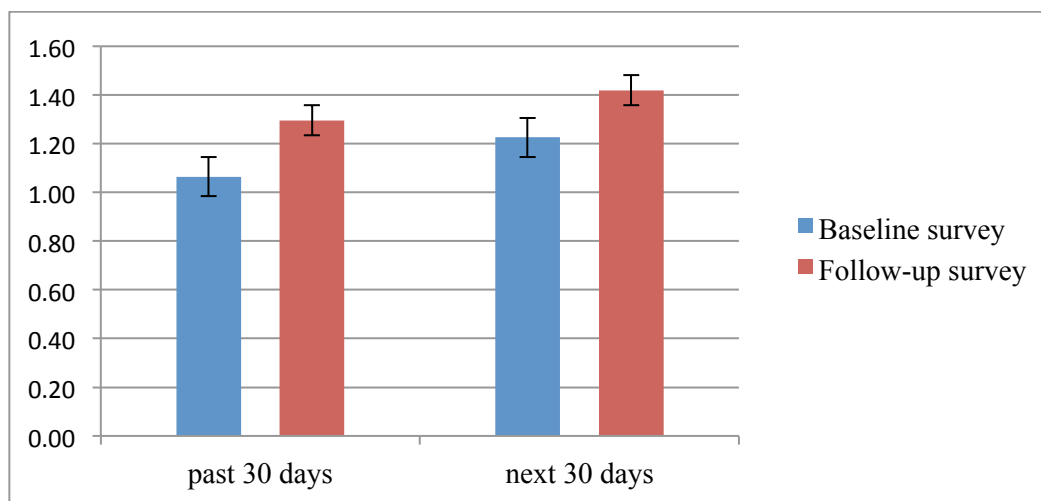


Figure 6: Frequency of usage in the past and next 30 days before and after the intervention (among those who have already tried ADHD medications)

Once more, I used the Wilcoxon/Mann-Whitney test to check if the means were significantly different, but the results seem to confirm those of Figure 6. Both for past 30 day's usages and for next 30 day's usages, the findings show no effect of the intervention ($p=0.44$ and $p=0.58$, respectively, see Appendix 4/j and 4/k). Furthermore, if we compare

⁹ The answers ranged from 0 to 4, where 0= 0 time, 1= 1-2 times, 2= 3-5 times, 3= 6-10 times, and 4= more than 10 times within the 30 day period.

planned usage in the baseline survey with actual past usage in the follow-up, we find a significant increase at 5%, with a p-value of 0.02 (Appendix 4/1).

Nevertheless, these results are not as disappointing as they first may seem. First, it has to be mentioned that this intervention of 30 days was substantially shorter than the usual Social Norms Marketing campaign, which lasts about 2-5 years in general. Furthermore, since the baseline survey was conducted in the middle of the semester and the follow-up was at the end, it is possible that the higher prevalence of stimulants in the second survey is simply due to an increased number of academic challenges (finals and papers). Indeed, when the students were asked about their reasons for taking prescription stimulants, 29 out of the 32 users answered they use such drugs because they help them with occasional big projects, such as midterms, papers, or finals.¹⁰ Therefore, it is possible that the experiment was in fact successful: it might be that the students would have wanted to take even more drugs, if it was not for the intervention. Unfortunately, the low number of participants prevented me from using a classic control group, which would have helped with the assessment of the intervention. Finally, even though the intervention has not succeeded in reducing the extent of prescription stimulant abuse at Trinity College, it should not be forgotten that it has indeed decreased the exaggerated perceptions of social approval and prevalence. This reduction in pluralistic ignorance might have an influence in the long run.

Summary

This paper has given an account of how social norms influence human behavior and how this can be used to improve economic and social factors in a community. The purpose was to provide an economic and social-psychological explanation for why and how people conform to norms, and to illustrate this with an experiment about conformity to perceived norms of ADHD medication abuse among college students.

First, in the literature review, I presented some key findings about the effects of social norms, and I explained the most crucial concepts. These included the distinction between injunctive and descriptive social norms, a number of theoretical and experimental explanations for conformity, and the importance of pluralistic ignorance and the availability heuristic. At the end of this chapter, I presented how the correction of misperceptions about

¹⁰ Question 19 in the baseline questionnaire

norms can be beneficial for society, but I also mentioned some limitations of the Social Norms Approach.

The second half of the paper described an application of the Social Norms Approach. This was a research I conducted at Trinity College, which was set out to prove the existence of pluralistic ignorance concerning the prevalence of ADHD medication abuse, and to show that the correction of misperceptions can reduce the abuse of prescription stimulants. As an additional hypothesis, I intended to show that both pluralistic ignorance and the urge to conform are stronger in a fraternity. The results of the experiment were mixed: while it was successful at proving the existence of, and subsequently at reducing pluralistic ignorance, it failed to diminish the prevalence of stimulant abuse or to show a significant effect of fraternity membership. Some of these deficiencies, however, might be explained by the brevity of the intervention and the lack of a classic control group.

All in all, the study proved the existence of misperceived norms, which is an issue that needs to be addressed. Further work needs to be done to establish whether a social norms campaign could have significant effects on the prevalence of prescription stimulant abuse – but the job is not done here. There still are numerous fields to which this method has not been applied yet. For instance, a future study investigating pluralistic ignorance regarding racism in Hungary would be very interesting. Analogously to the research presented in this paper, it might be true that we overestimate the extent of racism, and therefore, at least for some people, the only reason for being racist is that they are trying to conform to the misperceived norm. If a social norms campaign can be designed to improve towel-reuse and tax compliance, then we might have a chance at reducing racism and drug abuse, and step by step, lemming by lemming, make the world a better place.

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Appendix

Appendix 1: Baseline survey

1. Have you read the Informed Consent Form?
 - a. Yes, and I hereby consent to my participation in this research project.
2. ID:

(In order to analyze the results, I need to be able to match your answers at the end of the experiment to those at the beginning WHILE STILL MAKING THE SURVEY ANONYMOUS. So, I am asking you to create an ID and use it each time you take this survey. Your ID should be a 6 digit number, consisting of the 2 digit day of your father's birthdate, the 2 digit day of your mother's birth date, and of the 2 digit day of your own birth date. So, if my father was born on October 11, my mother on March 26, and I on May 2, then my ID is: 11-26-02.)

- a. [open ended]
3. College
 - a. [open ended]
4. Age
 - a. [open ended]
5. Gender
 - a. Male
 - b. Female
6. Classification
 - a. Freshman
 - b. Sophomore
 - c. Junior
 - d. Senior
7. Are you a member of a fraternity / sorority?
 - a. Yes
 - b. No
8. Citizenship
 - a. U.S.
 - b. International student
9. Ethnic origin

- a. American Indian
 - b. Asian / Pacific Islander
 - c. Black
 - d. Hispanic
 - e. White (non-Hispanic)
 - f. Other
10. Cumulative grade point average (GPA)
- a. [open ended]
11. Are you currently prescribed Adderall, Ritalin, or Dexedrine?
- a. Yes
 - b. No
12. Have you ever been prescribed Adderall, Ritalin, or Dexedrine?
- a. Yes
 - b. No
13. Have you ever used Adderall, Ritalin, or Dexedrine? (both with or without a prescription)
- a. Yes
 - b. No

/// PAGE BREAK: only for those who answered „Yes” to Question 13:

14. Within the past year about how often have you used Adderall, Ritalin, or Dexedrine?
- a. Never
 - b. 1 or 2 times / year
 - c. 1 or 2 times / month
 - d. 1 or 2 times / week
 - e. 3 – 5 times / week
 - f. more than 5 times / week
15. During the past 30 days how many times did you take Adderall, Ritalin or Dexedrine?
- a. 0 times
 - b. 1-2 times
 - c. 3-5 times
 - d. 5-10 times

e. more than 10 times

16. Please indicate how often you have experienced the following due to your Adderall, Ritalin or Dexedrine use:

	Never	Occasionally	Sometimes	Often	Almost always	Every time I take it
• Been in trouble with the police, residence hall, or other college authorities • Got into an argument or fight • Got nauseated or vomited • Been criticized by someone you know • Thought you might have an addiction problem • Tried unsuccessfully to stop using • Flushing, elevated body temperature or excessive sweating • Dry mouth • Headache • Diarrhea or constipation • Decreased appetite • Dizziness or blurred vision • Insomnia • Abnormal heartbeat						

• Anxiety • Irritability or aggressiveness • Hallucinations						
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17. Please indicate how often you have experienced the following due to your Adderall, Ritalin or Dexedrine withdrawal during the last year:

	Never	Occasionally	Sometimes	Often	Almost always	Every time I take it
• Fatigue • Depression • Increased appetite • Anxiety • Irritability or aggressiveness • Headaches • Excessive sleeping • Suicidal thoughts						

18. Would you still take Adderall, Ritalin or Dexedrine if nobody on your campus took it (without a prescription)?
- Yes
 - No
19. Why do you take Adderall, Ritalin or Dexedrine? (Multiple answers are possible)
- To improve my understanding and retention of the course material.
 - To improve or keep up my GPA.
 - To keep up with other students who use these drugs
 - To help with occasional big projects, such as midterms, papers, or finals.
 - To party / for recreational purposes.

f. Other (please specify)

/// PAGE BREAK: everybody:

20. During the next 30 days how many times are you planning on taking Adderall, Ritalin or Dexedrine?
- a. 0 times
 - b. 1-2 times
 - c. 3-5 times
 - d. 6-10 times
 - e. more than 10 times
21. How often do you go out in a typical month?
- a. Never
 - b. 1 or 2 times a month
 - c. Once a week
 - d. 2 or 3 times a week
 - e. More than 3 times a week
22. How much do you care about your academic achievement?
- 1: I care about it very little; 5: I care about it a lot
- 1 2 3 4 5
23. In your opinion, how much do you care about your academic achievement compared to the typical student on your campus?
- a. I care less than the typical student
 - b. I care about as much as the typical student
 - c. I care more than the typical student
24. In your opinion, what percentage of the students on your campus have used Adderall, Ritalin or Dexedrine at least once in their lives?
(Please write a number between 0 and 100)
- a. [open ended]
25. In your opinion, what percentage of the students on your campus have used Adderall, Ritalin or Dexedrine at least once in the past 30 days?
(Please write a number between 0 and 100)
- a. [open ended]

26. How often do you think the typical student on your campus uses Adderall, Ritalin or Dexedrine?
- Never
 - 1 or 2 times / year
 - 1 or 2 times / month
 - 1 or 2 times / week
 - 3 – 5 times / week
 - more than 5 times / week
27. In your opinion, how often do your best friends use Adderall, Ritalin or Dexedrine?
- Most of them take it less often than I do
 - Most of them take it about as often (as rarely) as I do
 - Most of them take it more often than I do
28. What do you think about those who take Adderall, Ritalin or Dexedrine without a prescription?
(-3 = disapproval; 0 = indifference; 3 = approval)
- | | | | | | | |
|----|----|----|---|---|---|---|
| -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|----|----|----|---|---|---|---|
29. In your opinion, what does the typical student on your campus think about those who take Adderall, Ritalin or Dexedrine without a prescription?
(-3 = disapproval; 0 = indifference; 3 = approval)
- | | | | | | | |
|----|----|----|---|---|---|---|
| -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|----|----|----|---|---|---|---|
30. Should Adderall, Ritalin and Dexedrine be available for everyone?
- Yes
 - No

/// INTERVENTION --- Have you paid attention?

You are DONE!!!

Now please go to this website and watch this approximately 3-minute presentation:

<http://prezi.com/szvjoj8j-zhl/intervention-3/>

Click in "More" and "Fullscreen", and then keep clicking on the arrow. It works like a PowerPoint presentation, only cooler :)

- I have watched the presentation, and I'm ready to finish this survey. However, I still need to answer 3 questions. But it won't take more than 1 minute. And then it's over.

31. The percentage of college students who have never tried Adderall is:
 - a. Below 25%
 - b. About 40%
 - c. More than 90%
32. In general, the GPA of those who take Adderall without a prescription is:
 - a. 4.0 or higher
 - b. between 3.0 and 4.0
 - c. 3.0 or lower
33. Those who take Adderall without a prescription are ...
 - a. ... 20 times more likely to use cocaine
 - b. ... 3 times less likely to use cocaine
 - c. ... 10 times less likely to use marijuana

Appendix 2: Intervention

The presentation can be found at <http://prezi.com/szvjoj8j-zhl/intervention-3/>.

The exact wording of the presentation is the following:

“The illicit use of ADHD medications among college students

How common is the non-prescribed use of Adderall?

According to the most widely cited study:

- 93.1% of the students have NEVER tried it
- 95.9% have not used it in the past year
- 97.9% have not used it in the past month.

This study was a national survey, with a representative sample of:

- 10,904 students
- from 119 America four-year colleges.

(McCabe et al., University of Michigan’s Substance Abuse Research Center).

Who takes Adderall without a prescription?

More likely to...

- be white or Latino than African American or Asian
- be male
- be member of a fraternity / sorority
- have a GPA of 3.0 or lower

Who take Adderall without a prescription?

They are...

- 5 times more likely to drive after binge drinking
- 10 times more likely to smoke marijuana
- 20 times more likely to use cocaine
- and generally more likely to use alcohol, cigarettes, and ecstasy

Most (over 90% of) college students never use ADHD medications.

Thank you for your attention!”

Appendix 3: Follow-up survey

1. Have you read the Informed Consent Form?

- a. Yes, and I hereby consent to my participation in this research project.

2. ID:

(Please type in the same ID that you used in the first survey. Remember, that your ID should be a 6 digit number, consisting of the 2 digit day of your father's birthdate, the 2 digit day of your mother's birth date, and of the 2 digit day of your own birth date. So, if my father was born on October 11, my mother on March 26, and I on May 2, then my ID is: 11-26-02.)

- a. [open ended]

3. College

- a. [open ended]

4. Age

- a. [open ended]

5. Gender

- a. Male
- b. Female

6. Classification

- a. Freshman
- b. Sophomore
- c. Junior
- d. Senior

7. Are you currently prescribed Adderall, Ritalin, or Dexedrine?

- a. Yes
- b. No

8. Have you ever been prescribed Adderall, Ritalin, or Dexedrine?

- a. Yes
- b. No

9. Have you ever used Adderall, Ritalin, or Dexedrine? (both with or without a prescription)
- Yes
 - No

/// PAGE BREAK: only for those who answered „Yes” to Question 9:

10. Within the past year about how often have you used Adderall, Ritalin, or Dexedrine?
- Never
 - 1 or 2 times / year
 - 1 or 2 times / month
 - 1 or 2 times / week
 - 3 – 5 times / week
 - more than 5 times / week
11. During the past 30 days how many times did you take Adderall, Ritalin or Dexedrine?
- 0 times
 - 1-2 times
 - 3-5 times
 - 5-10 times
 - more than 10 times
12. Please indicate how often you have experienced the following due to your Adderall, Ritalin or Dexedrine use:

	Never	Occasionally	Sometimes	Often	Almost always	Every time I take it
• Been in trouble with the						

police, residence hall, or other college authorities • Got into an argument or fight • Got nauseated or vomited • Been criticized by someone you know • Thought you might have an addiction problem • Tried unsuccessfully to stop using • Flushing, elevated body temperature or excessive sweating • Dry mouth • Headache • Diarrhea or constipation • Decreased appetite • Dizziness or blurred vision • Insomnia • Abnormal heartbeat • Anxiety • Irritability or aggressiveness • Hallucinations						
---	--	--	--	--	--	--

13. Please indicate how often you have experienced the following due to your Adderall,

Ritalin or Dexedrine withdrawal during the last year:

	Never	Occasionally	Sometimes	Often	Almost always	Every time I take it
• Fatigue • Depression • Increased appetite • Anxiety • Irritability • Headaches • Excessive sleeping • Suicidal thoughts or aggressiveness						

14. Would you still take Adderall, Ritalin or Dexedrine if nobody on your campus took it (without a prescription)?

- Yes
- No

15. Why do you take Adderall, Ritalin or Dexedrine? (Multiple answers are possible)

- To improve my understanding and retention of the course material.
- To improve or keep up my GPA.
- To keep up with other students who use these drugs
- To help with occasional big projects, such as midterms, papers, or finals.
- To party / for recreational purposes.
- Other (please specify)

/// PAGE BREAK: everybody:

16. During the next 30 days how many times are you planning on taking Adderall, Ritalin or Dexedrine?
- a. 0 times
 - b. 1-2 times
 - c. 3-5 times
 - d. 6-10 times
 - e. more than 10 times
17. How often do you go out in a typical month?
- a. Never
 - b. 1 or 2 times a month
 - c. Once a week
 - d. 2 or 3 times a week
 - e. More than 3 times a week
18. How much do you care about your academic achievement?
- 1: I care about it very little; 5: I care about it a lot
- 1 2 3 4 5
19. In your opinion, how much do you care about your academic achievement compared to the typical student on your campus?
- a. I care less than the typical student
 - b. I care about as much as the typical student
 - c. I care more than the typical student
20. In your opinion, what percentage of the students on your campus have used Adderall, Ritalin or Dexedrine at least once in their lives?
(Please write a number between 0 and 100)
- a. [open ended]

21. In your opinion, what percentage of the students on your campus have used Adderall, Ritalin or Dexedrine at least once in the past 30 days?
(Please write a number between 0 and 100)
- a. [open ended]
22. How often do you think the typical student on your campus uses Adderall, Ritalin or Dexedrine?
- a. Never
- b. 1 or 2 times / year
- c. 1 or 2 times / month
- d. 1 or 2 times / week
- e. 3 – 5 times / week
- f. more than 5 times / week
23. In your opinion, how often do your best friends use Adderall, Ritalin or Dexedrine?
- a. Most of them take it less often than I do
- b. Most of them take it about as often (as rarely) as I do
- c. Most of them take it more often than I do
24. What do you think about those who take Adderall, Ritalin or Dexedrine without a prescription?
(-3 = disapproval; 0 = indifference; 3 = approval)
- 3 -2 -1 0 1 2 3
25. In your opinion, what does the typical student on your campus think about those who take Adderall, Ritalin or Dexedrine without a prescription?
(-3 = disapproval; 0 = indifference; 3 = approval)
- 3 -2 -1 0 1 2 3
26. Should Adderall, Ritalin and Dexedrine be available for everyone?
- a. Yes
- b. No
27. Thank you so much for completing both questionnaires! You really helped me a lot with

my thesis.

- a. You're welcome.

Appendix 4: Statistical tests and regressions

a. Pluralistic ignorance concerning approval:

Test for Equality of Medians Between Series Date: 11/01/12 Time: 07:52 Sample: 1 58 Included observations: 58					
Method	df	Value	Probability		
Wilcoxon/Mann-Whitney		2.959610	0.0031		
Wilcoxon/Mann-Whitney (tie-adj.)		3.286400	0.0010		
Med. Chi-square	1	3.362319	0.0667		
Adj. Med. Chi-square	1	2.574275	0.1086		
Kruskal-Wallis	1	8.775641	0.0031		
Kruskal-Wallis (tie-adj.)	1	10.82058	0.0010		
van der Waerden	1	11.90873	0.0006		
Category Statistics					
Variable	Count	Median	> Overall Median	Mean Rank	Mean Score
ME_APPROVE	58	3.000000	8	49.25000	-0.285720
OTHERS_APPROVE	58	3.000000	16	67.75000	0.284252
All	116	3.000000	24	58.50000	-0.000734

b. Pluralistic ignorance concerning frequency of use:

. ttest friends_freq=1						
One-sample t test						
Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
friend~q	58	1.172414	.0891512	.6789551	.9938916	1.350936
mean = mean(friends_freq)					t =	1.9339
Ho: mean = 1					degrees of freedom =	57
Ha: mean < 1		Ha: mean != 1		Ha: mean > 1		
Pr(T < t) = 0.9710		Pr(T > t) = 0.0581		Pr(T > t) = 0.0290		

c. Test of proportion: does fraternity membership affect usage?

. prtesti 18 0.6667 36 0.4444					
Two-sample test of proportion			x: Number of obs = 18		
			y: Number of obs = 36		
Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.6667	.1111083			.4489317 .8844683
y	.4444	.0828165			.2820826 .6067174
diff	.2223	.1385772			-.0493063 .4939063
	under Ho:	.1442387	1.54	0.123	
diff = prop(x) - prop(y)			z = 1.5412		
Ho: diff = 0					
Ha: diff < 0			Ha: diff != 0		
Pr(Z < z) = 0.9384			Pr(Z < z) = 0.1233		
			Ha: diff > 0		
			Pr(Z > z) = 0.0616		

d. Probit: first regression

Dependent Variable: EVER_USED					
Method: ML - Binary Probit (Quadratic hill climbing)					
Date: 11/07/12 Time: 18:14					
Sample (adjusted): 2 58					
Included observations: 56 after adjustments					
Convergence achieved after 6 iterations					
Covariance matrix computed using second derivatives					
Variable	Coefficient	Std. Error	z-Statistic	Prob.	
C	2.881721	4.943840	0.582891	0.5600	
FRAT	0.233679	0.669336	0.349121	0.7270	
CLASS	0.341769	0.245349	1.392988	0.1636	
GENDER	0.277075	0.743928	0.372448	0.7096	
GPA	-0.887932	1.133671	-0.783236	0.4335	
CARE_EDU	-0.775362	0.645231	-1.201681	0.2295	
CARE_MORE	0.425139	0.730057	0.582336	0.5603	
FRIENDS_FREQ	-0.614777	0.418409	-1.469323	0.1417	
OTHERS_FREQ	-0.438187	0.391404	-1.119526	0.2629	
LEGALIZE	0.850248	0.543696	1.563829	0.1179	
ME_APPROVE	0.423631	0.218801	1.936143	0.0529	
OTHERS_APPROVE	-0.453322	0.268175	-1.690395	0.0910	
OTHER_PAST30	0.019437	0.021385	0.908893	0.3634	
OTHERS_TRIED	0.018835	0.019792	0.951613	0.3413	
PARTY	0.848698	0.411417	2.062864	0.0391	
McFadden R-squared	0.489466	Mean dependent var		0.553571	
S.D. dependent var	0.501621	S.E. of regression		0.402906	
Akaike info criterion	1.237593	Sum squared resid		6.655654	
Schwarz criterion	1.780098	Log likelihood		-19.65260	
Hannan-Quinn criter.	1.447921	Deviance		39.30521	
Restr. deviance	76.98839	Restr. log likelihood		-38.49420	
LR statistic	37.68319	Avg. log likelihood		-0.350939	
Prob(LR statistic)	0.000581				
Obs with Dep=0	25	Total obs		56	
Obs with Dep=1	31				

e. Probit: last regression

Dependent Variable: EVER_USED				
Method: ML - Binary Probit (Quadratic hill climbing)				
Date: 11/07/12 Time: 18:44				
Sample: 1 58				
Included observations: 58				
Convergence achieved after 6 iterations				
Covariance matrix computed using second derivatives				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.566797	2.915415	0.194414	0.8459
FRAT	0.575775	0.586628	0.981500	0.3263
CLASS	0.377319	0.209748	1.798912	0.0720
CARE_EDU	-0.817919	0.532726	-1.535346	0.1247
FRIENDS_FREQ	-0.519938	0.405574	-1.281980	0.1998
OTHERS_FREQ	-0.385353	0.325617	-1.183454	0.2366
LEGALIZE	0.943679	0.531137	1.776714	0.0756
ME_APPROVE	0.484264	0.196289	2.467096	0.0136
OTHERS_APPROVE	-0.462809	0.250700	-1.846070	0.0649
OTHERS_TRIED	0.036728	0.013893	2.643747	0.0082
PARTY	0.690393	0.345096	2.000581	0.0454
McFadden R-squared	0.470258	Mean dependent var		0.551724
S.D. dependent var	0.501661	S.E. of regression		0.386068
Akaike info criterion	1.108009	Sum squared resid		7.005268
Schwarz criterion	1.498782	Log likelihood		-21.13226
Hannan-Quinn criter.	1.260223	Deviance		42.26451
Restr. deviance	79.78327	Restr. log likelihood		-39.89164
LR statistic	37.51876	Avg. log likelihood		-0.364349
Prob(LR statistic)	0.000046			
Obs with Dep=0	26	Total obs		58
Obs with Dep=1	32			

f. Probit: last regression with marginal effects

. mfx compute								
Marginal effects after probit								
y = Pr(everused) (predict)								
= .63188331								
variable	dy/dx	Std. Err.	z	P> z	[	95% C.I.	]	x
frat*	.2056715	.19431	1.06	0.290	-.175159	.586502		.310345
class	.1422262	.07741	1.84	0.066	-.009487	.29394		1.86207
care_edu	-.3083057	.1947	-1.58	0.113	-.689909	.073298		4.65517
fr~sfreq	-.1959851	.14867	-1.32	0.187	-.487372	.095402		1.17241
others~q	-.1452546	.12083	-1.20	0.229	-.382068	.091559		1.98276
legalize*	.3232695	.16086	2.01	0.044	.007996	.638543		.327586
me_app~e	.1825381	.07286	2.51	0.012	.039734	.325342		2.63793
others~e	-.1744508	.09385	-1.86	0.063	-.358388	.009487		3.39655
others~d	.0138443	.00511	2.71	0.007	.003825	.023864		65.6897
party	.2602361	.12909	2.02	0.044	.007224	.513248		2.37931
(*) dy/dx is for discrete change of dummy variable from 0 to 1								

g. Fraternity as dependent variable

Dependent Variable: FRAT				
Method: ML - Binary Probit (Quadratic hill climbing)				
Date: 11/07/12 Time: 21:28				
Sample (adjusted): 2 58				
Included observations: 56 after adjustments				
Convergence achieved after 6 iterations				
Covariance matrix computed using second derivatives				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.065255	3.141533	-0.020772	0.9834
CLASS	0.246528	0.238000	1.035832	0.3003
GENDER	1.082589	0.581864	1.860553	0.0628
GPA	-0.780680	0.843625	-0.925387	0.3548
CARE_MORE	0.420680	0.539561	0.779670	0.4356
FRIENDS_FREQ	0.711138	0.319251	2.227522	0.0259
OTHERS_FREQ	0.140619	0.271268	0.518375	0.6042
LEGALIZE	0.290208	0.485570	0.597663	0.5501
OTHERS_APPROVE	-0.183778	0.221411	-0.830032	0.4065
OTHERS_TRIED	-0.026364	0.012894	-2.044582	0.0409
PARTY	0.528256	0.262371	2.013391	0.0441
McFadden R-squared	0.307449	Mean dependent var	0.321429	
S.D. dependent var	0.471251	S.E. of regression	0.413861	
Akaike info criterion	1.262620	Sum squared resid	7.707645	
Schwarz criterion	1.660457	Log likelihood	-24.35337	
Hannan-Quinn criter.	1.416861	Deviance	48.70674	
Restr. deviance	70.32946	Restr. log likelihood	-35.16473	
LR statistic	21.62272	Avg. log likelihood	-0.434882	
Prob(LR statistic)	0.017146			
Obs with Dep=0	38	Total obs	56	
Obs with Dep=1	18			

h. Intervention: Pluralistic ignorance: percentage

Test for Equality of Medians Between Series					
Date: 11/07/12 Time: 22:16					
Sample: 1 58					
Included observations: 58					
Method	df	Value	Probability		
Wilcoxon/Mann-Whitney		3.250022	0.0012		
Wilcoxon/Mann-Whitney (tie-adj.)		3.264213	0.0011		
Med. Chi-square	1	11.91175	0.0006		
Adj. Med. Chi-square	1	10.65908	0.0011		
Kruskal-Wallis	1	10.58083	0.0011		
Kruskal-Wallis (tie-adj.)	1	10.67343	0.0011		
van der Waerden	1	9.966503	0.0016		
Category Statistics					
Variable	Count	Median	> Overall Median	Mean Rank	Mean Score
OTHERS_TRIED	58	70.00000	38	68.02586	0.278581

XOTHERS_T RIED	57	50.00000	19	47.79825	-0.284649
All	115	60.00000	57	58.00000	-0.000585

i. Intervention: Pluralistic ignorance: approval

Test for Equality of Medians Between Series					
Date: 11/07/12 Time: 22:31					
Sample: 1 58					
Included observations: 58					
Method	df	Value	Probability		
Wilcoxon/Mann-Whitney		2.476557	0.0133		
Wilcoxon/Mann-Whitney (tie-adj.)		2.818726	0.0048		
Med. Chi-square	1	3.387508	0.0657		
Adj. Med. Chi-square	1	2.488781	0.1147		
Kruskal-Wallis	1	6.147376	0.0132		
Kruskal-Wallis (tie-adj.)	1	7.963410	0.0048		
van der Waerden	1	7.071155	0.0078		
Category Statistics					
Variable	Count	Median	> Overall Median	Mean Rank	Mean Score
XME_APPROVE	57	0.000000	5	49.82456	-0.224123
XOTHERS_APPROVE	57	0.000000	12	65.17544	0.211926
All	114	0.000000	17	57.50000	-0.006098

j. Intervention: Past 30 days usage

Test for Equality of Medians Between Series					
Date: 11/07/12 Time: 23:50					
Sample: 1 58					
Included observations: 58					
Method	df	Value	Probability		
Wilcoxon/Mann-Whitney		0.764591	0.4445		
Wilcoxon/Mann-Whitney (tie-adj.)		0.802176	0.4225		
Med. Chi-square	1	0.415243	0.5193		
Adj. Med. Chi-square	1	0.132221	0.7161		
Kruskal-Wallis	1	0.595682	0.4402		
Kruskal-Wallis (tie-adj.)	1	0.655685	0.4181		
van der Waerden	1	0.599736	0.4387		
Category Statistics					
Variable	Count	Median	> Overall Median	Mean Rank	Mean Score
PAST_30NUM	31	1.000000	8	29.27419	-0.046301
XPAST_30	30	1.000000	10	32.78333	0.109040
All	61	1.000000	18	31.00000	0.030096

k. Intervention: Next 30 days usage

Test for Equality of Medians Between Series					
Date: 11/07/12 Time: 23:51					
Sample: 1 58					
Included observations: 58					
Method	df	Value	Probability		
Wilcoxon/Mann-Whitney		0.553790	0.5797		
Wilcoxon/Mann-Whitney (tie-adj.)		0.619635	0.5355		
Med. Chi-square	1	0.417434	0.5182		
Adj. Med. Chi-square	1	0.209316	0.6473		
Kruskal-Wallis	1	0.309789	0.5778		
Kruskal-Wallis (tie-adj.)	1	0.387835	0.5334		
van der Waerden	1	0.846843	0.3574		
Category Statistics					
Variable	Count	Median	> Overall Median	Mean Rank	Mean Score
NEXT_30	58	0.000000	23	56.28448	0.023336
XNEXT_30	57	0.000000	26	59.74561	0.093074
All	115	0.000000	49	58.00000	0.057902

l. Intervention: Next 30 days in baseline vs. Past 30 days in follow-up

Test for Equality of Medians Between Series					
Date: 11/09/12 Time: 17:58					
Sample: 1 58					
Included observations: 58					
Method	df	Value	Probability		
Wilcoxon/Mann-Whitney		2.301933	0.0213		
Wilcoxon/Mann-Whitney (tie-adj.)		2.492172	0.0127		
Med. Chi-square	1	7.282759	0.0070		
Adj. Med. Chi-square	1	6.119540	0.0134		
Kruskal-Wallis	1	5.319179	0.0211		
Kruskal-Wallis (tie-adj.)	1	6.234696	0.0125		
van der Waerden	1	5.706461	0.0169		
Category Statistics					
Variable	Count	Median	> Overall Median	Mean Rank	Mean Score
NEXT_30	58	0.000000	23	39.98276	-0.095564
XPAST_30	30	1.000000	21	53.23333	0.326662
All	88	0.500000	44	44.50000	0.048377