Working Paper in Economics No. 762

Who is willing to stay sick for the collective? – Individual characteristics, experience, and trust

Fredrik Carlsson, Gunnar Jacobsson, Sverker C. Jagers, Elina Lampi, Felicia Robertson, Björn Rönnerstrand

Department of Economics, May 2019

ISSN 1403-2473 (Print)
ISSN 1403-2465 (Online)

UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Who is willing to stay sick for the collective? – Individual characteristics, experience, and trust

Fredrik Carlsson[a,b,c], Gunnar Jacobsson[b,d], Sverker C. Jagers[b,c,e], Elina Lampi[a,b,c], Felicia[b,c,e], Robertson, Björn Rönnerstrand[b,c,f,*]

Abstract: This paper deals with the collective action dilemma of antibiotic resistance. Despite the collective threat posed by antibiotic resistance, there are limited incentives for individuals to consider the contribution of their decisions to use antibiotics to the spread of resistance. Drawing on a novel survey of Swedish citizens (n=1,906), we study factors linked to i) willingness to accept a physician's decision not to prescribe antibiotics and ii) willingness to limit personal use of antibiotics voluntary. In our study, 53 percent of the respondents stated that they would be willing to accept the physician's decision despite disagreeing with it, and trust in the healthcare sector is significantly associated with acceptance. When it comes to people's willingness to voluntarily abstain from using antibiotics, a majority stated that they are willing or very willing not to take antibiotics. The variation in willingness is best explained by concerns about antibiotic resistance and experience of antibiotic therapy, especially if a respondent has been denied antibiotics. Generalized trust seems to be unrelated to willingness to abstain, but the perception that other people limit their personal use of antibiotics is linked to respondents' own willingness to do so. Few of the individual characteristics can explain the variation in that decision.

Keywords: collective action, antibiotics use, antibiotic resistance, willingness to abstain

JEL classification: D90, I12

Acknowledgments: Financial support from the Center for Antibiotic Resistance Research, Foundation for Economic Research in West Sweden and the Center for Collective Action Research is gratefully acknowledged.

[a] Department of Economics, University of Gothenburg, Gothenburg, Sweden
[b] Center for Antibiotic Resistance Research (CARe), University of Gothenburg, Gothenburg, Sweden
[c] Centre for Collective Action Research (CeCAR), University of Gothenburg, Gothenburg, Sweden
[d] Department of Infectious Diseases, Institute of Biomedicine, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden
[e] Department of Political Science, University of Gothenburg, Gothenburg, Sweden
[f] The SOM Institute, University of Gothenburg, Gothenburg, Sweden
* Corresponding author

1 Introduction

Many global challenges, such as climate change, resource depletion, and the spread of communicable diseases, are so-called collective action dilemmas. These are problems that can only be solved by large groups of people contributing to a common good and/or abstaining from harmful behavior. Collective action problems are often defined as situations where the gain for the collective is largest when everyone cooperates, while the gain for each individual actor is largest if he or she abstains from cooperating, disregarding all other actors' behavior (Dawes 1980). Nevertheless, it is well known that voluntary cooperation does frequently occur, especially in small- and medium-scale settings such as in the area of local resource extraction; scholars like Elinor Ostrom (Ostrom 1990, 2005, 2011) and Arun Agrawal (Agrawal 2001; Agrawal and Gibson 1999; Agrawal and Goyal 2001) have shown that such cooperation occurs and have explained why. Thus, the literature has identified a number of key factors that tend to increase the probability of cooperation, including group size, the delimitation of the resource, low degree of anonymity, high degree of public disclosure, possibilities for communication among actors, repeated interactions, possibilities for punishing unwanted behavior, and – in particular – trust (Dietz et al. 2002). Factors that have been found to decrease cooperation include the availability of a resource being perceived to be critically low and uncertainty about the state of a resource (Hine and Gifford 1996; Parks, Xu, and Van Lange 2017).

Antibiotic resistance is a collective action dilemma. It is well known that use of antibiotics leads to the development of antibiotic resistance (Bronzwaer et al. 2002; Goossens et al. 2005). The more consumption there is, the less healing capacity remains. Antibiotic resistance is already causing hundreds of thousands of deaths annually and is predicted to increase radically in the future if it is not effectively counteracted (O'Neill 2014). At the same time, even for milder medical problems, people value their own time and are therefore eager to take medications that give them faster symptom relief and enable them to return to their normal activities as soon as possible (Wilson et al. 2004). The collective action problem of antibiotic resistance is therefore best described as a situation where prescribers and patients alike have no or only few reasons to take the global levels of resistance into account when making their consumption decisions, since the individual contribution is always comparably small (Laxminarayan and Heymann 2012; Rönnerstrand and Andersson Sundell 2015; Jørgensen et al. 2016; Tarrant et al. 2019).

Similar to other large-scale problems, such as climate change and marine plastic pollution, reduction of the problem of antibiotic resistance will require large-scale cooperation in terms of both geographical scope and number of actors (Nannestad 2008). Despite the large scale of the problems mentioned, and despite the limited impact one single individual can have on the outcome, we do know that some people voluntarily make certain sacrifices to contribute to reducing the negative impacts, i.e., they cooperate. Most scholarly attention in this context has been given to people's willingness to reduce their own contribution to global climate changes, and researchers have found that voluntary sacrifices are typically correlated with a number of individual characteristics. For example, individuals with higher education tend to be more concerned about climate change and younger people are usually more willing to change their behavior related to climate change, while for example right-wing voters are less willing to take such actions (Semenza et al. 2008; Tobler, Visschers, and Siegrist 2012). Although to a much lesser extent, there are also studies focusing on people's willingness to contribute to the reduction of antibiotic resistance. For example, a few studies have looked at the role of trust/reciprocity and people's general willingness to postpone or abstain from using antibiotics (Rönnerstrand and Andersson Sundell 2015; Robertson, Jagers, and Rönnerstrand 2018).

The focus of this study is individual collective action to limit antibiotic use. We explore the links between individual characteristics, past experiences of antibiotics use, knowledge about antibiotic resistance, and generalized and institutional trust and (i) the acceptability of a physician's decision not to prescribe antibiotics and (ii) the willingness to abstain from using antibiotics for the common good. In doing so, the paper connects to the broad literature on collective action and voluntary provision of public goods.

It is difficult to use observational data to study acceptability and voluntary collective action. A number of studies have used experiments to investigate cooperation, and then cooperation in smaller scale settings in the lab (Chaudhuri 2011). Field studies have focused on donations (Frey and Meier 2004; Shang and Croson 2009) or resource use at the local level (Cardenas, Ahn, and Ostrom 2004; Velez, Stranlund, and Murphy 2009). Our interest is in large-scale settings, and we use a survey-based method where we construct scenarios and ask the respondents what they would do under those specific circumstances. Moreover, we carried out the study in Sweden, where both the level of knowledge about antibiotics is high (Vallin et al. 2016; 'Special Eurobarometer 445: antimicrobial resistance.' 2016) and antibiotics are solely available by

prescription. In addition, we explained the definition of antibiotic resistance in our survey. Our respondents were therefore aware of the link between antibiotics use and antibiotic resistance and knew that the availability of antibiotics is regulated by prescriptions from physicians. Since the frequency of prescriptions is already comparably low (i.e., we investigate the willingness to cooperate in a setting with a low level of unnecessary prescriptions of antibiotics), choosing the case of Sweden can be seen as a critical case: If we find willingness to abstain from using antibiotics, one can probably expect even stronger willingness in countries where the current level antibiotic use is higher.

We conducted a survey with a representative sample of the Swedish population. In the survey, we asked respondents how likely they would be to accept a physician's decision not to prescribe antibiotics in a situation where they believe they actually need antibiotics. In addition, respondents were asked to state their willingness to abstain from taking antibiotics in a situation where this would prolong their sickness but not be lethal in any way. We also asked them about their expectations about how willing they believed other people would be to do the same. Finally, we also included questions to measure respondents' institutional and generalized trust, their knowledge about antibiotic resistance, their health status, possible experiences of being denied antibiotics, as well as socioeconomic and demographic characteristics.

Our empirical analyses reveal that trust in healthcare sector is positively associated with acceptability of a physician's decision not to prescribe antibiotics, also when controlling for knowledge about antibiotic resistance and other potential confounders. Those who are worried about antibiotic resistance are also more willing to accept a doctor's decision. However, our ability to explain the variation in the responses is limited. When it comes to willingness to abstain, we find that the variation in responses is mainly related to past experiences and concerns about antibiotic resistance. Individuals who have used antibiotics in the last year and those who have been denied antibiotics in the past are typically much less willing to abstain from taking antibiotics. We do not find that any form of trust affects the willingness to abstain from using antibiotics, while expectations about what others would do does have a certain effect. Thus, we argue that the belief of what others would do if confronted with the same situation as the respondents appears to be linked to cooperation through norms of reciprocity (Gächter and Herrmann 2009; Fehr and Schmidt 2006; Rönnerstrand and Andersson Sundell 2015) rather than trust per se.

The rest of the article is structured as follows: First, we describe antibiotics use in high-income countries and what factors have been shown to affect it. Second, we discuss the relationship between individual characteristics, experiences, trust and antibiotics use and behavior, followed by a description of previous research and mechanisms between generalized trust and individual cooperation to limit antibiotics use. In the subsequent section, our data and method are explained, followed by our results. Thereafter our findings are discussed. We end the article with some concluding remarks.

2 Antibiotics use and individual behavior

It is well-known that the consumption of antibiotics in high-income countries does not correspond to the frequency of bacterial infections. Instead, the levels of antibiotics use and/or antibiotic resistance are linked to a number of institutional, socioeconomic, and cultural factors. Institutional factors include type of healthcare system (Cars, Mölstad, and Melander 2001) and variables related to it, such as national recommendations, treatment traditions and pharmaceutical marketing (Bjerrum et al. 2004), and levels of corruption (Collignon et al. 2015; Collignon et al. 2018; Rönnerstrand and Lapuente 2017). Examples of socioeconomic factors include economic inequality (Kirby and Herbert 2013), GDP per capita, and public spending on healthcare (Collignon et al. 2018). Uncertainty avoidance and masculinity norms have been identified as the most relevant cultural factors affecting antibiotics use in a country (Harbarth and Monnet 2008; Touboul-Lundgren et al. 2015; Borg 2012, 2014).

There are also individual-level factors affecting personal consumption of antibiotics. In a study of the Swedish population, knowledge about antibiotic resistance has been linked to more appropriate use of antibiotics (Vallin et al. 2016). However, the results from prior studies are partly inconclusive. Another study found that better knowledge is linked to higher stated frequency of self-medication with left-over antibiotics (McNulty et al. 2007). The same two studies found a link between low education and lower commitment to prudent antibiotic use and higher consumption of antibiotics. A systematic review of gender differences in the prevalence of

antibiotic treatment found women to be treated with antibiotics to a larger extent than men (Schröder et al. 2016).

Since overconsumption is a key reason for the accelerated growth of antibiotic resistance, there is an upsurge in regulations intended to reduce antibiotics use through antibiotic stewardship programs in inpatient and outpatient care (Sanchez 2016; Barlam et al. 2016). A majority of countermeasures are directed to medical practitioners, for example through education and implementation of treatment guidelines to reduce their prescription of antibiotics (Mölstad et al. 2002; Mueller and Östergren 2016). But since patients are known to influence the decision-making by healthcare staff (Bradley 1992a, 1992b; McNulty et al. 2013; Mangione-Smith et al. 2004), attention is now also being given to efforts to change the behavior and attitudes of the general public. Information campaigns focusing on prudent use of antibiotics is one example (Huttner et al. 2010).

However, although an increase in the public's knowledge and awareness of antibiotic use and its link to resistance is likely to be necessary in order for behavioral and attitudinal change to occur, it can hardly get the job done alone. At least, this has been a theoretical point of departure in many models of collective action, ever since the seminal work by Hardin (Hardin 1968). Furthermore, the fact that the use of antibiotics is correlated with individual-level characteristics, attitudes or knowledge, does not necessarily mean that such factors are also correlated with people's *willingness to abstain* from taking antibiotics. We therefore investigate whether factors such as individual characteristics, past experiences, knowledge and concerns about antibiotic resistance, and generalized and institutional trust are linked to people's willingness to abstain from taking antibiotics and to accept a doctor's decision not to prescribe.

In regard to larger-scale problems, research also points to the importance of trust. High levels of generalized and institutional trust are argued to promote stability and effectiveness of a number of societal processes, including support of and compliance with a range of policies (Braithwaite and Levi 1998; Lubell and Scholz 2001). Trust has also been found to matter for health systems, and trust-based health systems in its turn can build value to a society (Gilson 2003). Although highly correlated, the mechanism at work when it comes to generalized and institutional trust differ. Generalized trust is argued to stimulate voluntary cooperation while institutional trust

upholds confidence in information from authorities and acceptance of their decisions (Braithwaite and Levi 1998; Putnam 2000; Uslaner 2002).

Although some prior studies discuss trust as potentially important for levels of antibiotic use (Nguyen 2011; Touboul-Lundgren et al. 2015; Deschepper et al. 2008), rather few empirically test whether this is in fact the case. Touboul-Lundgren et al. measure trust in physicians as an integrated part of their measure of culture, and show that practitioners are worried about losing patients' trust if they do not prescribe antibiotics. This is important since patients' expectations have previously been found to affect antibiotic prescription behavior (Stivers 2005). In a survey study on public knowledge and awareness related to antibiotics and antibiotic resistance in Sweden, André et al. (2010) found that when given a choice between a doctor who prescribed antibiotics and one who did not, more respondents reported trusting the latter. Similarly, Vallin and co-authors (2016) found that while 89 percent of their respondents had confidence in doctors who did prescribe antibiotics also as many as 79 percent had confidence in physicians who decided not to prescribe antibiotics. There are a few studies looking at the influence of trust and people's general willingness to postpone or abstain from using antibiotics (Rönnerstrand and Andersson Sundell 2015; Robertson, Jagers, and Rönnerstrand 2018). Rönnerstrand and Andersson Sundell found reciprocity and generalized trust to be positively correlated with individuals' willingness to postpone antibiotics treatment. Similarly, Robertson et al. showed that generalized trust is an important channel for explaining willingness to abstain from using antibiotics. In addition to generalized trust, we also investigate trust in healthcare as well as beliefs, i.e., expectations, about others' willingness to abstain from taking antibiotics. Moreover, and further discussed in the design section, we frame the willingness not to take antibiotics question such that there is real trade-off for the respondents between not taking the antibiotics and getting well sooner by taking them.

3 Survey design and data

The survey was administered to respondents (18–75 years old) through the Citizen Panel (Martinsson et al., 2018), which is an online panel survey administered by the Laboratory of Opinion Research (LORE) at the Faculty of Social Science, University of Gothenburg, in Sweden. The survey was conducted from March 22 to April 16 in 2018 and resulted in a total of

1,906 responses. The participation rate for the survey panel was 55.4 percent. To better mirror the Swedish population, the sample was stratified by education, age, and gender.

The survey consisted of four parts. The first part contained questions about the respondent's contact with the healthcare sector and use of antibiotics. The second part contained knowledge-questions about antibiotics and antibiotic resistance. In the third part, respondents were asked about their levels of generalized trust and trust in various institutions, including healthcare sector. Finally, the last part contained questions about the respondent's demographics and socio-economic status.

3.1 Dependent variables

Two separate indicators of preparedness for collective action to limit antibiotic resistance were used: Acceptability of the physician's decision not to prescribe antibiotics and willingness to abstain from taking antibiotics. In order to measure the willingness to abstain from taking antibiotics in a situation where this would not cause any serious threats to the individual, we asked the following question:

> "For a number of bacterial infections, for example tonsillitis, we know that the use of antibiotics will quicken your recovery. If you do not take antibiotics, you will continue to be ill for several additional days. How willing or unwilling are you to abstain from using antibiotics when possible, even if it means that you will be sick for some extra days?"

Respondents were told to answer on a scale from 1 (very willing) to 5 (very unwilling). In order to measure acceptability of a physician's decision, we asked the following question:

> "If a doctor would not prescribe antibiotics, even if you were sure that you needed them, how would you react?"[g] The following response alternatives were given (the respondents could mark several): (i) I would accept it, (ii) I would try to convince the doctor to prescribe antibiotics, (iii) I would be upset, but not say anything, (iv) I would contact another doctor, (v) I would ask for advice from a doctor I know, and (vi) other.

Respondents who choose option (i) are identified as "willing to accept the decision."

[g] It could of course be brought into question whether patients really can be "sure" that they need antibiotics, but the question is designed to target the perceptions of patients and not medical realities.

3.2 Independent variables

The final part of the survey consisted of questions regarding demographic and socioeconomic factors such as age, gender, education, place of residence, children, income, and self-rated health status.

The first part of the survey contained a set of questions about the use of antibiotics in the past 12 months, whether the respondents had visited a doctor in the past 12 months, and whether they had been denied antibiotics one or several times (despite them believing that they needed them). The survey also included a set of questions intended to measure the respondents' knowledge about antibiotics and antibiotic resistance. The variable consists of an index based on four knowledge questions. Respondents were asked to identify whether the following statements are correct: (i) antibiotics are effective against viruses, (ii) if I have bronchitis I will get well sooner with antibiotics, (iii) antibiotics negatively affect the body's natural bacterial flora, (iv) bacteria can be resistant to antibiotics, and (v) the use of antibiotics in animal husbandry may eventually affect the effectiveness of antibiotics in humans. In addition, we asked to what extent respondents worried about antibiotic resistance on a 1–4 scale, where 4 corresponded to the highest level of concern.

Regarding trust, the survey included a question on generalized trust, reading "In your opinion, to what extent can people in general be trusted?" The respondents answered this question on a 0–10 scale, where 0="You cannot trust people" and 10="You can trust people." We also asked about their trust in healthcare sector and the doctor(s) at their own healthcare center. Here the response alternatives ranged from 1 (very high trust) to 6 (very low trust). In order to investigate whether perceptions about other people's willingness to reduce their consumption of antibiotics mediate the relationship between generalized trust and own willingness to limit use, we asked the following question: "How willing or unwilling do you think other people are to abstain from using antibiotics when possible, even if it means a few extra sick days?" The respondents were again told to answer on a scale from 1 (very willing) to 5 (very unwilling).

4 Results

4.1 Descriptive statistics

Table 1 reports descriptive statistics for the sample. A large share of the respondents had visited a doctor at least once and 20 percent had taken antibiotics at least once, in the past 12 months. Overall, the subjectively rated health status of the respondents is good, with a mean value of almost 4 (on a 1–5 scale). The level of knowledge about antibiotics is high, with a mean value of 0.77, meaning that the number of correct answers is close to 4 out of 5. There is also a considerable level of concern about antibiotic resistance. Overall, the level of trust is high with an average level of generalized trust of almost 7 (on a 0–10 scale), and the level of trust in healthcare and the doctor(s) at one's own healthcare center is also high (3.8 on a 1–5 scale).[h,i] Comparing with official statistics for Sweden, we can see that our sample is representative with respect to gender and education, but there is a certain overrepresentation of older respondents.

[h] Figure A1 in the appendix shows the full distribution of responses to the question on generalized trust.

[i] The fact that both the self-rated health status and trust in healthcare are high in our sample is in line with the findings by Mohseni and Lindström (2007), who found that low trust in the healthcare system is related to poor self-perceived health.

Table 1. Descriptive statistics

Variable	Description		Statistics of Sweden
Female	=1 if respondent is female	0.480	0.499
Older	= If respondent is ≥60 years	0.291	0.198
Young	= if respondent is <40 years	0.293	
University	=1 if university education ≥ 3 years.	0.263	0.270
Large city	=1 if respondent lives in one of the 3 biggest cities in Sweden	0.386	
Has child	=1 if respondent has children < 11 years	0.185	
Work	=1 if working full time	0.633	
Income	=household income after taxes in SEK 10,000	4.067 (2.173)	
Visit doctor	=1 if visited a doctor at least once in the last 12 months	0.710	
Taken antibiotics	=1 if taken antibiotics at least once in the last 12 months	0.200	
Refused antibiotics	= 1 if having not received antibiotics despite actually needing them	0.131	
Health status	Rating of own health status on the 1–5 scale, where 5 is very good	3.909 (0.853)	
Correct	Mean value of correct answers to 5 statements about antibiotic usage	0.769 (0.082)	
Worry resistance	Level of concern about resistance on a 1–4 scale, where 4 means highest level of concern.	3.090 (0.982)	
Generalized trust	Rating of general trust on 0–10 scale, where 10 is very high trust	6.862 (1.980)	
Trust healthcare	Rating of trust in healthcare sector in general on a 1–5 scale, where 5 is very high trust.	3.752 (0.919)	
Trust own doctor	Rating of trust in doctor at own healthcare center on 1–5 scale, where 5 is very high trust	3.660 (1.016	
Accept decision	= 1 if respondent would accept doctor's decision despite belief that antibiotics should be prescribed	0.528	
N	Number of observations	1,869	

A majority, 53 percent, of the sample would accept a decision by a doctor not to prescribe antibiotics, despite disagreeing.[j] Table 2 presents responses to our two main questions regarding willingness not to take antibiotics. The first question concerned own willingness and the second the perceived willingness of others.

[j] Vallin et al. (2016) also conducted a study in Sweden and found that over 79 percent of their respondents had confidence in decisions by doctors not to prescribe antibiotics. However, they did not inquire about the respondents' acceptance in cases where the respondents believed they really needed antibiotics.

Table 2. Distribution of responses to question on willingness not to take antibiotics

	Self	Others
Very unwilling	5%	12%
Unwilling	15%	52%
Neither willing nor unwilling	15%	20%
Willing	35%	14%
Very willing	30%	2%
Number of obs.	1,869	1,869

A majority stated that they are willing or very willing not to take antibiotics, while only 16 percent thought that others are willing or very willing. Furthermore, 20 percent are unwilling or very unwilling to abstain from using antibiotics, while the same fraction is 64 percent when the question concerns other people's willingness. The correlation coefficient between the responses to the two questions is around 0.36. The difference in response distributions is statistically significant at the 1% level using a sign-rank test, indicating a clear difference between the two questions. Thus, there is a large difference between what respondents think they would do personally and what they think other people would do. At the individual level, this might be correct of course, but in total a rather large share of the respondents are either over-estimating their own willingness not to take antibiotics or under-estimating others' willingness not to take antibiotics. The phenomenon of trusting one's own ability to make decisions relates to the literature on overconfidence (Moore and Healy 2008; Benoît and Dubra 2011; Benoît et al. 2015). In the overconfidence literature, a person's belief that his or her own judgment is better than other people's judgment is known as *overconfidence* or *illusionary superiority* if person´s beliefs are identified as biased. Bias occurs if more than half of the population believes that their behavior or decisions are better than those of half of the population.

Our interest, however, is not primarily in the exact levels of the responses to the two questions. Instead, we are interested in the variation in responses across individuals and in the correlation and relative difference between the responses to the two questions. Thus, even if there is an element of overconfidence in the responses, we will assume that an individual who claims to be very willing is actually more willing to abstain than one who claims to be, for example, unwilling.

4.2 Regression analysis

In the main text we focus on how factors correlate with the two main questions of interest, i.e., concerning (i) the likelihood of accepting the decision of a physician and (ii) the willingness to abstain from taking antibiotics, respectively. In Table A1 in the appendix, we report regression models for stated trust (both generalized and trust in healthcare sector) and for expectations about other people's willingness not to take antibiotics.[k]

Acceptance of a doctor's decision is a binary variable, equal to one if a respondent accepts and zero if not, but we report results from a standard ordinary least square regression.[l] We first estimate a model with socio-economic characteristics only. In the second model, we add variables relating to experience and knowledge regarding antibiotics and antibiotic resistance, and finally, in the third model we also include trust and expected willingness of others. The results are presented in Table 3.

[k] Generalized trust is correlated with a number of individual characteristics. Females and university educated have higher levels of trust, trust increases with income, and younger people have a lower level of trust. In addition, trust increases with self-reported health status. Stated trust in the healthcare sector is not correlated with as many individual characteristics, but it is positively correlated with being older, income, and health status, and in addition, those who have been refused antibiotics have a lower level of trust in the healthcare sector. The stated willingness of others to abstain from taking antibiotics is correlated with age: those who are older have higher beliefs about other people's willingness to abstain from taking antibiotics. Moreover, the stated willingness of others to abstain is negatively correlated with a high knowledge about correct antibiotics usage and positively correlated with generalized trust.

[l] Results from a binary probit model give similar results. These are available from the authors upon request.

Table 3. Regression models for acceptance of doctor's decision not to prescribe antibiotics

	(1)	(2)	(3)
Female	-0.018	-0.018	-0.016
	(0.024)	(0.024)	(0.024)
Older	0.076*	0.050	0.040
	(0.031)	(0.031)	(0.031)
Young	-0.024	-0.040	-0.033
	(0.029)	(0.030)	(0.030)
University	-0.021	-0.037	-0.046
	(0.028)	(0.028)	(0.028)
Large city	-0.036	-0.038	-0.034
	(0.024)	(0.025)	(0.024)
Work	-0.019	-0.019	-0.012
	(0.028)	(0.029)	(0.028)
Income	-0.005	-0.006	-0.009
	(0.0061)	(0.006)	(0.006)
No response income	-0.060	-0.033	-0.031
	(0.060)	(0.061)	(0.060)
Has child	-0.018	-0.022	-0.024
	(0.032)	(0.033)	(0.033)
Visit doctor		0.018	0.014
		(0.027)	(0.027)
Taken antibiotics		-0.055	-0.055
		(0.030)	(0.030)
Refused antibiotics		-0.160***	-0.137***
		(0.035)	(0.035)
Correct		0.047	0.011
		(0.147)	(0.146)
Worry resistance		0.032*	0.030*
		(0.012)	(0.012)
Health status		0.018	0.002
		(0.014)	(0.015)
Trust healthcare			0.075***
			(0.014)
Generalized trust			0.009
			(0.006)
Others' willingness to abstain			-0.003
			(0.013)
Constant	0.577***	0.417**	0.188
	(0.036)	(0.130)	(0.139)
Observations	1,869	1,786	1,786
R-squared	0.013	0.032	0.053

Note: Significant at * 5%, ** 1%, and *** 0.1%

The willingness to accept a doctor's decision not to prescribe antibiotics despite disagreeing is not to any large extent correlated with any of the individual characteristics we observe. Older respondents are more likely to accept the decision, but the effect is small and the coefficient is only statistically significant at the 5% level.[m] In the next model, we add experiences and knowledge regarding antibiotics and antibiotic resistance. Being concerned about antibiotic resistance increases the likelihood of accepting a no-prescription decision. The effect size is not very large; a one standard deviation increase in concern increases the likelihood of accepting a no-prescription decision by 0.02 units. However, experience of having been refused antibiotics in the past, despite own belief that antibiotics were needed, decreases the acceptance of the decision by 0.16 units. In the third model, we add the two measures of trust. Interestingly, generalized trust is not statistically significant[n], while trust in healthcare sector is. However, the size of the effect is not very large; a one standard deviation increase in trust in healthcare (0.92) increases the likelihood of accepting a no-prescription decision by 0.07 units (the average value of the probability of accepting the decision is 0.53). Thus, in general, we cannot explain the variation in acceptability of a no-prescription decision. All three models have a low explanatory power, and the effect sizes are small.

Next, we estimate models for the willingness to abstain from using antibiotics in a case of non-fatal infection but where antibiotics would decrease the number of sick days. The stated own willingness to abstain variable has five categories (1 = very unwilling and 5 = very willing), but we report results from standard ordinary least squares regressions.[o]

---

[m] As shown in Table 1, we have overrepresentation of older respondents in the sample. However, the significant but small impact of being older disappears in models 2 and 3 with more controls. Therefore, we are not worried that this overrepresentation has affected our results to any significant extent.

[n] Veenstra (2000) also found that general trust was unrelated to self-reported health status, but an association between trust and self-reported mental health has been found in for example Lindström and Mohseni (2009).

[o] We have also estimated ordered probit models, but we report results from standard regressions since the results are very similar and the interpretation of the results is more straightforward. Results from ordered probit models are available from the authors upon request.

Table 4. Regression models for stated willingness to abstain from taking antibiotics

	(1)	(2)	(3)
Female	-0.054	-0.073	-0.042
	(0.056)	(0.055)	(0.051)
Older	-0.023	-0.066	-0.107
	(0.073)	(0.070)	(0.065)
Young	0.089	0.025	0.119
	(0.069)	(0.068)	(0.063)
University	-0.008	-0.066	-0.109
	(0.065)	(0.064)	(0.060)
Large city	-0.138*	-0.141*	-0.106*
	(0.057)	(0.055)	(0.051)
Work	-0.025	-0.061	-0.041
	(0.066)	(0.064)	(0.060)
Income	-0.009	-0.017	-0.023
	(0.015)	(0.014)	(0.013)
No response income	-0.079	-0.009	-0.041
	(0.142)	(0.137)	(0.127)
Has child	0.051	0.071	0.077
	(0.077)	(0.074)	(0.069)
Visit doctor		-0.094	-0.103
		(0.062)	(0.057)
Taken antibiotics		-0.228***	-0.248***
		(0.068)	(0.063)
Refused antibiotics		-0.603***	-0.531***
		(0.079)	(0.073)
Correct		-0.372	-0.111
		(0.330)	(0.307)
Worry resistance		0.285***	0.276***
		(0.028)	(0.026)
Health status		0.097**	0.096**
		(0.032)	(0.031)
Trust healthcare			0.029
			(0.029)
Generalized trust			0.005
			(0.014)
Others' willingness to abstain			0.451***
			(0.027)
Constant	3.816***	3.152***	1.722***
	(0.089)	(0.293)	(0.292)
Observations	1,869	1,786	1,786
R-squared	0.006	0.111	0.240

Note: Significant at * 5%, ** 1%, and *** 0.1%

In the first model with only individual characteristics, living in a large city is the only one that is significantly associated with willingness to abstain from using antibiotics. Thus, again we are unable to explain the variation in responses with individual characteristics. We then add experience and knowledge variables. Almost all characteristics related to own health status and recent experience with healthcare are statistically significant: worse health status, recent use of antibiotics, being denied antibiotics in the past, low level of concern about resistance, and lower health status are all associated with a lower willingness to abstain. Having been denied antibiotics has the largest effect: the willingness decreases by 0.6 units (mean value of the stated willingness is 3.7) if a respondent has been denied antibiotics in the situation where he or she believed they were needed. Past use of antibiotics is relatively important as well: the willingness to abstain is 0.2 units lower if the person has used antibiotics in the last 12 months. Finally, those who are concerned about antibiotic resistance are clearly more likely to state they would not take antibiotics.

Next, we look at what happens if we include both of the stated trust variables and expectation about other people's willingness to abstain from using antibiotics. Interestingly, neither of the stated trust variables is statistically significant, while expectation about what others would do is, and the effect is sizeable. An increase by one standard deviation in expectation variable (0.93) increases the stated willingness by 0.47 units (the mean value of the stated own willingness to abstain is 3.7). Clearly, expectation about others and trust may be correlated. However, if we estimate the model without expectation about others, personal trust is still not statistically significant, although the size of the coefficient increases.

5 Discussion

We set out to investigate whether people accept a doctor's decision not to prescribe antibiotics despite disagreeing and whether people's willingness to abstain from taking antibiotics can be explained by trust, individual characteristics, and experience and knowledge regarding antibiotics and antibiotic resistance.

We found that a substantial fraction of the respondents reported to be willing to accept a doctor's decision not to prescribe antibiotics. Even though this issue is potentially sensitive to social

desirability and hence over-reporting of compliant behavior, our finding is important not least in light of the existence of other sources of antibiotics available to patients who are disappointed with doctors' decisions not to prescribe antibiotics, such as leftover supplies from previous prescriptions, online pharmacies, and simply other doctors. High acceptability of doctors' no-prescription decisions is also important because it signifies that even in a low-prescribing setting, such as in Sweden, a strict antibiotics policy may be supported by the Swedish people. (André et al. 2010; Vallin et al. 2016). In a study by André and colleges, high acceptability of physicians' decision of not prescribing antibiotics was found. However, the rate of prescriptions of antibiotics decreased substantially after the sampling of data (2006) in the study by André et al. and continued to decrease also after the data sampling (2013) in Vallin et al (Swedres-Swarm 2017). It is questionable whether these results are valid today in the new low-prescribing setting, and this highlights the importance of repeated large-scale surveys like ours.

Intriguingly, we have a hard time explaining acceptability of a doctor's decision. A few of the individual characteristics and experiences are statistically significant, but with small effect sizes. The factors significantly associated with acceptability of a doctor's decisions include trust in the healthcare system. This finding fits well with prior studies investigating the link between institutional trust and health-related collective action problems, such as vaccinations (Rönnerstrand 2013) and other protective measures to limit the spread of transferable diseases (Chuang et al. 2015). As Ancilotti et al. (2018) point out, patients often trust their own healthcare centers and rely on proper information about antibiotic resistance and why antibiotics are not needed in some situations. If a patient perceives that the information is not accurate, his or her trust in and acceptance of a doctor's decision is likely to diminish. Trust in the healthcare system is thus conditional not only on decisions on antibiotic prescriptions but also on information provided by healthcare workers.

The willingness to abstain from using antibiotics is rather strongly correlated with experience and concerns about resistance. Again, individual characteristics do not explain the variation in responses. Interestingly, we did not find generalized or institutional trust to be correlated with willingness to abstain from using antibiotics. This contradicts what has been demonstrated in other studies on antibiotic use (Robertson, Jagers, and Rönnerstrand 2018; Rönnerstrand and Andersson Sundell 2015). One possible explanation for the lack of association between institutional trust in the healthcare sector and willingness to limit one's use of antibiotics might

be that this kind of trust makes people more inclined to believe that antibiotic resistance is a problem that can be effectively resolved by the healthcare system, and hence that voluntary behavioral change by individuals is unnecessary. However, the importance of expectations about what others would do suggests that the willingness to abstain from antibiotics is linked to cooperation through norms of reciprocity (Gächter and Herrmann 2009; Fehr and Schmidt 2006). This is in line with prior scenario-experimental results (Rönnerstrand and Andersson Sundell 2015).

Thus, while we find that individuals in this study are willing to take action to reduce the use of antibiotics and to accept a doctor's decisions not to prescribe, we cannot explain the determinants behind the behavior to any large extent. This means that our paper provides little guidance on how to increase the likelihood of voluntary cooperation. It still remains an open question whether there are other factors that can explain the variation to a larger degree. Future research may further explore the potential link between personality types and attitudes and behavior related to antibiotic use (Axelsson 2013). Also, patient´s experience of expecting a prescription of antibiotics, but being refused, should be examined in settings with low rates of antibiotic prescriptions. Otherwise a judicious use of antibiotics may suffer setbacks.

References

Agrawal, Arun. 2001. 'Common property institutions and sustainable governance of resources', *World Development*, 29: 1649-72.

Agrawal, Arun, and Clark C. Gibson. 1999. 'Enchantment and disenchantment: the role of community in natural resource conservation', *World Development*, 27: 629-49.

Agrawal, Arun, and Sanjeev Goyal. 2001. 'Group Size and Collective Action: Third-party Monitoring in Common-pool Resources', *Comparative Political Studies*, 34: 63-93.

Ancillotti, Mirko, Stefan Eriksson, Jorien Veldwijk, Jessica Nihlén Fahlquist, Dan I. Andersson, and Tove Godskesen. 2018. 'Public awareness and individual responsibility needed for judicious use of antibiotics: a qualitative study of public beliefs and perceptions', *BMC Public Health*, 18: 1153.

André, Malin, Åsa Vernby, Johanna Berg, and Cecilia Stålsby Lundborg. 2010. 'A survey of public knowledge and awareness related to antibiotic use and resistance in Sweden', *Journal of Antimicrobial Chemotherapy*, 65: 1292-96.

Axelsson, Malin 2013. 'Report on personality and adherence to antibiotic therapy: a population-based study', *BMC Psychology*, 1: 24.

Barlam, Tamar F., Sara E. Cosgrove, Lilian M. Abbo, Conan MacDougall, Audrey N. Schuetz, Edward J. Septimus, Arjun Srinivasan, Timothy H. Dellit, Yngve T. Falck-Ytter, and Neil O. Fishman. 2016. 'Implementing an antibiotic stewardship program: guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America', *Clinical Infectious Diseases*, 62: e51-e77.

Bjerrum, Lars, Albert Boada, Josep M. Cots, Carlos Llor, Dolors Fores Garcia, Bente Gahrn-Hansen, and Anders Munck. 2004. 'Respiratory tract infections in general practice: considerable differences in prescribing habits between general practitioners in Denmark and Spain', *European journal of clinical pharmacology*, 60: 23-28.

Borg, Michael A. 2012. 'National cultural dimensions as drivers of inappropriate ambulatory care consumption of antibiotics in Europe and their relevance to awareness campaigns', *Journal of Antimicrobial Chemotherapy*, 67: 763-67.

———. 2014. 'Cultural determinants of infection control behaviour: understanding drivers and implementing effective change', *Journal of Hospital Infection*, 86: 161-68.

Bradley, Colin P. 1992a. 'Factors which influence the decision whether or not to prescribe: the dilemma facing general practitioners', *British Journal of General Practice*, 42: 454-58.

———. 1992b. 'Uncomfortable prescribing decisions: a critical incident study', *Bmj*, 304: 294-96.

Braithwaite, Valerie, and Margaret Levi. 1998. *Trust and governance* (Russell Sage Foundation).

Bronzwaer, Stef L. A. M., Otto Cars, Udo Buchholz, Sigvard Mölstad, Wim Goettsch, Irene K. Veldhuijzen, Jacob L. Kool, Marc J. W. Sprenger, John E. Degener, and System participants in the European Antimicrobial Resistance Surveillance. 2002. 'The Relationship between Antimicrobial Use and Antimicrobial Resistance in Europe', *Emerging infectious diseases*, 8: 278-82.

Cardenas, Juan-Camilo, T. K. Ahn, and Elinor Ostrom. 2004. 'Communication and co-operation in a common-pool resource dilemma: A field experiment.' in, *Advances in Understanding Strategic Behaviour* (Springer).

Cars, Otto, Sigvard Mölstad, and Arne Melander. 2001. 'Variation in antibiotic use in the European Union', *The Lancet*, 357: 1851-53.

Chaudhuri, Ananish. 2011. 'Sustaining cooperation in laboratory public goods experiments: a selective survey of the literature', *Experimental Economics*, 14: 47-83.

Chuang, Ying-Chih, Ya-Li Huang, Kuo-Chien Tseng, Chia-Hsin Yen, and Lin-hui Yang. 2015. 'Social capital and health-protective behavior intentions in an influenza pandemic', *PLoS One*, 10: e0122970.

Collignon, Peter, Prema-chandra Athukorala, Sanjaya Senanayake, and Fahad Khan. 2015. 'Antimicrobial resistance: the major contribution of poor governance and corruption to this growing problem', *PLoS One*, 10: e0116746.

Collignon, Peter, John J. Beggs, Timothy R. Walsh, Sumanth Gandra, and Ramanan Laxminarayan. 2018. 'Anthropological and socioeconomic factors contributing to global antimicrobial resistance: a univariate and multivariable analysis', *The Lancet Planetary Health*, 2: e398-e405.

Dawes, Robyn M. 1980. 'Social dilemmas', *Annual review of psychology*, 31: 169-93.

Deschepper, Reginald, Larissa Grigoryan, Cecilia Stålsby Lundborg, Geert Hofstede, Joachim Cohen, Greta Van Der Kelen, Luc Deliens, and Flora M. Haaijer-Ruskamp. 2008. 'Are cultural dimensions relevant for explaining cross-national differences in antibiotic use in Europe?', *BMC Health Services Research*, 8: 123.

Dietz, Thomas, Nives Dolšak, Elinor Ostrom, and Paul C. Stern. 2002. 'The Drama of the Commons.' in Elinor Ostrom, Thomas Dietz, Nives Dolšak, Paul C. Stern, Susan Stonich and Elke U. Weber (eds.), *The drama of the commons* (National Academy Press: Washington DC).

Fehr, Ernst, and Klaus M. Schmidt. 2006. 'The economics of fairness, reciprocity and altruism–experimental evidence and new theories', *Handbook of the economics of giving, altruism and reciprocity*, 1: 615-91.

Frey, Bruno S., and Stephan Meier. 2004. 'Social comparisons and pro-social behavior: Testing" conditional cooperation" in a field experiment', *American Economic Review*, 94: 1717-22.

Gilson, Lucy. 2003. 'Trust and the development of health care as a social institution', *Social Science & Medicine*, 56: 1453-68.

Goossens, Herman, Matus Ferech, Robert Vander Stichele, and Monique Elseviers. 2005. 'Outpatient antibiotic use in Europe and association with resistance: a cross-national database study', *The Lancet*, 365: 579-87.

Gächter, Simon, and Benedikt Herrmann. 2009. 'Reciprocity, culture and human cooperation: previous insights and a new cross-cultural experiment', *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364: 791-806.

Harbarth, Stephan, and Dominique L. Monnet. 2008. 'Cultural and socioeconomic determinants of antibiotic use.' in, *Antibiotic policies: fighting resistance* (Springer).

Hardin, Garrett. 1968. 'The tragedy of the commons', *science*, 162: 1243-48.

Hine, Donald W., and Robert Gifford. 1996. 'Individual restraint and group efficiency in commons dilemmas: The effects of two types of environmental uncertainty 1', *Journal of Applied Social Psychology*, 26: 993-1009.

Huttner, Benedikt, Herman Goossens, Theo Verheij, and Stephan Harbarth. 2010. 'Characteristics and outcomes of public campaigns aimed at improving the use of antibiotics in outpatients in high-income countries', *The Lancet Infectious Diseases*, 10: 17-31.

Jørgensen, Peter S., Didier Wernli, Scott P. Carroll, Robert R. Dunn, Stephan Harbarth, Simon A. Levin, Anthony D. So, Maja Schlüter, and Ramanan Laxminarayan. 2016. 'Use antimicrobials wisely', *Nature News*, 537: 159.

Kirby, Andrew, and Annie Herbert. 2013. 'Correlations between Income Inequality and Antimicrobial Resistance', *PLoS One*, 8: e73115.

Laxminarayan, Ramanan, and David L. Heymann. 2012. 'Challenges of drug resistance in the developing world', *BMJ-British Medical Journal*, 344: e1567.

Lindstrom, Martin, and Mohabbat Mohseni. 2009. 'Social capital, political trust and self-reported psychological health: A population-based study', *Social Science & Medicine*, 68: 436-43.

Lubell, Mark, and John T. Scholz. 2001. 'Cooperation, Reciprocity, and the Collective-Action Heuristic', *American Journal of Political Science*, 45: 160-78.

Mangione-Smith, Rita, Marc N. Elliott, Tanya Stivers, Laurie McDonald, John Heritage, and Elizabeth A. McGlynn. 2004. 'Racial/ethnic variation in parent expectations for antibiotics: implications for public health campaigns', *Pediatrics*, 113: 385-94.

McNulty, Cliodna A. M., P. Boyle, T. Nichols, P. Clappison, and P. Davey. 2007. 'The public's attitudes to and compliance with antibiotics', *J Antimicrob Chemother*, 60 Suppl 1: i63-68.

McNulty, Cliodna A. M., Tom Nichols, David P. French, Puja Joshi, and Chris C. Butler. 2013. 'Expectations for consultations and antibiotics for respiratory tract infection in primary care: the RTI clinical iceberg', *The British Journal of General Practice*, 63: e429-e36.

Mohseni, Mohabbat, and Martin Lindstrom. 2007. 'Social capital, trust in the health-care system and self-rated health: The role of access to health care in a population-based study', *Social Science & Medicine*, 64: 1373-83.

Mueller, Tanja, and Per-Olof Östergren. 2016. 'The correlation between regulatory conditions and antibiotic consumption within the WHO European Region', *Health Policy*, 120: 882-89.

Mölstad, Sigvard, Cecilia Stålsby Lundborg, Anna-Karin Karlsson, and Otto Cars. 2002. 'Antibiotic Prescription Rates Vary Markedly Between 13 European Countries', *Scandinavian Journal of Infectious Diseases*, 34: 366-71.

Nannestad, Peter. 2008. 'What Have We Learned About Generalized Trust, If Anything?', *Annual Review of Political Science*, 11: 413-36.

Nguyen, Ha. 2011. 'The principal-agent problems in health care: evidence from prescribing patterns of private providers in Vietnam', *Health Policy and Planning*, 26: i53-i62.

O'Neill, Jim. 2014. 'Review on antimicrobial resistance', *Antimicrobial Resistance: Tackling a Crisis for the Health and Wealth of Nations.*

Ostrom, Elinor. 1990. *Governing the commons: The evolution of institutions for collective action* (Cambridge university press).

———. 2005. *Understanding institutional diversity* (Princeton University Press Princeton, New Jersey).

———. 2011. 'Background on the institutional analysis and development framework', *Policy Studies Journal*, 39: 7-27.

Parks, Craig D., Xiaojing Xu, and Paul A. M. Van Lange. 2017. 'Does information about others' behavior undermine cooperation in social dilemmas?', *Group Processes & Intergroup Relations*, 20: 260-74.

Putnam, Robert D. 2000. *Bowling alone: The collapse and revival of American community* (Simon and Schuster).

Robertson, Felicia, Sverker C Jagers, and Björn Rönnerstrand. 2018. 'Managing Sustainable Use of Antibiotics—The Role of Trust', *Sustainability*, 10: 143.

Rönnerstrand, Björn. 2013. 'Social capital and immunisation against the 2009 A(H1N1) pandemic in Sweden', *Scandinavian Journal of Public Health*, 41: 853-59.

Rönnerstrand, Björn, and Karolina Andersson Sundell. 2015. 'Trust, reciprocity and collective action to fight antibiotic resistance. An experimental approach', *Social Science & Medicine*, 142: 249-55.

Rönnerstrand, Björn, and Victor Lapuente. 2017. 'Corruption and use of antibiotics in regions of Europe', *Health Policy*, 121: 250-56.

Sanchez, Guillermo V. 2016. 'Core elements of outpatient antibiotic stewardship', *MMWR. Recommendations and Reports*, 65.

Schröder, Wiebke, Harriet Sommer, Beryl Primrose Gladstone, Federico Foschi, Jenny Hellman, Birgitta Evengard, and Evelina Tacconelli. 2016. 'Gender differences in antibiotic prescribing in the community: a systematic review and meta-analysis', *Journal of Antimicrobial Chemotherapy*, 71: 1800-06.

Semenza, Jan C., David E. Hall, Daniel J. Wilson, Brian D. Bontempo, David J. Sailor, and Linda A. George. 2008. 'Public perception of climate change: voluntary mitigation and barriers to behavior change', *American Journal of Preventive Medicine*, 35: 479-87.

Shang, Jen, and Rachel Croson. 2009. 'A field experiment in charitable contribution: The impact of social information on the voluntary provision of public goods', *The Economic Journal*, 119: 1422-39.

'Special Eurobarometer 445: antimicrobial resistance.'. 2016. *European Commission*, Wave EB85.1.

Stivers, Tanya. 2005. 'Non-antibiotic treatment recommendations: delivery formats and implications for parent resistance', *Social Science & Medicine*, 60: 949-64.

Swedres-Swarm. 2017. "Consumption of antibiotics and occurrence of antibiotic resistance in Sweden." In. Solna/Uppsala: The Public Health Agency of Sweden.

Tarrant, Carolyn, Andrew M. Colman, Edmund Chattoe-Brown, David R. Jenkins, Shaheen Mehtar, Nelun Perera, and Eva M. Krockow. 2019. 'Optimising antibiotic prescribing: Collective approaches to managing a common-pool resource', *Clinical Microbiology and Infection*, In press.

Tobler, Christina, Vivianne H. M. Visschers, and Michael Siegrist. 2012. 'Addressing climate change: Determinants of consumers' willingness to act and to support policy measures', *Journal of environmental psychology*, 32: 197-207.

Touboul-Lundgren, Pia, Siri Jensen, Johann Drai, and Morten Lindbæk. 2015. 'Identification of cultural determinants of antibiotic use cited in primary care in Europe: a mixed research synthesis study of integrated design “Culture is all around us”', *BMC Public Health*, 15: 908.

Uslaner, Eric M. 2002. *The moral foundations of trust* (Cambridge University Press).

Vallin, Martina, Maria Polyzoi, Gaetano Marrone, Senia Rosales-Klintz, Karin Tegmark Wisell, and Cecilia Stålsby Lundborg. 2016. 'Knowledge and Attitudes towards Antibiotic Use and Resistance-A Latent Class Analysis of a Swedish Population-Based Sample', *PLoS One*, 11: e0152160.

Veenstra, Gerry. 2000. 'Social capital, SES and health: an individual-level analysis', *Social Science & Medicine*, 50: 619-29.

Velez, Maria Alejandra, John K. Stranlund, and James J. Murphy. 2009. 'What motivates common pool resource users? Experimental evidence from the field', *Journal of Economic Behavior & Organization*, 70: 485-97.

Wilson, Robert, Luigi Allegra, Gérard Huchon, Jose-Luis Izquierdo, Paul Jones, Tom Schaberg, Pierre-Phillippe Sagnier, and Mosaic Study Group. 2004. 'Short-term and long-term outcomes of moxifloxacin compared to standard antibiotic treatment in acute exacerbations of chronic bronchitis', *Chest*, 125: 953-64.

Appendix

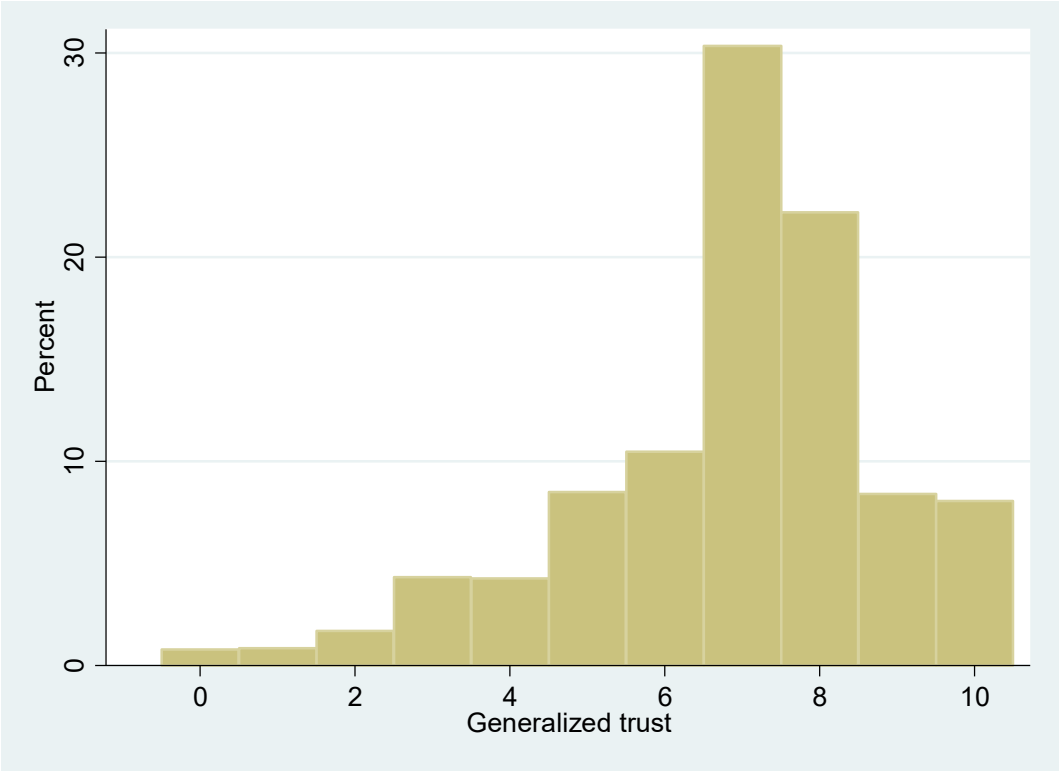

Figure A1. Histogram, generalized trust (0 = You cannot trust people in general, …., 10 = You can trust people in general)

Table A1. Regression models, generalized trust, trust in healthcare, and stated willingness of others to abstain

	Generalized trust	Trust in healthcare	Willingness of others	(4)
Female	0.249**	-0.068	-0.067	-0.077
	(0.092)	(0.044)	(0.046)	(0.046)
Older	0.057	0.140*	0.081	0.075
	(0.119)	(0.056)	(0.059)	(0.059)
Young	-0.361**	-0.061	-0.200***	-0.181**
	(0.114)	(0.054)	(0.056)	(0.056)
University	0.518***	0.068	0.086	0.059
	(0.108)	(0.051)	(0.053)	(0.053)
Large city	0.085	-0.070	-0.076	-0.078
	(0.094)	(0.044)	(0.046)	(0.046)
Work	-0.084	-0.088	-0.038	-0.032
	(0.109)	(0.052)	(0.054)	(0.054)
Income	0.083***	0.027*	0.009	0.004
	(0.024)	(0.011)	(0.012)	(0.012)
No response income	-0.258	0.009	0.073	0.085
	(0.233)	(0.110)	(0.115)	(0.114)
Have child	-0.113	0.040	-0.015	-0.010
	(0.126)	(0.059)	(0.062)	(0.062)
Have visit doctor	-0.0607	0.062	0.016	0.017
	(0.104)	(0.049)	(0.052)	(0.051)
Taken antibiotics	-0.059	0.013	0.043	0.046
	(0.116)	(0.055)	(0.057)	(0.057)
Refused antibiotics	-0.241	-0.285***	-0.138*	-0.119
	(0.133)	(0.063)	(0.066)	(0.066)
Correct	1.100*	0.337	-0.612*	-0.674*
	(0.560)	(0.265)	(0.276)	(0.275)
Worry resistance	0.130**	0.012	0.016	0.009
	(0.047)	(0.022)	(0.023)	(0.023)
Health status	0.444***	0.158***	-0.013	-0.038
	(0.055)	(0.026)	(0.027)	(0.027)
Generalized trust				0.049***
				(0.012)
Trust healthcare				0.024
				(0.026)
Constant	3.515***	2.795***	2.951***	2.712***
	(0.497)	(0.235)	(0.245)	(0.254)
Observations	1,786	1,786	1,786	1,786
R-squared	0.106	0.056	0.024	0.035

Note: Dependent variables are categorical: generalized trust (0 = You cannot trust people in general, …., 10 = You can trust people in general), trust in healthcare sector (0=very low trust, …, 4=very high trust), and stated willingness of others to abstain from not taking antibiotics (1 = very unwilling, and 5 = very willing). Results are reported for ordinary least squares. Significant at * 5%, ** 1%, and *** 0.1%.