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# THE ROLE OF INTERPERSONAL TRUST IN LARGE-SCALE VOLUNTARY COLLECTIVE ACTION DILEMMAS

New cross-sectional and experimental insights to  
antibiotics use in Sweden

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## Abstract

What is the role of interpersonal trust in large-scale voluntary collective action dilemmas? Many of the most pressing issues facing humanity are collective action problems, which require cooperation to be resolved. Previous studies have found that voluntary cooperation in small-scale dilemmas is possible when interpersonal trust between actors is present. However, there is a gap in our understanding whether interpersonal trust affects individual voluntary cooperation in large-scale dilemmas. Testing whether interpersonal trust has this link, and furthermore, effect on cooperation is applied to the case of antibiotics use in Sweden, which is a type of collective action dilemma. This study is separated into two parts where one examines stated behavior among individuals in Sweden using SOM-data. The second is a survey-experiment of anticipated stated behavior among Swedes using the Laboratory of Opinion Research (LORE). Using logistic regression, interpersonal trust was found to have a positive relationship with cooperation, even when controlling for other factors. The following survey experiment showed that information on the cooperativeness of others result in an increasing likelihood to abstain antibiotics. The results from the experiment indicate an interesting relationship, even if support for the hypothesis was not found. With unique data on a Swedish sample, this study contributes to the understanding of the role of interpersonal trust for individual voluntary behavior in large-scale collective action dilemmas such as antibiotic use.

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## 1 Introduction

The most salient issues that humans have been facing can be referred to as collective action problems. This includes the vast problems we are seeing today such as environmental degradation, access to safe drinking water (Ostrom 2010) and antibiotic resistance (Jørgensen et al. 2016; Laxminarayan and Heymann 2012; Rönnerstrand and Andersson Sundell 2015). These are examples of issues which demands many people to come together and coordinate its solution. The solution of which demands that people continuously contribute to the shared problem, something that is tend to be costly for the single individual. The point of departure is that, since individuals are tempted to make decisions in short-term self-interest, collective action theory projects a sub-optimal consumption of the resource or the good, leading to its under provision, or potentially, its depletion (Dawes 1980; Ostrom 1998).

Since *The Tragedy of the Commons* (Hardin, 1968) was presented, early solutions to the problem have regarded regulations of the commons, since self-interest among actors would not make it possible to solve the problems themselves and only lead to further depletion. Yet, there is voluntary action taken to limit personal use, particularly in settings of small-scale problems. We now know that mechanisms such as communication, trust, possible future interactions and agreements, and rules also contribute to explain human behavior in a dilemma situation, together with self-interest. (Dietz et al.: 5).

Furthermore, and contrary to the theoretical assumptions, collective action has also been found when studying large-scale problems, contrary to the theoretical assumptions. Examples of such large-scale collective action is paying taxes and recycling waste (Sønderskov 2009). What is yet to be explored is what could lead to behavior of voluntary collective action in large-scale settings where effective mechanisms such as communication, trust and possible future interactions and agreements are increasingly difficult, or even impossible, to occur.

One suggestion supposed to increase collective action is interpersonal trust, which has been studied in many collective action dilemmas, however, its effect on large-scale problems is yet to be understood. Interpersonal trust affects cooperation, according to theory and practice, and is related to positive societal outcomes (Nannestad 2008, Uslaner, 2000). When regarding small-scale problems, interpersonal trust has been found to increase cooperation and thus diverting the trajectory from a state of tragedy of the commons. Following previous research, the question is if interpersonal trust has an effect on increasing cooperative behavior in large-scale settings when important mechanisms in small-scale dilemmas are not pertinent.

The collective action dilemma which will be explored to discern if interpersonal trust can explain cooperation in this study, is antibiotics use. The growth of antibiotic resistance could be viewed as a collective action dilemma since it requires individual action, in the form of behavioral change, to solve a shared problem (Jørgensen et al. 2016; Laxminarayan and Heymann 2012; Rønnerstrand and Andersson Sundell 2015). I regard resistance as the collective action dilemma and the behavior of overconsumption as the contributing cause. Antibiotics as a remedy of bacterial infection has diminishing effects over time due to the increase of resistance. The depletion of this resource could be resolved through prudent consumption by individuals (Bell et al. 2014).

The thesis is structured as follows; the second chapter depicts the theoretical advancements of collective action theory and its possibilities to be applied on large-scale settings, the previous findings within collective action and trust-research. I also highlight the research gap and describe the theoretical model and the following hypotheses. The third chapter is the method chapter where the case, the method of surveys, binary logistic regression, survey experiment and ANOVA that are used, to test the hypotheses, are described. The fourth and fifth chapter are the analysis of the SOM survey and survey experiment in LORE, where the hypotheses are tested. The sixth chapter is a disseminating section in which the results are discussed. The seventh chapter consists of concluding remarks and suggestions for further research. The eighth chapter is references and sources.

## 2 Previous research

In this chapter I introduce collective action theory, recount previous findings within interpersonal trust research, identify the research gap, and lastly describe the theoretical model and hypotheses.

### 2.1 A first note on collective action

A collective action problem can be defined as a problem where individual benefits and incentives, as well as, group benefits and incentives are conflictual. The choice which individuals are facing is either to contribute to the common good or to act in self-interest (Ostrom 1998). Robyn Dawes (1980) defines it as the payoff for each individual is larger if the individual defects from the group interests, rather than cooperating, disregarding the actions of others. On the other hand, if everyone were to cooperate, the payoff would be higher for everyone. Apart from greed and self-interest preceding individual action, an

individual with an understanding of the salience of the issue, and who thus contributes to the common good, can easily find herself in the position of a “sucker” (Kollock 1998). The position of a “sucker” is achieved by not receiving the individual profit, yet also suffering from the collective harm. According to collective action theory, these are the factors of uncooperative behavior causing the detrimental state of the collective action dilemma.

Collective action problem is an umbrella term for the two kinds of problems typically known as coordination problems and social dilemmas. These problems are related but the difference is that coordination problems can have multiple Nash equilibria whereas social dilemmas only have one. A coordination problem has multiple solutions yet the dilemma situation, there is only one situation that is beneficial for the collective (Taylor [1976] 1987). In this thesis, I am interested in the study of social dilemmas, i.e. the more complex problem. From here on, I use the term collective action dilemma when recounting previous findings.

The difficulty, however, lies in resolving this issue and averting a situation like the tragedy of the commons by soliciting cooperative behavior. Early solutions to the collective action dilemma that have been given are rewards and punishment to change the payoff structure (Dawes, 1980), imposing a harsh external enforcement (Hardin, 1968), moderate rules and formal institutions with sanctions (Olson 1965) or through private property (Demsetz 1967). Albeit regulations, monitoring and punishment can be installed to attain its goals, it may come at a very high cost (Dawes, 1980).

Ellinor Ostrom (1990; 1998; Dietz et al. 2002), on the other hand, argue that collective action is possible on a small-scale without the installment of external enforcement. It is possible since actors want to solve a shared problem and may contribute to the common good voluntarily. Since her early discoveries, many have joined in believing that voluntary cooperation, in the form behavioral change when individuals side-step their short-term interest, can solve collective action dilemmas. This is particularly appealing since upholding voluntary cooperation may be more efficient compared to the costly installment of regulation and monitoring (Dawes 1980).

To make a distinction of the collective action situation of regulated and voluntary collective action dilemmas I present figure 1 below. In the figure, one can see the decision-making options an individual is faced with in the two different collective action situations. In a regulated dilemma, it is possible to either defect or to comply with the rules and regulations (Scholz and Lubell 1998). In the voluntary collective action situation, it is possible to either defect or to voluntarily contribute to the collective good (Ostrom 1998).

**Figure 1** Collective action decisions

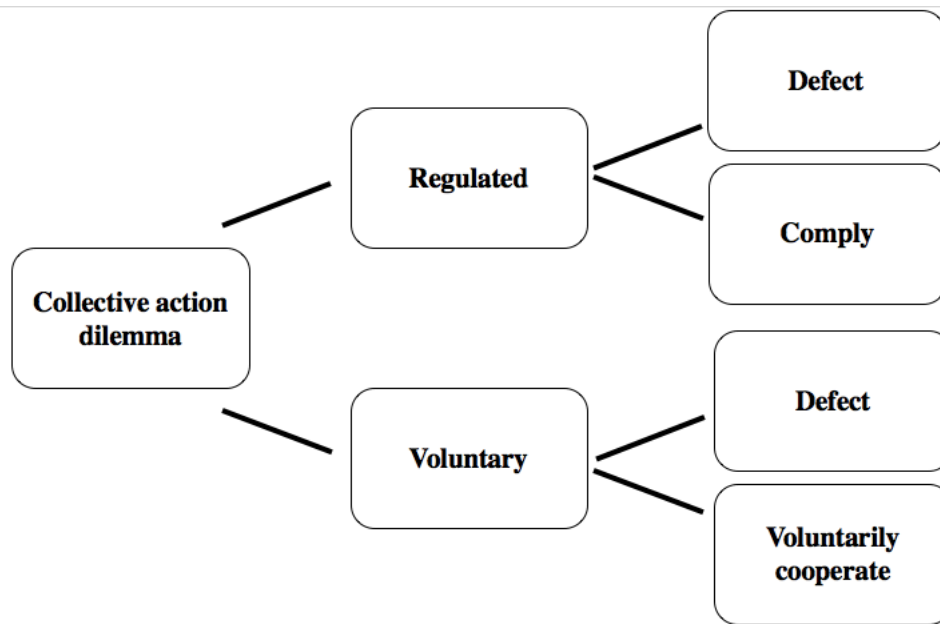


Table 1 I give an overview of what is chartered in collective action theory. 1) We know people comply in both small and large-scale regulated dilemmas and why they do this (Scholz and Lubell 1998). 2) We know voluntary cooperation occur in small and large-scale dilemmas (Ostrom 1998). We know why people cooperate in small-scale voluntary dilemmas, but why do people voluntarily cooperate in large-scale dilemmas?

While much of the previous studies within the field of voluntary collective action dilemmas have been focusing on small-scale dilemmas (Ostrom 1998; Kopelman et al. 2002; Gächter et al. 2004; Gächter & Hermann 2009), this study focus on *large-scale* collective action; a situation where collaboration is needed yet where the capacity to act is dispersed among a large number of actors. According to Andreas Duit (2011), greenhouse gas emissions, biodiversity loss and waste accumulation are examples of large-scale collective action problems with transboundary effects. This large number of actors are constrained by anonymity, little information on behavior of peers, temporal delays between actions and consequences, and few if any repeated interactions.

**Table 1** The research gap

	Small-scale	Large-scale
Regulated collective action	Effect	Effect
Voluntary collective action	Effect	<b>Unknown</b>



Many theories predict that when the group size increases, the possibility for collective action correspondingly decreases (Bendor and Mookherjee 1987). Mancur Olson (1965) also assumes that in a situation with many actors, only regulation and surveillance will effectively evade the situation from a tragedy of the commons. The argument is that as social responsibility spread in large groups, so does individual accountability when group size increases (Darley and Latané 1968; Fleishman 1980).

Despite that the individual benefit from contributing to the collective is smaller than the benefit from defecting, many people do contribute, contrary to early writings (Hardin 1980:101). We vote, do not commit crimes and limit our personal behavior even in situations where our personal contribution is miniscule or where our deserting will hardly be noticeable (Dawes 1980). The question is what induces voluntary cooperation in the large-scale setting?

While the small-scale situation is seemingly distinct from the large-scale version, it is still a good point of departure to begin with evidence where we know cooperation occurs. Throughout this chapter I will try to make the case how they are comparable.

## 2.2 Collective action research

In the following section I present the empirical lessons learnt about collective action dilemmas to overcome the tragedy of the commons.

After decades of empirical research, focus has been on rules and regulation, however, we now know that we need more than changing the payoff structure to ensure cooperative behavior to solve collective action problems (Levi, 1998).

Regulations and surveillance have an effect on collective action dilemmas, in both small and large-scale, real life and experimental settings. In these situations, regulations have been found to positively affect compliance and cooperative behavior. However, it only has an effect if trust in institutions is present (Scholz and Lubell 1998; Levi and Stoker 2000).

Yet, imposing monitoring systems and institutions controlling individual behavior may enhance cooperation, it does so at large costs. Sometimes the cost of such an institution is even larger than the cost of voluntary compliance (Dawes 1980). This would entail an increased efficiency if a solution besides enforcement was introduced.

In addition to privatization and external enforcement, later studies have underlined the importance of voluntary action to succumb small-scale dilemmas (Ostrom 1998; Kopelman et al. 2002; Gächter et al. 2004; Gächter & Hermann 2009). Factors such as communication, repeated interactions, possibility of surveillance, possibility to create and uphold rules as well

as trust among actors are typically present in situations where collective action on a small-scale has been found to occur (Dietz et al. 2002:5).

Collective action has advanced over the years from the narrow assumption on human behavior as solely based on self-interest to include a better explanation why people cooperate. Voluntary cooperation has been found when moral, conscience and social norms are present (Dawes 1980; Kerr et al. 1997). In an experiment on motivations behind choices by Messick and McClintock (1968), the authors found that few accept payments for only oneself with nothing for a friend. This implies that self-interest on its own does not explain human action. Moral can thus be a mechanism guiding decisions. Nevertheless, it is noteworthy that these are results from small-scale dilemmas or lab experiments.

Creating and upholding norms are particularly linked to communication which in experiments (Bonacich et al. 1976; Dawes et al. 1977) and in reality (Dietz et al. 2002: 5), indicated increased voluntary cooperation. Especially when it entailed face-to-face interaction (Dawes et al. 1977), which is possible in small-scale dilemmas and laboratory experiments.

Related to communication is reputation-building, which has also been found to be important to induce voluntary cooperation (Dietz et al. 2002: 5). In a small-scale dilemma or laboratory experiment you can create a reputation of being cooperative and thus potentially reap benefits from an increased cooperation from your peers. In a large-scale dilemma, it is difficult to discern if reputation-building influences peers and it is possible to disregard the action of others.

Another mechanism that was discovered to be influential in collective action is public disclosure. Anonymity is what is regarded to be the mechanism dissolving the benefits of communication and reputation-building in large-scale dilemmas. However, Kopelman et al. (2002) argue that social norms and assurance might not be as important in the large-scale dilemma as in the small-scale dilemma when anonymity exist and there is less possibility for face-to-face communication. Conversely, people seem to internalize norms and it is therefore possible to have cooperation, even when anonymity reigns, since many people are self-monitoring (Kerr et al. 1997).

One mechanism that has been fruitful in small-scale situations to increase cooperative behavior, is punishment, both institutional and social. However, this is unlikely in large-scale situations since intended social punishment, on the small-scale this could be in the form of defecting, will not be perceived as punishment and thus not increase the cooperative choice by the person who is being punished (Sønderskov 2009). Formal punishment in large-scale

situations is difficult since it entails large-monitoring costs and it is increasingly difficult to detect individual defectors in large numbers (Dawes 1980).

Another individual-level factor that has been found to influence individuals' willingness to reduce their own consumption, is their personal level of consumption, meaning that the more an individual consumes, the less willing he or she is to limit that consumption (Lebel and Lorek 2008; Peattie 2010).

How and to what extent an individual worries about the environment and climate change is closely tied to the way individuals are willing to act with concern for the planet and its resources (Stern et al. 1999; Stern 2000; Harring and Jagers 2013).

Uncertainty of group size and of the resource is often regarded to be detrimental for cooperation, yet this might not always be the case (Kopelman et al. 2002:127). Van Dijk et al. (1999) found that in complex dilemmas, cooperation depends on if the resource is a public good or a commons resource, the degree of inequality among actors, and type of uncertainty. Uncertainty does not only regard the action of others but also of the relative gain of cooperation or contribution. Van Dijk et al. (1999) find that uncertainty does not necessarily decrease cooperation.

Many experimental studies have found that the result of voluntary contributions is independent on the number of participants. In a study by Isaac et al. (1994), they find that contributions in a public goods game approach the Nash equilibrium even when the number of players increases. They find that contributions are not dependent on number of participants but rather on the relative gains. This evidence from experiments supports findings in reality, that large-scale collective action is possible.

Lessons from the laboratory experiments on collective action dilemmas are that in public goods games, cooperation occurs and tends to be high initially but slowly declines in repeated interactions (Burton-Chellew et al. 2017).

The previous studies have had focus on small-scale dilemmas and lab experiments. The experiments are often small, with low number of participants, who are usually students in western universities, playing games using tokens. It is arguable how applicable these experiments are on behavior of the whole population.

In this section I have described the differences in voluntary collective action in small and large-scale situations. Another suggestion to solve large-scale dilemmas is interpersonal trust (Levi 1998; Uslander 2002; Sønderskov 2009). In the next section I will describe how and why interpersonal trust can affect voluntary cooperation.

### 2.3 Interpersonal trust

Interpersonal trust has been found to be important in a multitude of settings, it affects how we vote, how we interact with other's in society and how we make decisions (Uslaner 2008). During the last 20 years, there has been a global expansion in scientific interest in trust-research within the social sciences. The study of trust was ignited by Robert Putnam (1993), in the field of social capital where he argued that trust leads to economic prosperity and good governance. He argues that trust, as an important component within social capital together with norms and networks, to promote large-scale cooperation. Despite being a contended concept, there is some agreement of the connotation. Interpersonal trust is commonly denoted as "the belief that most people can be trusted" (Uslaner 2000).

Previous studies have found that interpersonal trust influences voluntary action and contribution (Levi 1998; Uslaner 2002; Sønderskov 2009). For example, paying taxes and recycling have been found to be affected by interpersonal trust (Sønderskov 2009). We know that interpersonal trust affect voluntary action to overcome collective action problems on a small scale (Dietz et al. 2002: 5). We also know that something is soliciting prosocial behavior in large scale settings, e.g. Sønderskov (2009) found that interpersonal trust may be the factor fostering cooperation. But we know less of the mechanism linking trust to cooperation. Applying small-scale theory on large-scale situations is a good start, yet its application is likely to differ. This since trust and trustworthiness may act differently in large-scale situations compared to small scale-situations (Hardin 1982; Ostrom 1990). I will start to untangle what interpersonal trust is and how it is suggested to be linked to cooperation.

Firstly, research on trust can be separated into whether it is depending upon rationality depending on norms or moral. The aspect of rationality regards the consequences of the actions, whereas norms relate to the appropriateness of actions. Whereas moral is a learnt world view. Secondly, trust can be considered particularized or generalized, where the former relates trust to a particular person in a given situation and the latter that trust is possible in general or hypothetical situations (Nannestad 2008). A common example of particularity is that people trust a doctor to perform a medical checkup but not necessarily to babysit your children (Nannestad 2008).

Trust has many definitions but a starting point could be Julian Rotter's (1971: 444) definition of interpersonal trust as "(...) an expectancy held by an individual or a group that the word, promise, verbal, or written statement of individual or group can be relied on." Trust is theorized to forego individual behavior, where distrust is projected to foster caution,

surveillance, noncompliance or dissolving of a relationship (Levi and Stoker 2000). Distrust is thus connected to the demise of collective action or the tragedy of the commons.

When it comes to the relationship between trust and cooperation, most scholars studying interpersonal trust have been focused on the conditionality of individual action. This means that most people cooperate if they trust that others will cooperate as well. If they perceive others to be cheating, i.e. free riding, they adapt to this behavior instead (Nannestad 2008).

Contrary to the rational account is the moral-driven concept. Eric Uslaner (2000, 2002) argue that some people are unconditional cooperators, namely they contribute no matter the actions of others. The actions of unconditional cooperators reflect their world view based on optimism, egalitarianism and values appertain to Protestantism. This is a socialized concept and can be learnt, and is different from the rational view, since it is not experienced.

Similar to the moralistic account given by Uslaner, is Margaret Levi's (1998) ethical reciprocity argument, stipulating that people are contingent consenters who make decisions with ethical considerations. This means that they want to contribute to the common good, yet are still interested in the actions of others. Levi (1998) make the case that people need information to constantly revisit and update their beliefs about others' action. Preceding decision-making, people have moral considerations, which makes them cooperate even when short-term benefits favors non-compliance. This is subject to change if the price of cooperation is too costly. Thus, she argues, that people are both strategic and ethical actors. Many collective action researchers agree that having the belief that others will cooperate seems to matter when people are making decisions regarding their own cooperation, e.g. people are conditional cooperators (Levi 1998; Gächter and Herrmann, 2009).

Direct reciprocity has been found to increase cooperation in repeated games. A study by Fischbacher et al. (2001) support the conditional cooperation theory since 50 % of the participants in the public goods games were conditional cooperators. However, this is unlikely in the large-scale situation due to anonymity and the number of participants.

Though reciprocity works in both ways and can also increase and uphold negative behavior. The same goes for interpersonal trust, it can create benefits or deficits (Levi, 2001). It is important to note that interpersonal trust or reciprocity on its own is not a virtue, sometimes distrust is the logical response when the risk of exploitation is large (Levi, 1998).

Although, the argument regarding trust being a measure of trustworthiness and reciprocity have been contended (Dufwenberg and Gneezy, 2000). In one-shot games played with money, neither trust nor trustworthiness pays off. Trust as a response does not have to be due to reciprocity or having expectations the donation would be returned but through the giver

appreciating this act (Ashraf et al. 2006; Fehr and Schmidt, 1999). Trust and trustworthiness can thus occur due to a preference or because it is based on norms.

Other ongoing debates regard what is the changeability of trust – is it fixed or fluid? Nannestad (2008) argue that since the availability of data on interpersonal trust does not date back far in time it is a difficult question to answer. Interpersonal trust is most commonly studied through the survey question “Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?” However, many repeated surveys of interpersonal trust find similar proportions in repeated analysis and conclude that trust seems to be quite stable on the national level. On the individual level, there seems to be more potential for changeability (Nannestad 2008). In an experimental study by Diana Mutz (2005) she finds that individuals’ appreciation of the trustworthiness of others can be manipulated by what they read, in this example by a magazine. This supports the notion that interpersonal trust is possible to change.

Summarizing the different theories on trust, one can conclude that only the rational account and ethical reciprocity are able to be fluid. The essence of unconditional cooperation, however, is that it is fixed. In a large-scale situation, rationalistic trust is not reasonable to occur, since the benefits of non-cooperation is large. If cooperation occurs, it is more plausible to be moralistic or norm-driven.

Contesting theories also consider interpersonal trust to be an important mechanism. Institutional theory (Rothstein and Stolle 2002; Farrell and Knight 2003) and social capital literature (Putnam 1993) are examples of this, making the application and further scrutiny of this concept an interesting endeavor.

The interpersonal explanation of cooperation has been contended by institutional theorists who argue that well-functioning institutions can mediate the trust between individuals since people can expect institutions to monitor and apply sanctions when necessary (Farrell and Knight 2003; Levi 1998, Rothstein and Stolle 2002). Scholz and Lubell (1998) found that institutional trust together with interpersonal trust are important in both large and small-scale dilemmas when regulation of the resource is installed. They argue that if these factors are both present, costly monitoring and surveillance can be avoided. Thus, it is difficult to discern if good institutions foster individuals to trust each other and or if trusting individuals create better institutions (Nannestad 2008).

In conclusion, I am investigating consequences of interpersonal trust, such as cooperation, not the preceding causes of trust. This is the reason why I do not aim to resolve the argument between which came first, institutional or interpersonal trust, but only conclude

that both are important for cooperative behavior. When regarding unregulated collective action dilemmas, voluntary cooperation is more dependent on interpersonal trust, which is why it is in focus in this study. However, since these concepts are related, both are included in the analysis. Furthermore, I assume that interpersonal trust is both subject to change and is dependent on the trustworthiness of others.

The small-scale situation is seemingly distinct from the large-scale version. Yet it is a good point of departure to begin with evidence where we know cooperation occurs. Moreover, interpersonal trust seems to be one of the factors which remains in large-scale dilemmas. The difference being that interpersonal trust can be rational on a small-scale but is less plausible under the large-scale conditions. The norm and moralistic accounts are more plausible to foster cooperation when the dilemma is upscaled.

Thus far, I give an account for what is already known of interpersonal trust and collective action. The options an individual has is to contribute to the common good or act in self-interest (Ostrom, 1999). Furthermore, decision-making in collective action situations is depending on if the dilemma is regulated or voluntary (see figure 1). If it is regulated you can either defect or comply. If it is unregulated you can either defect or voluntarily cooperate. I stated that we know interpersonal trust increases cooperation in small-scale collective action (Dietz et al. 2002:5). Furthermore, we know institutional trust increases compliance in both small and large-scale situations when the resource is regulated (Scholz and Lubell 1998; Levi and Stoker 2000) (See table 1). What is yet to be disentangled is if interpersonal trust leads to cooperation in large-scale situations? And if so, what is the role of interpersonal trust in inducing cooperation in large-scale situations? Is the belief of the actions of others a possible mechanism connecting interpersonal trust and cooperation?

## 2.4 Theoretical model and hypotheses

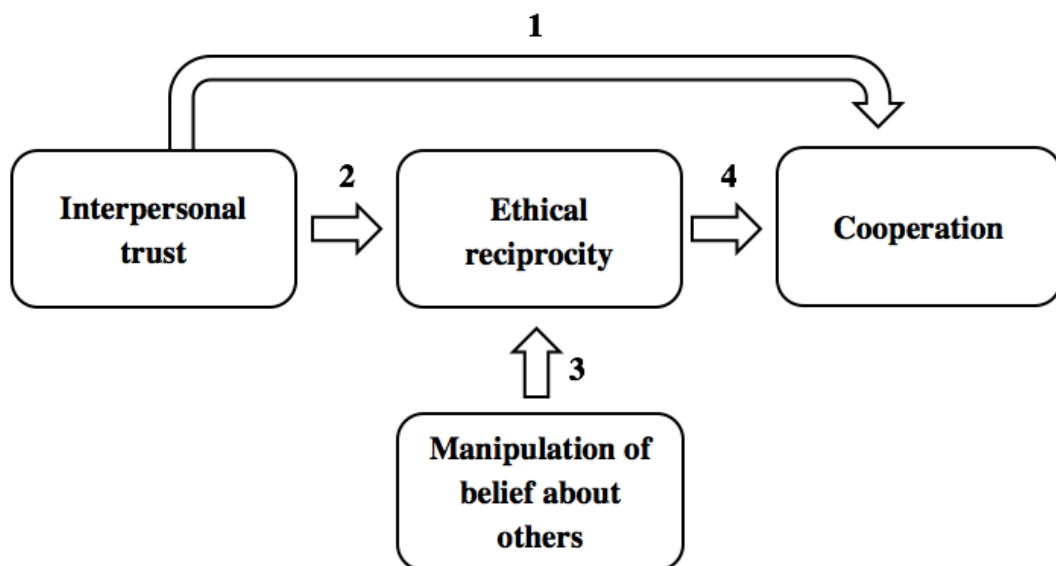
In this section I present my theoretical model and which mechanism I suggest connects trust and cooperation in a large-scale collective action dilemma.

I argue that the factor which cause individuals to take voluntary actions to contribute to the common good in the large-scale setting is interpersonal trust. In Figure 2 I present the theoretical model where higher levels of interpersonal trust leads to higher levels of cooperation. I base this on the theory of ethical reciprocity by Levi (1998) which claim that individuals have ethical considerations in mind when making decisions in a cooperation situation and want to contribute to the common good. In the theoretical model (see figure 2,

arrow 1), I suppose that interpersonal trust will be correlated with cooperation. The first hypothesis relates to the first part of the study where correlation between interpersonal trust and cooperation will be tested. I assume that individuals who report higher levels of interpersonal trust have a higher willingness to abstain from using a resource. The willingness to abstain from using a resource is related to cooperation since the abstention would be a side-step from self-interest and thus a contribution to the common good.

**H<sub>1</sub>:** *Higher levels of interpersonal trust is positively correlated with a higher propensity to take voluntary action to decrease one's own use of a resource.*

**Figure 2** The theoretical model – interpersonal trust and cooperation



If there is a relationship between interpersonal trust and cooperation, I will use experiments to determine what the inherent mechanism there is in interpersonal trust that leads to cooperation. I argue that ethical reciprocity, the belief about the action of others, to be the mechanism linking interpersonal trust to cooperation. People do not want to be “suckers”, and therefore contribute to the common good only insofar as they perceive others to contribute or will contribute as well (Figure 1, arrow 2 and 4). The second hypothesis relates to my assumption that if you perceive others to be cooperating, you will be more willing to cooperate yourself. This will be the second part of the study aiming at explaining causality where I will manipulate the belief of others (not interpersonal trust) to see if this suggested mechanism of interpersonal trust can explain large-scale voluntary cooperation (Figure 1, arrow 3 and 4).



*H<sub>2</sub>: Higher beliefs of the cooperation of others has a positive effect on the propensity to take voluntary action to decrease one's own use of a resource*

### 3 Method

In the chapter that follows I start to explain the case and move on to the methods used, namely, survey method and survey experiment, to answer my hypotheses. I also discuss the data and operationalization and end the chapter with highlighting potential confounders.

#### 3.1 Case: Antibiotic resistance

Antibiotic resistance could be viewed as a collective action problem since it requires individual action, in the form of behavioral change, to solve a shared problem (Jørgensen et al. 2016; Laxminarayan and Heymann 2012; Rønnerstrand and Andersson Sundell 2015). This entails that contributions from individuals are necessary for the issue to be resolved. I previously described the “sucker” situation, in the case of antibiotics, a sucker would be subjected to prolonged illness whilst simultaneously be subjected to the possibility of obtaining antibiotic resistant bacteria. Antibiotics as a remedy of bacterial infection has diminishing effects over time due to the increase of resistance. This growth of resistance has been linked to overconsumption (Bronzwaer et al. 2002, Goossens 2009; Bell et al. 2014). Achieving optimal consumption of antibiotics is a shared issue with a vast time horizon, which is dependent on prudent actions of individuals to overcome short-term self-interest in favor for group concerns. The field of voluntary collective action in large-scale situations, such as the case of antibiotic resistance, is under studied. Antibiotic resistance can be defined as a large-scale collective action problem due to the large number of actors, the level of anonymity, temporal delays, few if any repeated games.

The use of antibiotics in Sweden is regulated to ensure that individuals only can attain them through a prescription from a medical practitioner (Public Health Agency of Sweden, 2014: 75; Mölsted and Hoveus 1989). This means that the issue of antibiotics is regulated to a certain extent. Since it can almost only be attained through a prescription, individual use is contingent on the proper behavior and advice from health care personnel (Cars and Håkansson 1995; Bjerrum et al. 2004; De Sutter et al. 2001).

Doctors can be depicted as gatekeepers, nevertheless, it is possible to evade them by seeking help from another doctor or to order antibiotics online. Individuals also have the decision not to take the prescribed antibiotics or not to retrieve the prescription at all. We also

know that doctors largely fulfill the demands of the patients. In a British study, 96,5% of patients who requested (26% out of 450) antibiotics also received it (McNulty 2013). Therefore, some authors argue that lowering patients' expectations of receiving an antibiotic prescription is important in lowering consumption. It is a shared decision-making process where patients' demand increases prescription and in turn resistance (McNulty et al. 2013). Borg (2012) argue that information campaigns empowers patients to resist doctors' wrongful prescriptions. This means that each patient is a potential driver of high prescription rates and a change towards appropriate behavior on the patient side might curb overconsumption and in turn, growth of resistance.<sup>1</sup>

In health care research, the concept trust has mainly been interpreted mainly as an institutional feature. Trust in health care provider is an important feature defining preventive measures, enrollment and adherence to advice (Thom et al. 1999, Thom et al. 2004). Trust as a collective good is a foundation for an effective health care system (Thom et al. 2004; Gilson 2003) partly, since it enables lower monitoring costs (Gilson 2003).

However, apart from how to attain antibiotics, there are many other opportunities to shirk and to contribute to overconsumption and growth of resistance. Other types of shirking behavior are inappropriate use in the form of adherence to guidelines such as early termination of treatment, not taking the doses on assigned time and further on, reuse of left-over antibiotics at a later occasion. This behavior might not remove the intended bacteria while also foster growth of resistance (Dajani 1996; Sclar et al. 1994; Kardas 2005). Overconsumption in turn, has been found to be a driver of the negative externality antibiotic resistance (Bronzwaer et al. 2002; Goosens 2009; Bell et al. 2014).<sup>2</sup> However, in this thesis, I only regard increased resistance linked to overconsumption as a collective action dilemma.<sup>3</sup>

I argue that the actions of other people are important when making decisions on individual action. This might be even more important in an issue with a high level of anonymity, as well as being a personal health question, which is not widely discussed with peers. Antibiotics use is a decision that has high personal costs, in prolonged illness and in the personal economy, with very low benefit from contribution to the common good.

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<sup>1</sup> There are ongoing information campaigns from health care institutions to lower antibiotics use with regards to the benefit to the individual health (Bell et al. 1989:1491). Few collective action problems do not have mixed incentives outside the lab, ie. commuting by bike instead of car has both health and environmental benefits.

<sup>2</sup> Turnidge and Christiansen (2005) argue that it is important to discern the type of antibiotic, the dosage, differences in age, population density and demography since these influence the growth of resistance. For the sake of this study, the delimitation is individual use and factors curtailing voluntary action, for which I argue that the assumption of overconsumption is sufficient.

<sup>3</sup> I want to point out that antibiotics is necessary in certain cases and abstaining antibiotics is not a virtue on its own. It must be assessed in relation to the severity of the infection.

I would also argue that in a collective action situation, there's a difference between whether a medical practitioner advises you to postpone or abstain a course of antibiotics and whether you yourself make that decision. I will distinguish only the voluntary contributions and the relationship with interpersonal trust. The case of individual consumption in Sweden is interesting because the knowledge on the risks and side effects of antibiotics use is widespread (Borg 2012). I argue that knowledge is endogenous in my model and do not have to provide more information to ensure that people understand the issue at hand. The likelihood of respondents not to understand the question is lower in Sweden compared to other countries. This means I can isolate a possible effect from interpersonal trust without having potential noise from information on the salience of the issue. This makes it easier to ask questions of willingness to abstain.

Secondly, since Sweden is a case of a high trust country, meaning that if differences in levels of trust is showed to have an effect in this case, it is very likely that these differences will be larger elsewhere. I thus conduct a so called tough test for the theory, if the behavior of other's work in a high trust case such as Sweden, it will likely be larger elsewhere (George & Bennet 2005). Lastly, there is also exceptional access to data, through the SOM-survey and the LORE-panel, something I return to later in this chapter.

### 3.2 Factors affecting antibiotic consumption and possible confounders

In this section I discuss what has previously been defined to affect antibiotics use and discuss potential confounders affecting both the dependent and independent variables. This regards factors influencing interpersonal trust and health decisions such as antibiotic consumption.

Previous studies have found that there is variation in antibiotics use between individuals, yet, the variation cannot fully be explained by a corresponding variation in bacterial infections. Researchers argue that it is rather the cause of individual and contextual factors (Cars et al. 2001: 1853). Individual factors could be related to knowledge (Vallin et al. 2016), trust in fellow people (Rönnerstrand and Sundell 2015) and trust in institutions (Rönnerstrand and Sundell 2015). Contextual factors could be cultural (Borg 2012), social (Cars et al. 2001) or related to the health care system (Cars et al. 2001; Rönnerstrand and Lapuente 2017).

Like many other collective action problems, e.g. driving cars, eating less meat, appropriate knowledge on antibiotics use and its effects have not been found to be a sufficient determinant for prudent use of antibiotics (Vallin et al. 2016).

General health status could be confounding since health decisions and interpersonal trust as plausibly related. In the experiment, it is likely that people who consider them to have worse health status will not be affected as much by the behavior of others. Gender could also be a confounder since it is sometimes found to affect cooperation (Kopelman et al. 2002: 121) and use of antibiotics is higher among women (Schröder et al. 2016). Education has previously been found to correlate with higher levels of interpersonal trust (Charron and Rothstein 2016). People with higher education have more knowledge about antibiotic resistance (Vallin et al. 2016; McNulty et al. 2007) and are also reported to be more worried about growth of resistance (Rönnerstrand and Andersson Sundell 2015). Age may have an influence since older people consume more antibiotics (The Directorate General for Health and Food Safety 2016) and trust others to a higher extent (Li and Fung 2012; Sutter and Kocher 2007).

Some argue that doctors are both health care providers and representatives of the health care system. Trust is thus built on their role as implementers of the system and as people (Thom et al. 2004; Thom 2002). Discerning the influence between institutional or interpersonal trust may be more pertinent in an issue as antibiotics use where doctors serve as gatekeepers. However, trust can also have an inverse influence on antibiotics use if trust in the physician is high while the physician lends faulty advice.

### 3.3 Research design

In this thesis, the aim is to not only explain correlation between interpersonal trust and voluntary collective action, but also to explain if interpersonal trust can cause voluntary collective action. To achieve this, I will apply both survey methodology and survey experiment to explain individual behavior in the collective action dilemma of antibiotics use.

The first part of the study tests the relationship between self-reported willingness to abstain antibiotics and interpersonal trust. The second part will test the findings from the correlational study in a survey experiment to approach an explanation of causality. Atzmüller and Steiner (2010) argue that the combination of surveys and survey experiment should be more frequently used when measuring attitudes and behavior. When comparing methods, cross-sectional and experimental methods have trade-offs. Cross-sectional data has high external validity but may lack internal validity whereas experimental research has higher internal validity yet lower external validity making results harder to generalize (Aguinis and

Bradley 2014). Through the combination of these methodologies it is possible to have higher levels of validity and reliability.

This first part of the thesis applies binary logistic regression to explain stated behavior since the outcome is binary; either the individual is certainly willing to abstain antibiotics or not. The model will thus estimate the probability of abstaining a course of antibiotics if an individual has high levels of interpersonal trust.

The second part of the study is a continuation of the first part to tests whether interpersonal trust leads to cooperation, in this case, if it leads to increased willingness to abstain antibiotics. In this case, the proposed mechanism belief of behavior of others is manipulated. The method used is ANOVA to compare means with a post-hoc test to disentangle if there is a between-group variation.

### 3.3.1 Logistic regression

What I will be measuring is if there is a correlation between higher levels of interpersonal trust and higher levels of cooperation. The dependent variable in this study is binary which leads to my decision of using logistic regression. This since the variable is coded so that you are either certain to abstain from using antibiotics or you are not. Thus, the binary logistic model can measure the odds or probability of someone choosing to certainly abstain from using antibiotics or choosing not to (Field 2013, 270-273). The model measures the probability of an event occurring based on the hypothesis that people with higher levels of interpersonal trust are more likely to certainly abstain from using antibiotics.

There are a few assumptions for logistic regression which are alike the assumptions for OLS regression. The first is that all continuous variables should be linear when plotted against the dependent variable. Secondly, the error term should be well-behaved, meaning that the measure of an individual or occurrence should not be related to a measurement earlier in time. The third assumption is that no multicollinearity exists which means that dependent variables are not highly correlated (Field 2013: 273). Fourthly, all relevant variables are included in the model, e.g. correct model specification. Lastly, no outliers or influential cases should be present. Controlling these assumptions is imperative to generalize to the target population.

The main independent variable interpersonal trust is continuous and will be controlled to be linear to the log of the dependent variable. Yet, many of the variables included in this model are categorical and can thus not be controlled to be linear. Respondents only receive the SOM survey once and hence it fulfils the independence of errors criteria. Regarding the

assumption of a well-behaved error term, the binary variables will not have outliers or influential cases. However, the continuous variables are controlled for influential cases and outliers. Lastly, I check the additivity of variables and discuss if multicollinearity exists. The SOM survey includes most individual level variables that have previously been identified to affect either collective action or antibiotic consumption. I assume that Swedes have appropriate knowledge on prudent use of antibiotics and that it is internalized in the model. That is an additional variable that could have been controlled for to ensure this assumption.

When doing logistic regression, two other problems might occur. Overdispersion occur if observations are not independent and result in a deflated standard error. Complete separation also lead to an underestimated standard error when the outcome is predicted by one or more variables (Field 2013: 275-776).

How well the model describes the variation in the data is estimated by the -2 Log Likelihood and its Chi-square distribution. -2 Log Likelihood is called a pseudo-R, and estimates the model fit of the predictors on the dependent variable. Other estimates I use are the Wald statistic and the appertain significance of that estimate, and Nagelkerke's R to further assess the fit of the model. It is different than Pearson's R and can only be compared to the previous model where an increase in Nagelkerke R square signifies a better fit. Furthermore, the classification estimate signifies the amount of successful prediction of an individual to be willing to abstain antibiotics (Field 2013: 283). I also use Hosmer and Lemeshow's goodness of fit measure. It indicates if the step of the model has significantly improved how the model fit the data. If the statistic is insignificant it indicates a better fit (Field 2013: 281-282). By looking at the model chi2 statistic it is possible to discern the relative improvement compared to the previous model (Field 2013: 285). The steps of the analysis will be enter and the cut off value is set to the significance level of  $p=0.05$ .

When conducting logistic regression analysis, it is important to have observations in each cell to be able to assess the probability of the event occurring. If this is not fulfilled, the standard errors may be inflated. This study both has a large sample and categorical variables with few options, making the prospect of meeting this criterion quite high (Field 2013: 276).

### 3.3.2 Survey experiment

The basic assumptions of experimental methods are that a cause and effect are closely related in time. A second condition is that the effect must occur after the cause. Thirdly, the effect would not occur without the cause. Lastly, the manipulated group must be compared to a

group which did not receive the manipulation to rule out confounding variables. If these conditions are present, statistical inference can be drawn that there is a cause and effect relationship (Field 2013: 13-14).

In my study, I choose to manipulate the mechanism linking interpersonal trust to cooperation, drafting different individuals to different experiment groups in a so-called between-subjects design as my data collection. Without the manipulation, I expect no difference in means between the experiment groups (Field 2013: 15-16). I can reject the null hypothesis when the differences are large enough, that such an extreme difference would be unlikely to reoccur if the study was repeated. This bar has been set to the 95% confidence level (Field 2013: 325).

To attain internal validity in testing the relationship between interpersonal trust and voluntary collective action, it is necessary to manipulate interpersonal trust. If interpersonal trust is found to change levels of cooperation then conclusion about causality can be drawn.

I introduce control variables to control for confounders. This is particularly important in the between-groups design where unsystematic variation, due to sampling, can cause noise in the manipulated condition (Field 2013: 16-17). This is done by random assignment meaning that each unit in the sample is equally likely to be drafted to each group (Field 2013: 17-18).

I will use ANOVA to discern whether the three experiment groups and the control group have the same mean. ANOVA uses an F-test which estimates the relationship between the systematic and unsystematic variation in the sample. Despite this, The F-ratio test will only indicate if there is at least one group which is different from another and not which this was (Field 2013: 349). To discern which groups have significantly different means, a post hoc test will be used and Tukeys HSD statistic as measure of equality (Field 2013: 372-374). The effect size for ANOVA can be measured by Eta squared (Field 2013: 389).

The sampled subjects will randomly be assigned to different experiment groups. With the aim to explain if interpersonal trust will affect the willingness to voluntarily cooperate to abstain antibiotics. This thesis, will not study actual antibiotics use, but I do expect that changes in trust will affect an individual's stated intent to consume antibiotics in the future.

In table 2 I describe the different information and stimuli the different experiment groups received. The two experiment groups received different stimuli, one which framed cooperation of others in a positive manner that 4 out of 5 (80%) cooperate), a second which framed cooperation in a negative manner that 1 out of 5 (20 %) cooperate). In this case cooperativeness is that others choose not to consume antibiotics. Both group 1 and 2 received information on the salience of the issue. Since I assume that information about the salience of

the issue will affect the willingness to abstain antibiotics I wanted to ensure that the willingness to abstain was due to belief about others, and not due to information, I included a control group (Group 3) which received information about the salience of the issue yet not anything about the actions of others. Subsequently a fourth group, the control group, which did not receive any condition yet answered the same questions as the two experiment groups. I expect the group with information about other’s cooperativeness will exhibit the highest willingness to cooperate. I expect the control group to show levels of willingness to cooperate between the experiment groups. If the experiment groups with the manipulation of behavior of others and the group which only received information does not have significantly different means it is possible that cooperation is a moral action in accordance with Uslaner’s theory.

**Table 2** Design – Experimental groups and treatments

	Group 1	Group 2	Group 3	Group 4
Information about resistance	x	x	x	
Physician prescribes antibiotics	x	x		
Interpersonal trust	x	x		
Question to abstain antibiotics	x	x	x	x

A pilot study was undertaken with 60 respondents to ensure that the information in the vignette and the questions were logical and comprehensible. The respondents were students who were recruited face-to-face at the University of Gothenburg. They were also debriefed after answering the survey to describe the hypothetical scenario and also gave the respondents an opportunity to give comments.

Another other option was to describe cooperation of others in non-numerical terms to say that a majority of people cooperate or do not cooperate. I could have described low cooperation as 80% choose not to cooperate and therefore consume antibiotics themselves. However, I would argue that that measurement would be of the antipathy towards uncooperativeness of your peers and not a reaction to cooperation which would make the positive and negative stimuli non-comparable. This is important since the between-subject design requires that scenarios are very alike to render them comparable.

In creating the vignettes, I draw inspiration from a study by Björn Rönnerstrand and Karolin Andersson Sundell (2015). In that study, they were interested in institutional trust in the form of doctors’ advice to abstain antibiotics and the effect of reciprocity on individuals’ willingness to abstain antibiotics.



The vignette is as follows. Imagine the following: The use of antibiotics has increased and has led to growth of antibiotic resistant bacteria. Unnecessary use is driving the growth of resistance and affect the possibility to undertake surgery. You suffer from a respiratory infection with cough, fever and chest pain. You have visited the primary care unit and received a prescription of antibiotics. Yet many respiratory infections do not require antibiotics as treatment and heal with time. [Research has shown that four out of five people (80%) tend to regard these collective questions when making decisions for themselves and choose to abstain from using antibiotics/ Research has shown that one out of five people (20 %) tend to regard these collective questions when making decisions for themselves and choose to abstain from using antibiotics.]

Are you willing to abstain from using antibiotics, if possible, even when you risk additional sick days? 1= Yes, probably, 5= No, probably not.

Ideally, I would be able to measure actual antibiotic consumption preceding and succeeding the manipulations of interpersonal trust in the experiment. As a proxy, I expect that stated intent will precede future decisions to use antibiotics or not.

The strength of doing experimental study is to control for what can often be confounded with trust and trustworthiness. In addition of using survey data, this experiment will come closer to decision-making rather than only attitudes (Levi 2001).

Experimental vignette method (EVM) is also an appropriate method when real-life experiments would have been ethically questionable. As the case of antibiotics, the issue is sensitive and may have large effects on personal health (Aguinis and Bradley 2014). Although the subsequent reasons not to use EVM is when scenarios are different from reality (Aguinis and Bradley 2014). A downside with between-subjects EVM is that context may vary which may render comparisons between groups difficult (Atzmüller and Steiner 2010).

### 3.4 Data

The data used is a yearly survey with a random sample of the Swedish population generated by the SOM-institute at Gothenburg University. With a sample of 30.000 people and a high response frequency. The SOM survey is well-known in Sweden and has a high response rate rendering it to have quite a proportional representation. The sample has a slightly skewed representation of more educated, slightly more male participants and older respondents. Another strength of using this dataset is the multitude of questions asked meaning that all the

relevant control variables and potential confounders are included. The number of respondents in this wave is which led to a case reduction of about 4000 respondents.

The data used for the survey experiment is generated through The Laboratory of Opinion Research (LORE), a large-scale non-representative self-recruited sample with Swedish participants. It is non-representative but it has more participants from different groups, and not only undergraduate students. By using an online survey tool, it is possible to have a large sample to ensure statistical power. It is also possible to include relevant control questions and confounders. This sample is also skewed towards more educated. The total number of respondents is 3600, however, I have used preliminary data with 3130 respondents, which is approximately 87 %.

Participants in both the SOM-institute survey and LORE panel are also likely skewed towards more trusting individuals. This is also anticipated since the Swedish sample is more trusting in an international comparison.

### 3.5 Operationalization of concepts in the logistic regression

In this section I offer my operationalization of the concepts in the logistic model.

The focal relationship regards whether interpersonal trust has an effect on willingness to abstain antibiotics. Willingness to abstain antibiotics is surveyed as “Antibiotic resistance is increasing with increasing use of antibiotics. Are you willing to abstain from using antibiotics, when possible, even if you risk additional sick days?” The question is measured with four options namely, ‘Yes, absolutely’, ‘Yes, most likely’, ‘No, most likely not’ and ‘No, absolutely not’. Due to skewedness in the measurement, the variable was dichotomized to 1= ‘Yes, absolutely’ and 0= ‘Other’. Many respondents seem to be willing to abstain antibiotics, yet this is stated behavior which makes it reasonable that those who state to be most willing to abstain will also be more likely to behave this way in a real-life situation.

The question regarding interpersonal trust is posed as “To what extent can you say that people in general can be trusted?”. The question is measured from 0 to 10, where 0 represents that ‘people cannot be trusted and 10 that ‘People can be trusted. This is the standard way to operationalize interpersonal trust and argued to capture trust and not kin-trust. There has been a debate on the measuring of interpersonal trust regards the perception of the question whether most people can be trusted or not. While this measurement of interpersonal trust has been criticized, it also has high re-test validity within countries. Some scholars argue that respondents do not have people in general in mind when answering the question, Knack and

Keefer (1997) argue that the World Value survey question do capture interpersonal trust rather than kin trust, which it often has been blamed for. Noise in the measurement is likely present at the individual level, but is less of a problem on the aggregate-level (See Nannestad 2008), which is why I consider it to be adequately fitting.

To what extent people worry about increased antibiotic resistance is measured with the question ‘How worried would you say you are about increased antibiotic resistance in the future?’. Respondents are given four options 1= ‘Not at all worried’, 2= ‘Not very worried’, 3= ‘Worried’, 4= ‘Very worried’. Worry is important to be included since concern for a subject often precedes action.

The question on self-estimated health is measured as ‘How would you describe your general health?’ where 0 is ‘very bad’ and 10 is ‘very good’. This is commonly dichotomized into 0-6 ‘Bad’ and 7-10 as ‘Good’ due to skewness. It is important to include since people with worse health are less likely to, and in many cases, should not abstain antibiotics.

Antibiotics consumption is measured as ‘How many times have you used antibiotics in the last 12 months?’. The options given is 1= ‘More than 5 times’, 2= ‘2-5 times’, and 3= ‘Once’, 4= ‘Never’. Consumption is included since that in many other collective action dilemmas, bigger consumers have a harder time sidestepping their behavior or preference. The question regarding trust in institutions is asked as “How much confidence do you have that the health care institution is performing in line with their objective?”. This question had four alternatives which were 1= ‘Very low confidence’, 2= ‘Quite low confidence’, 3= ‘Quite high confidence’, and 4= ‘Very high confidence’. In this regard, I argue that confidence in the way institutions perform serve as a proxy for trust in the institution.

Level of education was first posed as “What kind of education do you have?” It is then coded in four categories, 1= ‘Low’, 2= ‘Middle low’, 3= ‘Middle high’ and 4= ‘High’. Low education is related to no education or elementary school, middle low is related to junior high and high school’, middle high means the respondent received higher education but did not graduate, and high education means the respondent graduated from university.

Gender is measured with the categories 0= ‘Man’, 1= ‘Woman’, or 2= ‘Other’. Due to few responses, only two respondents answered ‘Other’, whereby that category is excluded from further analysis.

Age was recoded into four different categories 1= ‘16-29 years’, 2= ‘30-49 years’, 3= ‘50-64 years’, 4= ‘65-85 years’.

In summary, all variables are coded in a direction where I assume that an increase in the explanatory variable will result in an increase willingness to abstain antibiotics.

## 4 Analyzing stated willingness to abstain antibiotics

In this chapter I analyze to discern if interpersonal trust has an individual contribution to explain the willingness to abstain antibiotic consumption.

The first step of the analysis is to produce an intercept only model (table 3). The classification estimate signifies the amount of successful prediction of an individual to be willing to abstain antibiotics. In this case, the number of correct classification was 54,9 %. When no independent variables are included, model 0 estimates the likelihood to belong to the most observed category (Field 2013: 283). In this case to not certainly abstain antibiotics. In this case, 54,9 % of observations fall into that category.

In model 1, I introduce interpersonal trust as an explanatory variable. This model estimates the likelihood to certainly abstain antibiotics. The beta coefficient for interpersonal trust can be interpreted as a one-step increase in interpersonal trust results in a .1 increase in likelihood to abstain antibiotics. In logistic regression, the beta coefficient is difficult to interpret in strength of the relationship, therefore we can interpret the exponent of the Beta which is 1.11. This means that for a one step increase in interpersonal trust, the odds of certainly abstaining antibiotics increase with 11%. To summarize, this increase in likelihood is very small yet it is significant.

Comparing the intercept-only model and model one where the focal relationship is analyzed, I observe a significant model improvement. The -2 Log Likelihood has decreased (from 1779.99 in model 0 to 1763.94 in model 1) and the model has a significant chi<sup>2</sup> statistic on the p-level= 0.01, and Hosmer and Lemeshow chi-square is small and insignificant which entails an improvement. More individuals are correctly classified (from 54.9% in model 0 to 57.3% in model 1) when interpersonal trust is introduced. Despite this improvement, this model is only slightly better than tossing a coin to discern an individuals' willingness to abstain antibiotics. This implies that there is a lot of unexplained variance that may be accounted for in the upcoming models.

In model 2 (table 3), I introduce variables that have previously been found to affect personal consumption in collective action dilemmas, such as worry about increased resistance and the size of individual consumption, together with findings from antibiotics research on the importance of individual health on antibiotics consumption decisions. When controlling for these factors, interpersonal trust seems to still have a statistically significant individual contribution in explaining willingness to abstain antibiotics. The Wald's Z statistic, based on the beta coefficient and the standard error, for interpersonal trust is statistically significant

( $p < .05$ ). Meaning that interpersonal trust contributes to explain abstention decisions. The exponent of the beta coefficient is 1.08 can be interpreted as a one-step increase in interpersonal trust increases the odds of certainly abstaining antibiotics with 8%, given that antibiotic consumption, self-estimated health and worry for increased resistance are included in the model and held constant. The direction is in line with my hypothesis of a positive relationship in my focal relationship.

Antibiotics use is also connected to willingness to abstain antibiotics in the same way as is stated by theory. E.g. people who consume less antibiotics, who either had no treatment or one treatment in the last 12 months, are more willing to abstain from using antibiotics. However, only the categories which used more than five treatments of antibiotics or no treatment of antibiotics are significantly different than the other categories (the former with  $p < .05$  and the latter with  $p < .01$ ) and should therefore be interpreted with caution.

Worry about increased resistance also follows the hypothesized direction, where higher stated levels of worry correspond to a higher willingness to abstain antibiotics. If a person increases its level of worrying about antibiotic resistance, it increases the likelihood to wanting to certainly abstain antibiotics, all other variables constant. However, only the group which did not worry about increased resistance at all and the group that was very worried are significantly different than the other groups on the  $p$ -level = .01.

In this model, self-estimated health also has a positive correlation with willingness to abstain from using antibiotics ( $B = .36$ ). It follows the theory that people with higher-levels of self-estimated health will be more willing to abstain antibiotics. If someone goes from having a bad health to good health, it significantly increases ( $p < .05$ ) the odds of abstaining antibiotics with 43 %.

The model fit for model 2 significantly increased with a lower  $-2$  Log Likelihood of 1674.07, while its appertained  $\chi^2$  is 105.92 and significant on the  $p$ -level = .01. Nagelkerke R square has increased to .105, and the number of correct classifications is now 62.1%, which signifies a better model fit in model 2 compared to model 1. Yet, Hosmer and Lemeshow's chi-square statistic is significant which can be interpreted that the introduced dependent variables, worry for increased antibiotic resistance, antibiotic consumption and self-estimated health is not a lot better at predicting willingness to abstain antibiotics compared to the model with only interpersonal trust as a predictor.

**Table 3** Logistic probability models of willingness to abstain antibiotics after interpersonal trust, antibiotics use, self-estimated health, worry about increased resistance, institutional trust, gender, age, and level of education

	Model 0 Exp (B)	Model 1 Exp (B)	Model 2 Exp (B)	Model 3 Exp (B)	Model 4 Exp (B)
Interpersonal trust		1.06*** (.03)	1.08** (.03)	1.06** (.03)	1.07**(.03)
Antibiotics use			**	**	**
2-5			1.48 (.38)	1.35 (.39)	1.36(29)
Once			1.20 (.35)	1.13 (.35)	1.06 (.36)
Never			1.80 (.33)	1.66 (.33)	1.56 (.34)
Worry about resistance			***	***	***
Not very worrying			.94 (.57)	.92 (.57)	1.01 (.58)
Quite worrying			1.93 (.54)	1.7 (.54)	1.99 (.55)
Very worrying			4.02*** (.53)	3.74** (.54)	4.40***(.55)
Self-estimated health (well)			1.43** (.14)	1.33* (.15)	.25*(.15)
Education				***	**
Medium low				1.87*** (.22)	1.53* (.23)
Medium high				2.42*** (.23)	1.95*** (.24)
High				2.39*** (.22)	1.86*** (.23)
Institutional trust					
Quite low confidence				.99 (.35)	1.00 (.35)
Quite high confidence				1.04 (.34)	1.10 (.35)
Very high confidence				1.15 (.37)	1.24 (.37)
Gender (women)					.95 (.12)
Age					***
30-49 years					1.14 (.21)
50-64 Years					.95 (.21)
65-85 years					.94** (.22)
Intercept	.82*** (.06)	.42*** (.18)	.09*** (.73)	.06***(.73)	.07*** (.76)
Number of individuals	1293	1293	1293	1293	1293
-2 Log Likelihood	1779.99	1763.94	1674.07	1653.84	1640.79
Pseudo R		.016	.105	.124	.137
Model Chi square		16.05***	105.92***	126.140***	139.20***
Hosmer & Lemeshow		8.25	13.61*	6.18	4.36
Classification	54.9%	57.3%	62.1%	63.9%	63.9%

**Note:** \*  $p < .10$ ; \*\*  $p < .05$ ; \*\*\*  $p < .01$  for Wald's Z. SE in brackets. Pseudo R = Nagelkerke R Square, Chi-square= model, Method=enter, Variables entered: "Are you willing to abstain from using antibiotics, if possible, even when you risk additional sick days." The options are, 'Yes, absolutely', 'Yes, most likely', 'No, most likely not' and 'No, absolutely not' and is dichotomized to 1= 'Yes, absolutely' and 0= 'Other'. Interpersonal trust was posed as "to what extent can you say that other people can be trusted?". The question is measured from 0 to 10, where 0= 'One cannot trust other people' and 10= 'You can trust other

people'. To what extent people worry for increased antibiotic resistance is measured with the question 'How worried would you say you are about increased antibiotic resistance in the future?'. Respondents are given four options 'Very worrying', 'Worrying', 'Not very worrying', 'Not at all worrying'. Trust in institutions is asked as "How much confidence do you have that the health care institution is performing in line with their objective?". The four alternatives are: 1= 'No confidence at all', 2= 'Not much confidence', 3= 'Confidence' and 4= 'Very much confidence'. Self-estimated health is measured as 'How would you describe your general health?' where 0= 'very bad' and 10= 'very good and is dichotomized into 0-6= 'Bad' and 7-10= 'Good'. Antibiotics consumption is measured as 'How many times have you used antibiotics the last 12 months?'. The options are 1= 'More than 5 times', 2= '2-5 times', 3= 'Once', and 4= 'Never'. Level of education is coded in four categories, 'low', 'middle low', 'middle high' and 'high'. 'Low' education is primary school, 'middle low' is up until high school, 'middle high' is post high school but not a university degree and 'high' is a university degree. Gender is measured with the categories 'Man', 'Woman', or 'Other'. Due to few responses, 'Other' was excluded. Age was recoded into four different categories '16-24 years', '25-39 years', '40-55 years', '45-85 years'. **Source:** The national SOM-survey 2016

In model 3 (table 3), I introduce institutional trust and level of education as control variables. Interpersonal trust still has an individual contribution to explaining willingness to abstain antibiotics given that other variables are also included in the model. A one step-increase in an individual trust increases the odds to certainly abstain antibiotics with 7 %. Interpersonal trust does not contribute to explaining the outcome as much when institutional trust and level of education are introduced to the model.

Antibiotics use explains less of the variance in model 3 compared to model, with only one significant category namely those who consumed more than 5 treatments. They were less likely than all the other categories to certainly abstain antibiotics.

Worry about increased resistance to antibiotics continues to only have two groups with significant contribution to explain certain abstention. The category which is not at all worry has a large Wald's Z (63.03). One example is that the category which is very worried have almost four times increased odds to abstain antibiotics compared to the group which is quite worried, all other variables constant. This should also be interpreted with caution since only one of the categories is significant.

Self-estimated health contributes less to explain why respondents choose to certainly abstain antibiotics in model 3 compared to model 2. If someone goes from having bad health to good health it increases the odds to certainly abstain antibiotics with 30 %. This difference, however is only significant on the p-level= .01.

Interestingly, institutional trust has so significant contribution to explain why some choose to certainly abstain antibiotics. This indicates that in a collective action dilemma such as this, where medical practitioners intuitively would influence why an individual choose to consume antibiotics, levels of interpersonal trust contribute more to explain consumption-decisions.

In this model, level of education significantly explains variance in the dependent variable. If someone goes from having low level of education to high level of education it increases the odds by 2. If someone goes from medium high to high the odds are more than 2 times higher. This related to theory through education being correlated with trust, level of

worry and knowledge on antibiotic resistance. Despite this, I did not find multicollinearity measures that indicated that they were highly correlated.

Model 3 is a significant model improvement compared to model 2. The model  $\chi^2$  has increased to 126.14 and is significant on  $p$ -level= .01. The model describes the variation in the data better though a lower -2LL, an increased Nagelkerke R Square, a small and insignificant Hosmer and Lemeshow  $\chi^2$ , and a higher number of correct classifications (-2LL= 1653.84, Nagelkerke R Square= .124, Hosmer and Lemeshow  $\chi^2$ = 6.18, and classification= 63.9%).

Model 4 (table 3) includes the control variables gender and age. Gender is not a significant contributor to explain willingness to abstain antibiotics, which is not surprising given the mixed results in other collective action dilemmas. Some of the age groups, however, have significant contributions ( $p < .01$ ) to explain willingness to abstain antibiotics. These are the youngest and the oldest age group. The oldest age group is the least willing to abstain antibiotics with a B-coefficient = -.45 and odds ratio of .64. This means that going from the second oldest age group to the oldest age group decreases the odds of abstaining antibiotics.

Model 4 is a slight improvement from model 3 with a lower -2LL, an increased Nagelkerke R Square, a small and insignificant Hosmer and Lemeshow chi square, yet an unchanged number correct classifications (-2LL= 1640.79, Nagelkerke R Square= .137, Hosmer and Lemeshow  $\chi^2$ = 4.36, and classification= 63.9%). Model four is a slightly better fit, yet the number of correct classifications has not increased but was still chosen.

I test for the linearity of the interval variable, interpersonal trust. Since the significance level for this test was not below the  $p$ -level .05 (.13 > .05) I conclude that interpersonal trust fulfils the criteria of linearity (Field 2013: 276).

Next test of the assumptions is the multicollinearity test. All tolerance values were above the limit of .1 and all VIF values were around 1, which is well below the limit of not having values larger than 10 (Field 2013: 297).

Checking for multicollinearity, the model fits the criteria of having less than 5 % of standardized residuals less than >2 and less than 1% is >2.5. Although one case had a standardized residual value above the limit. 3.08 > 3. The model did not have any values of Cook's distance above the cut off value. Almost 100 cases have average leverage values two or three times larger than the average leverage value. None of the variables have DFBeta values above 1.

In the correlations matrix, no variables seem to have high correlation. Therefore, all variables can be said to have an independent contribution to explain antibiotics use.



Some of the variables did not fulfil the criteria of normality. The generalizability of these models beyond the sample population can therefore be questioned.

To summarize this chapter, I should reject the hypothesis of no relationship between interpersonal trust and collective action in form of abstaining antibiotics, since there is support in data. I find support for my hypothesis that there is a positive relationship between interpersonal trust and willingness to cooperate in large-scale dilemmas such as this.

## 5 Analyzing the manipulation of behavior of others on willingness to abstain antibiotics

Moving on to the analysis of the survey experiment, the first test to do is ANOVA, in tables 4 and 4 below the results are presented. Table 6 shows the mean levels of how respondents in different group assess the likelihood of them abstaining a course of antibiotics. The control group, which did not receive any stimuli, report the lowest likelihood to abstain antibiotics (mean= 2.99). The group which only receive information on the negative effects of overconsumption of antibiotics report higher levels of willingness to abstain from using antibiotics (mean= 3.58) compared to the control group. The treatment group which receive information that 4 out of 5 cooperate report the highest level of abstention (mean= 3.77), which is in line with my hypothesis. The treatment group which received information that only 1 out of five cooperate reported slightly lower likelihood to abstain from using antibiotics (mean= 3.65) compared to the group where 4 out of five were said to cooperate. Table 6 reveals that at least one of the group means is different from the others and that this difference is significant.

**Table 4** Descriptive statistics of likelihood to abstain antibiotics by experiment groups

Descriptives						
How likely are you to abstain from using antibiotics even if you risk additional sick days?						
Group	N	Mean	Std. dev.	Std. err.	95 % CI Lower	95% CI Upper
80 % cooperate	745	3.77	1.37	.05	3.67	3.87
20% cooperate	809	3.65	1.33	.05	3.55	3.74
Information	750	3.58	1.39	.05	3.48	3.68
Control	746	2.99	1.56	.06	2.87	3.10
Total	3064	3.50	1.44	.03	3.45	3.55

Source: The Citizen Panel 26 2017

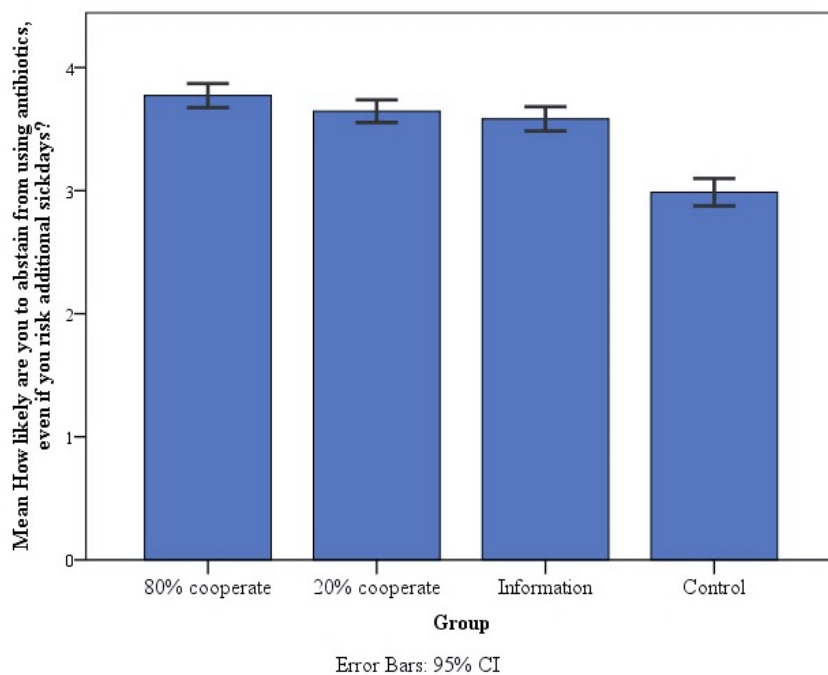
**Table 5** ANOVA

ANOVA					
How likely are you to abstain from using antibiotics even if you risk additional sick days?					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	274.37	3	91.46	45.93	.00
Within groups	6068.63	3048	1.99		
Total	6343	3051			

Source: The Citizen Panel 26 2017

Figure 3 is a graph of the mean levels of likelihood to abstain from using antibiotics divided by experiment groups. In Figure 3 you observe that some of the 95% confidence intervals for the group means overlap, when this occur it means that the groups with overlapping intervals do not report significantly different willingness to abstain from using antibiotics. Despite this, the group which receive a stimulus that 4 out of five cooperate are significantly more willing to abstain from antibiotics compared to the group which receive information on the salience of the issue or the control group. This gives some support for my hypothesis that information of other’s willingness to cooperate will increase one’s stated likelihood to abstain antibiotics.

**Figure 3** Mean levels of likelihood to abstain antibiotics divided by experiment groups



Source: The Citizen Panel 26 2017

I thus move on to perform a post-hoc test to discern which experiment groups is significantly different than the others. In table 7 you can infer that all experiment groups have a higher willingness to abstain from using antibiotics compared to the control group and that this difference is statistically significant on a p-level= .05. The group which received information on the salience of the problem reported lower levels of abstention compared to the group which received information on a high level of cooperation of others. Therefore, if individuals are provided with information on the high levels of cooperation of others, people are more willing to abstain from using antibiotics. However, there seems not to be any difference between the two groups which receive information on the actions of others. In other words, there seems not to be any difference between if you say that a lot of people cooperate or that some people cooperate. Thus, people do not cooperate more if they know that more of their peers also cooperate. It is noteworthy, however, that this difference is not statistically significant. The effect size for ANOVA is measured by Eta squared (Field 2013: 389). The Eta squared is 0.21 meaning that 21 % of the total variance in the stated likelihood to abstain antibiotics is explained by group differences, meaning it was effected by the experimental stimuli.

**Table 6** Post-hoc test

How likely are you to abstain from using antibiotics even if you risk additional sick days?

Tukey HSD						
I (Group)	J (Group)	Mean Diff.			95% CI	
		(I-J)	Std. Error	Sig	Lower	Upper
80 % cooperate	20% cooperate	.127	.07	.29	-.06	.31
	Information	.19	.07	.05	.00	.38
	Control	.79	.07	.00	.60	.97
20% cooperate	80% cooperate	-.13	.07	.29	-.31	.06
	Information	.06	.07	.82	-.12	.25
	Control	.66	.07	.00	.47	.84
Information	80% cooperate	-.19	.07	.05	-.38	.00
	20% cooperate	-.06	.07	.82	-.25	.12
	Control	.60	.07	.00	.41	.78
Control	80% cooperate	-.79	.07	.00	-.97	-.60
	20% cooperate	-.66	.07	.00	-.84	-.47
	Information	-.56	.07	.00	-.78	-.41

Source: The Citizen Panel 26 2017

Finally, I conduct a randomization control to ensure that groups do not have unwarranted variation that is not related to my stimuli. To do this, I conduct an ANOVA with group as dependent variable and the insert one independent variable at a time as a factor. If F-ratios are small and insignificant it means that there are no systematic errors in the group assignment. All variables had small F-ratios and were insignificant (see appendix) and I can thus conclude that random assignment was successful.

## 6 Discussion

In this chapter I discuss the relationship between study 1 and 2 as well as elaborate on the generalizability of the results. I end the chapter with a conclusion of my contribution to the theory on collective action and interpersonal trust.

In the first study, I concluded that there is a correlation between levels of trust and cooperation to abstain antibiotics. In the second study, I concluded that there is a tendency of a difference between only information on the salience of the issue and the cooperativeness of peers. These studies combined give some support for the interpersonal trust theory of the possibility to increase cooperation with reference to the behavior of others. In the case of the large cooperativeness of others, this seems to have an independent contribution to cooperative behavior, besides information on the salience of the issue. If interpersonal trust has an implication, we might be able to lower antibiotic consumption (or consumption of other goods) by informing people of the cooperative decision of others. Since many of the groups report high levels of likelihood to abstain from using antibiotics, I cannot rule out that people may be unconditional cooperators. This would cancel out the possibility to lower consumption through the spread of information of others cooperativeness.

Unfortunately, the second part of the study only look at the mechanism that I assumed would connect interpersonal trust to cooperation and not the actual effect of interpersonal trust on cooperation. Future studies should study the possibility of an interaction term between the experiment stimuli and interpersonal trust to analyze the actual effect of interpersonal trust on cooperation. When this is studied, we will know more about the link between interpersonal trust and cooperation in a large-scale dilemma such as this.

Something worthy discussion is when is 20 % a lot of cooperation? In a small-scale situation 20 % would likely be considered as a situation without cooperation. Whereas in the large-scale situation, if 20 % out of Sweden's population cooperate it means that 2 million people cooperate. Or in the global framing, it would entail that two billion people cooperate.

It is possible that the proportion of cooperators differ in the large-scale situation and that it is considered critical enough.

Intuitively, there should be a scale for the increasing willingness to abstain yourself when other people are increasingly cooperative. I do not expect a linear pattern where one persons' increasing cooperativeness should yield one increase in your own cooperativeness, but rather a curvilinear shape. Thus, future studies need to regard the cutoff value when other people's cooperative start to influence one's behavior by using more experiment groups.

Another question to regard is, due to the collective action dilemma being a transboundary problem, - who is being trusted in this study? Do people have other swedes or other nationalities in mind when answering these questions. This is complicated to control for but can be surveyed in future studies with local or global framings.

Continuing the criticism is why should it be ethical reciprocity that occur and not a band wagon effect? I argue that since the group with information on the salience of the issue and group with information that 20 % cooperate were not different, this indicates that many people are willing to cooperate, disregarding whether others cooperate or not.

Something that needs further scrutiny is whether these two studies measure the same thing – willingness to abstain and likelihood to abstain?

Another step in the research field trust is that we need to know more of how to discern institutionalized and generalized trust. In this case, institutional trust did not contribute to explain why people would want to choose to not consume antibiotics (in the logistic regression). For example, I would argue theoretically, it is plausible that since doctors are a part of the decision-making process when they are gatekeepers, institutional trust should be involved in this dilemma situation. We therefor need to know more how institutional trust is involved in this dilemma.

## 7 Conclusion

In this thesis, I have studied the role of interpersonal trust in large-scale collective action dilemmas. In the first part of the study, the survey data, I reject the hypothesis of no relationship between interpersonal trust and willingness to abstain antibiotics. This further indicates an interesting relationship between the concepts. In all models, trust had a significant individual contribution to explain willingness to abstain antibiotics, all other variables constant.

In the second study, the survey experiment, information on the behavior of others was assumed to be the mechanism linking interpersonal trust to cooperative behavior in the form of abstaining antibiotics. I did not reject the hypothesis of no relationship between information on other's cooperativeness and one's own likelihood to abstain antibiotics. However, in the Swedish case, it seems that knowing that a lot of other people are also contributing will render you more willing to cooperate yourself. It did not matter how many others cooperate only that some others are, since the groups with information of others cooperativeness were not significantly different. This is also interesting considering the finding that information on the salience of the issue is less important to discern individuals' cooperation decision, if I compare with the group that receive a stimulus that 80 % cooperate.

High levels of interpersonal trust might therefore have an individual contribution in making people cooperate in a dilemma situation such as this. As I mentioned in the discussion, this needs to be analyzed though an interaction between the experiment manipulation and stated interpersonal trust to fully be able to observe the link between interpersonal trust and cooperation.

Another suggestion is to conduct this study in a country which might not have the same theoretical explanation of unconditional cooperators. This would be a country which is not Protestant and preferably has more variation in interpersonal trust than the tough case that was suggested by the application in Sweden.

These studies contribute to the field of collective action and interpersonal trust through the finding that interpersonal trust is related to cooperation in a dilemma situation and that higher levels of cooperation from others indicate an increased willingness to abstain antibiotics. It supports the theory that cooperation of others is related to an increased willingness to cooperate. However, this needs further scrutiny since the group means, between the group that learned that 20% cooperate and that 80% cooperate, are not significantly different.

In conclusion, future studies are needed to further explore the relationship between interpersonal trust and collective action on a large scale. For example, the theoretical model could be applied to a different collective action dilemma situation to further investigate the strength of this relationship. We have come closer to understanding the role of interpersonal trust but continuing these studies is important for us to understand this piece of the large puzzle that is collective action dilemmas.

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## Appendix 1 The National SOM Survey

1. Motståndskraften hos bakterier ökar i takt med ökande antibiotikaanvändning. Är du beredd att avstå från antibiotika när så är möjligt, även om du riskerar några sjukdagar extra?

Ja, absolut

1

Ja, troligen

2

Nej, troligen inte

3

Nej, absolut inte

4

2. Enligt din mening, i vilken utsträckning går det att lita på människor i allmänhet?

Det går inte att lita på  
människor i allmänhet

0

1

2

3

4

5

6

7

8

Det går att lita på  
människor i allmänhet

9

10

3. Om du ser till läget idag, hur oroande upplever du själv ökad antibiotikaresistens inför framtiden?

Mycket oroande

1

Ganska oroande

2

Inte särskilt oroande

3

Inte alls oroande

4

4. Hur många gånger har du ätit antibiotika de senaste 12 månaderna?

Ingen gång

1

En gång

2

2-5 gånger

3

Mer än fem gånger

4

5. Hur bedömer du ditt allmänna hälsotillstånd?

Mycket dåligt

0

1

2

3

4

5

6

7

8

9

Mycket gott

10

6. Hur stort förtroende har du för hur sjukvården sköter sitt arbete?

Mycket stort förtroende

1

Ganska stort förtroende

2

Ganska litet förtroende

3

Mycket litet förtroende

4

7. Utbildningsnivå (bygger på fråga 8)

Låg	Meddellåg	Medelhög	Hög
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

8. Vilken skolutbildning har du? Om du ännu inte avslutat din utbildning, markera den du genomgår för närvarande.

- 1  Ej fullgjort grundskola (*eller motsvarande obligatorisk skola*)
- 2  Grundskola (*eller motsvarande obligatorisk skola*)
- 3  Studier vid gymnasium, folkhögskola (*eller motsvarande*)
- 4  Examen från gymnasium, folkhögskola (*eller motsvarande*)
- 5  Eftergymnasial utbildning, ej högskola/universitet
- 6  Studier vid högskola/universitet
- 7  Examen från högskola/universitet
- 8  Högskola/universitet, 3 år eller längre
- 9  Examen från forskarutbildning

9. Är du:

Kvinna	Man	Annat
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3

10. Ålder

16-29 år	30-49 år	50-64 år	65-85 år
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

## Appendix 2 Survey Experiment LORE

1. Föreställ dig att du har fått en luftvägsinfektion. Hur troligt är det att du vill avstå från antibiotika även om du riskerar några extra sjukdagar?

Väldigt troligt	Troligt	Varken troligt eller inte troligt	Inte troligt	Inte alls troligt
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5

2. Hur många gånger har du ätit antibiotika de senaste 12 månaderna

Ingen gång	En gång	2-3 gånger	4-5 gånger	Mer än fem gånger
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5

3. Enligt din mening, i vilken utsträckning går det att lita på människor i allmänhet?

Det går inte att lita på människor i allmänhet						Det går att lita på människor i allmänhet					
0	1	2	3	4	5	6	7	8	9	10	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

4. Hur bedömer du ditt allmänna hälsotillstånd?

Mycket dåligt									Mycket gott
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5	6	7	8	9	10

5. Hur stort förtroende har du att följande sköter sitt arbete?

	Mycket stort förtroende	Ganska stort förtroende	Varken stort eller litet förtroende	Ganska litet förtroende	Mycket litet förtroende
Sjukvården	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Läkare	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Folkhälso- myndigheten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5

6. Är du:

Kvinna	Man	Annat
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3



## Appendix 3 Tables and diagnostics SOM

**Table 10** Collinearity statistics

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	Tolerance	VIF
Interpersonal trust	.89	1.13
Antibiotic consumption	.96	1.03
Worry about resistance	.99	1.01
Self-estimated health	.92	1.09
Institutional trust	.92	1.09
Level of education	.94	1.06

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**Source:** The National SOM Survey 2016

## Appendix 4 Tables and diagnostics LORE

**Table 11** Randomization control

	F	Sig.
Interpersonal trust	1.165	.310
Confidence in medical institutions	.065	.626
Confidence in medical practitioners	.522	.720
Confidence in medical department	.630	.641
Self-estimated health	.413	.800
Antibiotic consumption	1.707	.145
Sex	.751	.386

**Note:** Note the difference that the variables in the logistic regression were measure on a 4-point Likert scale whereas the variables in the experiment were measured on a 5-point Likert scale. Willingness to abstain antibiotics is posed as “How likely is it that you will abstain from using antibiotics, even when you risk additional sick days?” The respondents rate the likelihood on a scale where 1= ‘Not at all likely’, 2= ‘Not likely’, 3= ‘Neither likely nor unlikely’, 4= ‘Likely’ and 5= ‘Very likely’. Interpersonal trust is posed as “To what extent would you say that people in general can be trusted?”. Where 0= ‘People in general cannot be trusted’ and 10= ‘People in general can be trusted’. Consumption of antibiotics is measured as “How many times have you consumed antibiotics the last 12 months?”. The options are 1= ‘More than 5 times’, 2= ‘4-5 times’ 3= ‘2-3 times’, and 4= ‘Once’, 5= ‘Never’. The question on self-estimated health is measured as ‘How would you describe your general health?’ The options are 1= ‘Very bad’, 2= ‘Quite bad’, 3= Neither good nor bad’, 4= ‘Quite good’ and 5= ‘very good’. The questions regarding trust in institutions is asked as “How much confidence do you have that the [health care institution/ health care department / Medical practitioners] is performing in line with their objective?”. The alternatives are 1= ‘Very low confidence, 2= ‘Quite low confidence, 3= ‘Neither high nor low confidence’, 4= ‘Quite high confidence’, and 5= ‘Very high confidence’. Gender is measured with the categories 0= ‘Man’, 1= ‘Woman’, or 2= ‘Other’. Due to few responses, only two respondents answered ‘Other’, whereby that category is excluded from further analysis. **Source:** The Citizen Panel 26 2017