

Executive Summary: English

In accordance with the national Strategy on Antibiotic Resistance (StAR, the Federal Council, 2015), the Swiss public is to be made aware of the need to use antibiotics more prudently and to adopt possible preventive measures against antibiotic resistance (e.g. in relation to personal hygiene). In order to develop effective information and education materials about these topics, it is necessary to understand the public's attitudes, beliefs, knowledge and decisions regarding antibiotics and antibiotic resistance.

The research project therefore had two **aims**. Firstly, the Swiss public's mental models regarding antibiotics and antibiotic resistance were identified, namely, their attitudes, beliefs and knowledge about these topics, as well as their decisions, such as their desire for antibiotics and their willingness to take preventive measures. Additionally, it was investigated whether segments within the population could be identified that differ in their mental models.

Secondly, we quantified the relationship between the public's attitudes, beliefs and knowledge about antibiotics and antibiotic resistance on the one hand and their desire for antibiotics for themselves, their children or their pets, and their willingness to adopt preventive measures on the other hand. This quantification revealed which psychosocial factors should be considered to influence people's desire for antibiotics as well as their willingness to adopt preventive measures. The research project comprised a qualitative interview study and a quantitative online survey in the German- and French-speaking parts of Switzerland.

The **qualitative interview study**, involving ten consumers, showed that the interviewees had an ambivalent attitude towards antibiotics. They appreciated the benefits of antibiotics in terms of aiding a swift recovery, but at the same time, they were critical about the side effects, the unnaturalness of antibiotics and possible antibiotic resistance. Although most interviewees were familiar with the concept of "antibiotic resistance", many appeared to hold contradictory beliefs about who or what becomes resistant to antibiotics, mentioning their own body as well as the bacteria.

Additionally, an interviewee's social environment had a bearing on their perception of and desire for antibiotics: some interviewees mentioned that they had been brought up to approach medicines, such as antibiotics, with care. The interviewees' attitudes, beliefs and decisions are based on egoistic, altruistic and biospheric values. Biospheric values, for example, foster the perception that antibiotics are artificial and dangerous for one's body and should therefore be avoided.

The subsequent **quantitative online survey** was completed by a sample size of 1,260 consumers.

On average, respondents answered 48% of the **knowledge** items about the functioning and effect of antibiotics correctly. They responded correctly to an average of 60% of the questions about antibiotic resistance and 49% of the questions about preventive measures. It is striking that the majority of the sample simultaneously believed that their own body as well as bacteria could become resistant to antibiotics, without recognizing this inconsistency in their knowledge.

The following **predictors of respondents' desire for antibiotics and their willingness to adopt preventive measures** were investigated: (1) demographic characteristics, (2) experience with antibiotics and antibiotic resistance, (3) cultural values: egoism, biospherism, altruism and conservatism, (4) knowledge about antibiotics, antibiotic resistance and preventive measures, and (5) perception (e.g. benefits of antibiotics, risks of antibiotic resistance and social norms regarding prudent antibiotics use).

The more important egoistic values are in respondents' lives and the more benefits they associate with antibiotics, the greater their desire is for antibiotics for themselves, their children and their pets. The stronger the respondents perceive the norm regarding prudent antibiotic use in their social environment to be, the lower their desire is for antibiotics for themselves, their children and their pets. The more risks respondents perceive in relation to antibiotic resistance and the more critical their attitude towards antibiotics is, the lower their desire is for antibiotics for themselves and their children, but not for their pets. Additionally, more knowledge about antibiotics reduces the desire for antibiotics for respondents themselves and their pets,

but not for their children. Respondents' willingness to adopt preventive measures is higher when they perceive higher risks of antibiotic resistance, have more critical attitudes towards antibiotics, are more knowledgeable about preventive measures and hold stronger biospheric and conservative values.

Four **segments** were identified in our sample of the **Swiss population** that differ in their perception and antibiotic use. The "Experienced Sceptics" are characterised by a low desire for and reported use of antibiotics. They are aware of the risks of antibiotic resistance and have had more personal experience with antibiotic resistance than the other segments. The "Knowledgeable Indifferent" have a good deal of knowledge about antibiotics, antibiotic resistance and preventive measures but hold indifferent attitudes towards antibiotics. The "Young Unwilling" show little willingness to adopt preventive measures, are rather uncritical regarding antibiotics and are mostly younger than those in the other segments. The "Self-serving Users" are characterised by a high desire for and use of antibiotics as well as by holding strong egoistic values. Many of this segment's members have children under 18 years of age.

Respondents were shown different scenarios about a disease situation in order to examine the **influence of a doctor's advice on a respondent's desire for an antibiotic prescription**. The results showed that whether a respondent desires an antibiotic treatment for themselves or their child is mostly influenced by the treatment advice from a doctor, or a veterinarian in scenarios including pets. Thus, respondents mainly follow the advice of their doctor. Additionally, in the scenarios for adults, the urgency to recover because of important engagements increases the desire for an antibiotic prescription, whereas the case history described in the scenario does not affect it. Similarly, the desire for an antibiotic prescription does not depend on the age of the child or the pet in the scenario.

To **summarize**, there is a general willingness among the Swiss public to use antibiotics prudently and to take measures to mitigate the risks of antibiotic resistance, but the extent of this willingness can certainly be increased. In both studies, only the respondents' intention to use antibiotics prudently and to adopt preventive measures, as well as their self-reported behaviour were assessed. According to theory and the results of previous studies, an intention is a good predictor of the actual behaviour. Nevertheless, based on these findings, we cannot infer with absolute certainty that, for example, the public's high level of willingness to adopt preventive measures is also translated into the corresponding behaviour.

To increase the public's willingness, intervention approaches should raise awareness about the risks of antibiotic resistance and convince them that the prudent use along with certain preventive measures will safeguard the benefits of antibiotics today and in the future. An awareness campaign can achieve these changes.

Recommendations, based on our findings, for an awareness campaign:

1. Inform the public about the function of antibiotics.
 2. Educate the public about the effectiveness of preventive measures and how to apply them.
 3. Increase the public's knowledge about the causes of antibiotic resistance as well as their risk awareness of the consequences of antibiotic resistance.
 4. Point out people's personal advantages of a prudent use of antibiotics.
 5. Reinforce the social norm about prudent antibiotic use.
 6. Refer to people's egoistic, biospheric and conservative values when communicating about prudent antibiotic use.
 7. Strengthen the communication skills of doctors and veterinarians.
 8. The "Experienced Sceptics": reinforce their already high level of risk awareness and low antibiotic use. Indicate to them which preventive measures are effective against the spread of antibiotic resistance.
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9. The “Knowledgeable Indifferent”: raise their awareness about the risks of antibiotic use and their willingness to adopt preventive measures by referring to their high level of knowledge and to the existing strong norms regarding prudent antibiotic use in their social environment.
 10. The “Young Unwilling”: endorse their low current antibiotic use and increase their awareness about the risks of antibiotic use. Use, for example, the general education system as a communication channel.
 11. The “Self-serving Users”: stimulate a more prudent use of antibiotics by pointing out the benefits of antibiotics now and for future generations.
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It is highly recommended that the effectiveness of such an awareness campaign be evaluated, for example by regular monitoring of the impact on the public’s perception of antibiotics and antibiotic resistance as well as their actual antibiotic use.