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Perceived risks and benefits of medical remedies and procedures: What do men and women think?

Percepção de riscos e benefícios em medicamentos e procedimentos médicos: O que pensam homens e mulheres?

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Abstract

Purpose: Are men more inclined to assume risks than women? The answer to this question is immediately relevant to various economic issues, including human behavior concerning medical remedies and procedures consumption. This paper aims to identify the perceived benefits of the consumption of medications centered on pharmaceutical risk assessment.

Originality/value: The literature documents that risks and benefits can be considered the main trade-offs in consumer decision-making, including the pharmaceutical industry. It is a current theme with a high potential for social impact due to the many identified cases of Covid-19. In developing countries, most medication is used by self-medicating individuals, as access to health care can be insufficient. Self-medication is a potentially greater problem, as in this case, medication usage often follows advice from friends, relatives, and neighbors. Yet, there is little empirical evidence regarding this problem in the context of emerging countries.

Design/methodology/approach: A survey of over 1,000 subjects using an extended regression model (ERM) in one of the biggest countries in the world, Brazil.

Findings: The results reported that women perceive more risks and benefits from medication usage and medical procedures. The perception of the benefits of medications can be explained by the following dimensions: risk (personal injury, risk alertness, and risk awareness), gender, regular usage, and the benefits of medical procedures. Regarding risk dimensions, the lower the perceptions of personal injury and the higher the perceptions of risk alertness and risk awareness, the greater the perceived benefits of medication usage.

Keywords: benefits, risks, gender, drugs, emerging countries

Resumo

Objetivo: Os homens estão mais inclinados a assumir riscos do que as mulheres? A resposta a essa pergunta é de relevância imediata para várias questões econômicas, incluindo o comportamento humano em relação ao consumo de medicamentos e procedimentos médicos. Este trabalho tem como objetivo identificar os benefícios percebidos do consumo de medicamentos, centrado na avaliação do risco farmacêutico.

Originalidade/valor: A literatura documenta que riscos e benefícios podem ser considerados os principais *trade-offs* na tomada de decisão do consumidor, inclusive na indústria farmacêutica. É um tema atual com alto potencial de impacto social por causa dos muitos casos identificados de Covid-19. Nos países em desenvolvimento, a maioria dos medicamentos é utilizada por indivíduos que se automedicam, pois o acesso aos cuidados de saúde pode ser insuficiente. A automedicação é um problema potencialmente maior, pois nesse caso o uso de medicamentos geralmente segue o conselho de amigos, parentes e vizinhos. No entanto, há pouca evidência empírica sobre esse problema no contexto dos países emergentes.

Design/metodologia/abordagem: Trata-se de uma pesquisa com mais de mil indivíduos em que se utilizou um modelo de regressão estendido (MRE) em um dos maiores países do mundo, o Brasil.

Resultados: De acordo com os resultados obtidos, as mulheres percebem mais riscos e benefícios do uso de medicamentos e procedimentos médicos. A percepção dos benefícios dos medicamentos pode ser explicada pelas seguintes dimensões: risco (danos pessoais, alerta de risco e conhecimento do risco), gênero, uso regular e benefícios dos procedimentos médicos. Em relação às dimensões de risco, quanto menor a percepção de danos pessoais e quanto maior a percepção de alerta e conhecimento de risco, maiores os benefícios percebidos do uso de medicamentos.

Palavras-chave: benefícios, riscos, gênero, medicamentos, países emergentes

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INTRODUCTION

Risk is a part of people's lives in many different contexts. With technological advances, societies are increasingly challenged to make decisions about the risks of new technologies and products/services (Beck, 1992; Bodemer & Gaissmaier, 2015; Jenkins et al., 2021). As it is neither possible nor desirable to avoid these risks, people should be able to deal with them. The problem arises when some risks, particularly those that can cause reactions (medications), are underestimated and their consequences are ignored. In the medical industry, perceived risks are related to the pharmacological properties of medications and patient consumption (Letzel, 1989). It is a current theme with a high potential for social impact due to the many identified cases of the novel coronavirus disease (designated as 2019-nCoV by the World Health Organization). Empirical investigations in this area are important to understand and assist in stopping these outbreaks.

From a constructivist viewpoint, the perception of medications' risks and benefits, and consequently the decision of whether and how to use them, arises from a complex interaction of affective and cognitive processes, strongly influenced by individual, cultural, and social characteristics (Burgess, 2015; Gardner & Jones, 2011). Among individual characteristics, gender has stood out for influencing perceptions of risk and benefit in the consumption of medical products (Axon et al., 2009; Bradford, 2010; Brandt & Dickinson, 2013; Chapman & Coups, 1999; Filia et al., 2014; Finucane et al., 2000; Mahalik et al., 2015; Picone et al., 2004), as women take more medications than men (Green, 2006; Kandall, 2010). Hypochondriac (fear of serious illness) concerns and attitudes are also more common in women (Hernandez & Kellner, 1992) and can trigger other health problems like anxiety and depression (Fallon et al., 2012; Rodriguez-Besteiro et al., 2021).

The increase in medication consumption by women can be associated with social and/or occupational barriers faced by this gender. It can be triggered by loneliness, stress, tiredness, dietary issues, low self-esteem, and body image problems (Greenfield et al., 2010). In stress-related disorders, women are at higher risk of depression and anxiety (Rodriguez-Besteiro et al., 2021), and men are at higher risk of alcohol-related disorders (Chaplin et al., 2008; Levy et al., 2021). Another aspect is related to women's propensity to seek help (Hunt et al., 2011). Biological issues also come into this discussion, justifying that sex and hormonal differences between the genders cause them to have different reactions to medications. Women experience more pain than men and therefore need more medication, especially

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in cases such as migraines, fibromyalgia, and osteoarthritis, among others (Kandall, 2010).

Thus, this study aims to understand men's and women's perceived risks and benefits of consuming medications and medical procedures in a developing country. In these countries, medications can account for 30% to 40% of health-related spending, yet average medicine availability does not reach 35% (World Health Organization – WHO, 2009). Only 16% of the world's population accounts for 78% of pharmaceutical spending. Another 71% of the same population, living in 78 countries with low or medium *per capita* income, account for only 11% of pharmaceutical spending. The spending discrepancy is even greater per capita: US$ 7.61 in low-income countries and US$ 431.60 in high-income countries (Kaplan & Mathers, 2011).

In developing countries, most medication is used by self-medicating individuals, as access to health care can be insufficient (Nguyen et al., 2013). Self-medication is a potentially greater problem, as in this case, medication usage often follows advice from friends, relatives, and neighbors (Grigoryan et al., 2006). People frequently keep leftover medications in their homes and reuse them or donate them to people in need (Hardon et al., 2004). Still, some demographic characteristics are distinct from developed countries and can be decisive for properly perceiving risks and benefits (Krewski et al., 2006). The lower average level of formal education can limit the ability to make assertive consumption decisions. Additionally, population aging and increased life expectancy increase medical care and medication consumption, requiring adjustments to the public health system (Cuevas et al., 2017).

Regarding psychological issues, the increase in the number of individuals with anxiety and depression, representative suicide rates (O'Connor et al., 2017), and low mood levels (Bolton et al., 2009) can trigger the consumption of medications, and these aspects are observed in emerging countries. In the current research, Brazil was taken to represent emerging countries. The study was conducted in the metropolitan region of São Paulo, with the largest estimated population, 45,094,866 inhabitants (Instituto Brasileiro de Geografia e Estatística, 2017); it is a representative commercial and industrial center of the country, covering a wide range of socioeconomic groups (Baer, 2014; Vieira & Ford, 1996) and about 33% of the Brazilian gross domestic product (Lucas et al., 2017).

This paper contributes in different ways. First is the importance of individual characteristics, such as gender, to understand risk perception and benefits. The influence of individual characteristics on risk-taking has been extensively discussed in the literature (Beyer et al., 2015). However, allowing

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comparisons to be made across populations from different nations and analyzing the risk/return relationship in medication use is different. In practical and social aspects, research can contribute to health management, especially after the pandemic. During pandemics, uncertainty, communication, and perception risk increase due to high infection rates, significant morbidity, lack of therapeutic measures, and rapid increases in cases. Changes in risk perception and poor risk communication can induce some behaviors that can lead to a lack of medications and personal protective equipment (Abrams & Greenhawt, 2020) and rejection of vaccines and new drugs (Paudel et al., 2021).

Therefore, the contributions at the health management level will help design better forms of communication with patients and the public, assess the impact of new drug problems, and ensure safe and effective medication usage (Slovic et al., 2007). Besides, they will highlight the relationships between risk dimensions and the importance of knowledge about diseases for perceived risk (London & Robles, 2000). Particularly, this research relates to understanding the perceived benefits of medication usage, which is considered as complex as risk perception (Beyer et al., 2015).

BACKGROUND

Perception of risks and benefits

Risks are entangled with people's lives, and risk management plays an important role in modern society (Fischhoff, 1983; Hopkin, 2017). In this paper, the constructivist paradigm is adopted, according to which beliefs, attitudes, judgments, forms of information processing, values, evaluations of cost-benefit balance, feelings, familiarity with emotional and affective risk, and the framing of media reports are all factors that are weighed in generating risk and benefit perception (Gardner & Jones, 2011). Hence, perception is a personal assessment of risk in a decision situation (Sitkin & Pablo, 1992) consisting of many factors (Olsen, 2001), including observable characteristics such as age, income, and gender (Betz et al., 2002; Breuer et al., 2017; Chapple & Johnson, 2007; Galizzi et al., 2016), as well as cultural and social characteristics (Burgess, 2015; Gardner & Jones, 2011).

In the constructivist understanding, there are several models for measuring risk perception. Particularly, there are the economic method and the psychological paradigm, which have in common the rejection of the existence of a risk formula (Hansen & Hammann, 2017). The psychological paradigm

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focuses on understanding how preferences and heuristics explain risk perception personally and predicting people's reactions to risks (Kahneman & Tversky, 1972; Renn, 2008; Simon, 1955). One of the most influential methods used to measure risk perception in this paradigm is psychometric (Fischhoff et al., 1978).

The psychometric method implements a psychophysical scale to measure the perceived risks of various technologies, products, and activities (Slovic, 1987). It identifies risk characteristics that contribute to the formation of risk perception (Slovic et al., 1982). Among the different risk dimensions are risk awareness, risk control, fear perception, and alertness risk, among others (Fischhoff et al., 1978; Slovic, 1987; Slovic et al., 1982). Regarding health risk perception, the literature initially concerned deliberative risk perceptions based on rules about the likelihood of developing a disease (Denes-Raj & Epstein, 1994; Shafir et al., 1993). Recently, affective risk perception has been included, which corresponds to values (positive *versus* negative) and excitement (high *versus* low) associated with affective responses linked to the possibility of developing a disease or not, including worry or fear (Leventhal et al., 1980).

It is noticeable that the perception of health risk can be enriched by analyzing multiple factors. Ferrer et al. (2016) ratified this question by checking deliberative, affective, and experiential factors. The latter are conceptualized as rule-based logical risk assessments, which correspond to the individual's experiential processing, involving concrete images and holistic vision, among other aspects (Epstein et al., 1996).

Gender differences

Studies indicate differences in risk perception between men and women (Flynn et al., 1994; Weber et al., 2002). Possible explanations for this phenomenon include social (Caroli & Weber-Baghdiguian, 2016; Mahalik et al., 2015), biological (De Sio et al., 2017), cultural (Finucane et al., 2000), behavioral, and cognitive factors, such as risk preference, emotions (Garikipati & Kambhampati, 2021), and overconfidence (Croson & Gneezy, 2009). Women's lack of knowledge and familiarity with science and technology (Morioka, 2014; Paul Slovic, 1999) has been cited as a relevant factor. Men take greater risks than women (Byrnes et al., 1999; Harris et al., 2006). Health risks are no different, as in the United States and other countries, men are encouraged to take more health risks, such as high levels of alcohol consumption, a behavior considered a symbol of masculinity (Mahalik et al., 2015).

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Women, in particular, are more sensitive to social norms regarding body weight issues, such as meeting the body mass index (BMI) and so-called beauty standards (Caroli & Weber-Baghdiguian, 2016). Thus, they tend to report worse health than men (Barreto & Figueiredo, 2009) and, consequently, become more able to perceive the effectiveness of drugs and the incidence of substance abuse and to believe in the effectiveness of prevention and treatment (Kauffman et al., 1997). However, with the diagnosis of chronic diseases, men rated their health worse than women (Barreto & Figueiredo, 2009).

Considering the context of the pandemic in terms of Covid-19 knowledge, risk perception, and precautionary behavior, adequate knowledge of Covid-19 was linked to higher involvement in precautionary behavior through risk perception for females but not for males (Abdelrahman, 2022; Garikipati & Kambhampati, 2021; Iorfa et al., 2020; Schneider et al., 2021; Zhang et al., 2019). This confirms that women are more sensitive to social norms based on risk perception. Evidence from psychology also suggests that women respond more strongly and intensely than men when anticipating negative outcomes, while men have been found to respond with anger to negative experiences. Therefore, if a negative outcome is anticipated as being worse by women than by men, women will be more risk-averse in situations like the current pandemic (Garikipati & Kambhampati, 2021; Rodriguez-Besteiro et al., 2021) because, in some contexts, the less one knows about a hazard, the higher their risk perceptions (Jenkins et al., 2021).

As for risk awareness, there are gender differences in the perceived risk and knowledge of colorectal cancer. Women had less knowledge about this condition, presenting a mistaken sense of personal risk (McKinney & Palmer, 2014). Gender was also associated with perceived risk awareness in tuberculosis, for which women had better results than men (Ailinger et al., 2003). Gender differences in health-related issues can also stem from demographic and socioeconomic conditions (Adler et al., 2016; Patrão & McIntyre, 2017; Pylypchuk & Kirby, 2017). Relationships between poverty, psychosocial stress, and obesity (Kwarteng et al., 2017) confirm the influence of socioeconomic elements on health (Cundiff et al., 2016). In households where men are providers, the allocation of health expenditures can be based on the preferences of the "head of household," which can lead to less access to health services by women (Onah & Horton, 2018). In families where adolescents perceive high levels of parental monitoring, male adolescents consume less tobacco, and women, fewer drugs and less alcohol (Nelson et al., 2017).

Personality traits also contribute to the explanation of gender differences. By analyzing the five personality domains, Beyer et al. (2015)

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concluded that an increase in the conscientiousness score increased the perceived benefit of a medication, considering men's scores are higher than women's. However, some studies indicate that for some medications and treatments, no differences are accorded to gender observation. In analyzing syndromes such as hypochondria and depression (Gureje et al., 1997; Piccinelli & Wilkinson, 2000) and in treatment for lung cancer (MacLean et al., 2017), men and women took similar initiatives. In summary, gender differences in risk perception can be considered from different perspectives: 1. they can perceive different levels of the same risk, 2. they can perceive different risks, or 3. they can assign different meanings to the same risk (Gustafson, 1998).

DATA AND METHODS

Data collection and variables

The dataset comprised 1,191 instruments applied at random in the largest city in South America, São Paulo, Brazil. The questionnaire considered the perception of the risks and benefits of medications and medical and non-medical procedures. Both the questionnaire and the data are available in Mendes-Da-Silva (2022). From an operational view, the measurement of perceived risk followed the psychometric and quantitative paradigm. Through the psychological paradigm, this study followed the psychometric model developed by Slovic et al. (1989) and which is already used in studies in Sweden, Canada, and the United States (Slovic et al., 1989, 1991, 2007). The following dimensions assessed perceived risk: risk alertness, risk awareness, and risk of personal injury.

For the evaluation, 52 items were chosen and separated into three categories (medicines: 31 items; medical procedures: eight items; and non-medical procedures: 13 items) according to several criteria, such as importance, familiarity to the general public, and diversity (Slovic et al., 2007). We proposed the following question to analyze the risk of alertness dimension: "If you hear or read about a particular problem or incident associated with each item in which people were seriously harmed, at what level would that episode serve as an alert, indicating that the risk of each item could be higher than you thought before this episode occurred?". To measure the perception of risk of personal injury, we used the following question: "To what extent would you say that people exposed to these items are at risk of personal injury?".

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The risk awareness dimension was observed while considering this question: "To what extent would you say that those exposed to these risks precisely know the risks associated with these items?". To evaluate the perceived benefits, we asked: "In general, how beneficial is the item?". Only the minimum and maximum were defined to determine the scale, providing free interpretation. Table 1 synthesizes the instrument.

Table 1

Information on the data collection instrument

Block	Variables	Description
Respondents' profile	From 1 to 14	Multiple-choice questions in which the respondents choose one alternative.
Risks of the prescription of medications	From 15 to 18	Based on what you know about prescription drugs, how often would you say that each of the following situations occurs among patients who have received a prescription? (1 = never; 6 = always) (a) Drugs work as expected; (b) The patient experiences side effects.
		During the past five years, have you experienced any side effects (or unwanted effects) from the prescription of a medicine? (yes; no; don't know)
		How do you evaluate the severity of this side effect (unwanted effect)? (mild; moderate; severe; not sure)
		When a patient experiences a side effect (unwanted effect) from a prescription drug, how often do you think each of the following is a cause? (1 = never; 6 = always)
Perceived risks and benefits	From 19 to 22	Risk to those exposed To what extent would you say that people (for instance, you or someone you know) exposed to this item are at risk of experiencing personal harm? (1 = they are not at risk; 7 = they are very much at risk)
		Benefits How beneficial do you consider this item to be for society? (1 = not at all beneficial; 7 = very beneficial)

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Table 1 (conclusion)

Information on the data collection instrument

Block	Variables	Description
Perceived risks and benefits	From 19 to 22	Knowledge of those exposed To what extent would you say that the risks associated with this item are known precisely to people who are exposed to those risks? (1 = risk level known; 7 = risk level not known)
		Warning sign If you read in the newspaper about an accident or an illness involving this item, in which people were seriously harmed, to what degree would this mishap serve as a warning sign, indicating that the risk of this item might be greater than was thought before the problem occurred? (1 = not a warning sign; 7 = very strong warning sign)

Note. The 52 items evaluated in these questions are cell phones, cigarette smoking, drugs for depression, IUD, drugs for anxiety, birth control pills, high-fat foods, drugs for AIDS, acne medicines, automobiles, drugs for ulcers, coffee, nuclear power plants, Botox injections, insulin, prescription drugs, household cleaners, food additives, vaccines, drugs for Alzheimer's disease, drugs for epilepsy, medical x-rays, alcoholic beverages, mammogram, antibiotic drugs, prostate screening tests, sleeping pills, heart surgery, air travel, laxatives, computed tomography, drugs for asthma, biotechnology drugs, nonsteroidal anti-inflammatory drugs, appendectomy, pesticides, drugs for cholesterol, artificial sweeteners, diet drugs, allergy drugs, drugs for erectile dysfunction (Viagra), acupuncture, nicotine replacement (patches), drugs for osteoporosis, genetically modified food, phytotherapy medications, drugs for arthritis, cancer chemotherapy, estrogen replacement (hormone replacement therapy), aspirin, vitamin pills, and blood pressure drugs. The details of all the questions and alternative answers can be obtained from the questionnaire (Mendes-Da-Silva, 2022).

The analysis strategy encompassed three phases: descriptive, bivariate, and extended regression model (ERM). To make comparisons by gender (men and women), the chi-square test and the Student's t-test were used. The estimation via ERM allows the observation of endogenous variables, that is, those correlated with the model's error term, so two other common problems can also be considered, like non-random selection and assignment of exogenous and endogenous treatment (Drukker, 2017). For the estimation, medications' benefits were the dependent variable, and the risk dimensions and dummy variables were the independent variables. The influence of risk perception on perceived benefit was analyzed with two models. In model (1), the ERM was estimated with the endogeny evaluation, whereas in model (2), besides the endogeny, gender was an exogenous treatment variable. Equations 1, 2, and 3 represent the estimated model.

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$$PB_i = \alpha_i + \sum_{i=1}^{3} \beta_i Risk_i + \sum_{i=4}^{12} \beta_i DY_i + \beta_i EndogMP_i + \beta_i EndogNMI_i + \varepsilon_i \tag{1}$$

$$EndogMP_i (BenefMP_i = \alpha_i + \beta_1 PI\, MP_i + \beta_2 RK\, MP_i + \beta_3 RA\, MP_i + \varepsilon_i) \tag{2}$$

$$EndogNMI_i (BenefNMI_i = \alpha_i + \beta_1 PI\, NMI_i + \beta_2 RK\, NMI_i + \beta_3 RA\, NMI_i + \varepsilon_i) \tag{3}$$

in which: PB_i is the perceived benefits of medications; $Risk_i$ = the risk dimension variables (risk alertness, risk awareness, and risk of personal injury); DY_i = the dummy variables, which are constructed as follows: gender (0 = men, 1 = women), works in the industry (0 = no, 1 = yes), awareness of prescription' problems (0 = no, 1 = yes), live with the elderly or sick (0 = no, 1 = yes), take care of the elderly or infirm (0 = no, 1 = yes), use medication regularly (0 = no, 1 = yes), have dysfunctions (0 = no, 1 = yes), health insurance (0 = no, 1 = yes), side effect (0 = no, 1 = yes); ε_i = error term; *$EndogMP_i$ and $EndogNMI_i$* are the endogenous variables, which were estimated considering the benefits based on the three risk dimensions; *NMI* = non--medical items; *MP* = medical procedures; *PI* = risk of personal injury; *RK* = risk awareness; *RA* = risk alertness. Table 2 summarizes the models, variables, and main references.

For the estimation of the models, the main research hypotheses were considered:

- H1: The lower the perceptions of personal injury and the higher the perceptions of risk alertness and risk awareness, the greater the perceived benefits.
- H2: Women perceive greater benefits of medications than men.

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Table 2

Models, equations, variables, and main references

Equation 1

$$PB_i = \alpha_i + \sum_{i=1}^{3} \beta_i \, Risk_i + \sum_{i=4}^{12} \beta_i \, DY_i + \beta_i EndogMP_i + \beta_i EndogNMI_i + \varepsilon_i$$

Equations 2 and 3

$$EndogMP_i(BenefMP_i = \alpha_i + \beta_1 PI\,MP_i + \beta_2 RK\,MP_i + \beta_3 RA\,MP_i + \varepsilon_i)$$

$$EndogNMI_i(BenefNMI_i = \alpha_i + \beta_1 PINMI_i + \beta_2 RK\,NMI_i + \beta_3 RA\,NMI_i + \varepsilon_i)$$

Variables	Abbreviation or description	Operational definition	References
Perceived benefits of medications	*PB*	Nothing beneficial – very beneficial (7 points)	Olsen (2001), Slovic (1987), and Slovic et al. (1989, 2004, 2007).
Risk	Risk alertness (RA), risk awareness (RK), and risk of personal injury (PI).	Little risk – too much risk (7 points)	
		Totally unknown risk – totally known risk (7 points)	
		Weak risk alert – strong risk alert (7 points)	
Dummy variables	DY (0 = no, 1 = yes)	Gender (0 = men, 1 = women)	Brandt and Dickinson, (2013), Burgess (2015), Flynn et al. (1994), Gardner and Jones (2011), Green (2006), Krewski et al. (2006), Mahalik et al. (2015), and Slovic et al. (2007).
		Works in industry	
		Aware of prescription's problems	
		Live with the elderly or sick	
		Take care of the elderly or infirm	
		Use medication regularly	
		Have dysfunctions	
		Health insurance	
		Side effect	

Note. ε_i = error term; *MP* = medical procedures; *NMI* = non-medical items.

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Respondents' profile

Of the 1,191 respondents, 52% were women, 44% had only completed high school, and 40% had a degree. The average age was 37 (minimum 16 and maximum 97, standard deviation 14.7). As for occupation, 13.7% worked in the healthcare industry, and 58.6% reported being aware of recent problems with prescription drugs or medical errors. One-third of respondents lived with elderly people or people with serious health problems, and 24.1% were actively involved in caring for sick, elderly, or highly inactive people. Regarding tobacco use, it was found that 38.0% had consumed cigarettes, 17.3% hookahs, and 6.6% cigars. However, approximately one-third (32.3%) reported never using any tobacco in the past. Consumption is heterogeneous, with 13.8% smoking daily or almost daily, and another 17.7% claiming to smoke only one to three times a month. Still, 32.7% declared they smoked only a few cigarettes a day, and 34.4% smoked a pack or more. Among those who had quit smoking, 47% had quit for over two years. Among the 12 disorders, high cholesterol (28.0%), high blood pressure (17.4%), and diabetes (12.8%) stand out. Medication usage was significant among respondents, with 47.9% consuming one, 22.0% two, and 9.8% three medications regularly. Table 3 presents the most consumed medications in the last five years.

Table 3

Medication consumption per gender

Medications	Percentage		
	Men (N = 549)	Women (N = 609)	
Vaccines	57.7%	56.8%	
Antibiotics	57.4%	59.8%	
Prescription drugs	27.0%	29.2%	
Medications for allergy	19.1%	29.2%	***
Laxatives	14.4%	21.7%	***
Medication for high blood pressure	13.7%	13.1%	
Sleeping pills	12.2%	10.8%	
Medications for cholesterol	9.1%	10.3%	
None of the above medications	7.7%	5.4%	
Medications for anxiety	7.3%	13.0%	***

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Table 3 **(conclusion)**

Medication consumption per gender

Medications	Percentage		
	Men (N = 549)	Women (N = 609)	
Medications for depression	6.9%	7.9%	
Contraceptive pills	0.0%	38.8%	***
Insulin	3.5%	5.7%	
Medication for ulcer	3.3%	3.6%	
Hormonal replacement therapy (HRT)	2.7%	6.6%	***
Medications for asthma	2.7%	3.8%	
Medication for arthritis	2.4%	4.4%	
Medication for erectile dysfunction	2.4%	0.3%	**
Medication for osteoporosis	1.6%	6.4%	***
Chemotherapy	0.9%	1.1%	
Medications for Aids[a]	0.5%	0.3%	
Medication for epilepsy[a]	0.0%	1.1%	
Medications for Alzheimer's[a]	0.0%	1.0%	
Medications from biotechnology[a]	1.3%	0.2%	

Source: Elaborated by the authors based on data and questionnaire from Mendes-Da-Silva (2022).

Note. ** p < .01, *** p < .001; [a] non-estimated since at least one cell has an expected value lower than 5. Presents the percentage of medication usage for men and women, showing products with a difference of means from the chi-square statistics.

The most relevant differences are medications for allergies, laxatives, anxiety, hormone replacement, osteoporosis, and erectile dysfunction. Antibiotics and vaccines were the most commonly used medications, with no differences being found according to gender ($p > 0.1$), corroborating Slovic et al. (2007). The abuse of antibiotics is common in all regions of the world (Gourgoulis et al., 2013), so in Brazil, the government has conditioned their sale on the presentation of special control prescriptions. As for vaccines, Brazil has an aggressive public policy aimed at reducing diseases using intensive campaigns for childhood vaccination (Ministry of Health, 2003). This policy aligns with efforts to increase access to vaccines in developing countries, such as the Global Alliance for Vaccines (Dickens, 2011).

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RESULTS

About 34% of men and women considered drugs to work as expected. For 17.4% of men and 20.3% of women, patients often experienced side effects. As patients, 38% of respondents said they had suffered side effects from medication in the last five years. Of these patients, 35.1% considered the effect mild, 35.7% moderate, and 29.2% severe. The most frequent causes of side effects were related to noncompliance with prescribed instructions (in both genders) and the patient's sensitivity to the drug, especially in women, with a percentage of 29.8% in options 5 and 6, corroborating Slovic et al. (2007).

Bivariate analysis

The risk dimensions and perceived benefits of medication consumption (Figure 1), medical procedures, and non-medical items were verified for both genders. It can be observed that women saw a greater benefit from some medications (biotechnology, anti-inflammatory, cholesterol, diet, allergy, Viagra, osteoporosis, arthritis, HRT, and blood pressure). Men saw equal or fewer benefits than women, with no higher benefits. As for the lowest perceived benefits, medications for these situations were cited: depression, Aids, sleeping, nicotine, and chemotherapy. Risk perception was higher in the risk alertness dimension, in which responses in both genders ranged from levels 3 to 6. In the personal injury dimension, vitamin pills had a low risk of personal injury, which follows findings in the United States, Canada, and Sweden (Slovic et al., 2007).

Risk awareness is sometimes lower, and personal injury and risk alertness assessment is relevant. This is the case with diet pills, which may be linked to poor knowledge of side effects, leading to a personal alert. This difference is more salient in women, who demonstrated higher levels of the perceived risk of personal injury and risk alertness. This corroborates women's greater concern about food safety and issues involving body weight (Caroli & Weber-Baghdiguian, 2016). Regarding gender, differences such as the perception of personal injury in antibiotics can be highlighted. The medians are distinct, showing that women perceive a higher consumption risk, yet they claim to use them more often than men (Figure 1). Higher antibiotic use by women can be explained by more common infections in this gender, such as urinary tract infections (Shaifali et al., 2012).

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Regarding risk awareness, the differences are in medications for osteoporosis and vitamin pills (men with higher perception) and chemotherapy (women with higher perception). In risk alertness, women demonstrated higher levels related to the medications for anxiety (Fallon et al., 2012), contraception, sleep, diet, and Botox (Beyer et al., 2013). The same analysis was performed for medical procedures. Risk alertness retained the highest perception in most procedures, with results similar to those of Slovic et al. (2007). In the analysis by gender, there was a balance between the medians, especially in the risk awareness dimension, showing that the perceptions are similar.

Comparing by categories, the dimensions of risk in non-medical elements were evaluated, with the perception of risk of personal injury found to be higher for smoking (Hoover et al., 2018) and nuclear power plants (Slovic et al., 2007). Nuclear power plants can cause anxiety because living near these sites can pose high-magnitude risks to human health (Lyons et al., 2020). Then, the respondents' perception of the benefits of medications and their relationship with the risks was pointed out (Figure 2). The respondent's average risk (the average risk of the three dimensions) was considered for this calculation.

Among medications, benefits ranged from 3 to 5, which shows a reasonable perception of benefits. The greatest perception of benefits was found in vaccines for both men and women. The lowest perception of benefits matched the results of Slovic et al. (2007), corresponding to Botox injection. Men and women had similar perceptions of the risk-benefit relationship, especially for Viagra, for which the results were nearly equivalent. For women, the highest risk was attributed to chemotherapy, which may be linked to women's lower risk awareness regarding cancer (McKinney & Palmer, 2014). For men, the greatest risk was attributed to depression medications.

In the risk-benefit relationship, six medications (antidepressants, sleeping pills, anxiety medication, Botox injections, diet pills, and erectile dysfunction medication) had a negative relationship. Respondents had a perception that these medications pose higher risks. In medical procedures, superior relationships were found for prostate exams (Farrel et al., 2002; Slovic et al., 2007), indicating that the benefits of this procedure outweigh the associated risks, especially in women's view. The highest risk level for both genders was associated with cardiac surgeries (Beyer et al., 2013).

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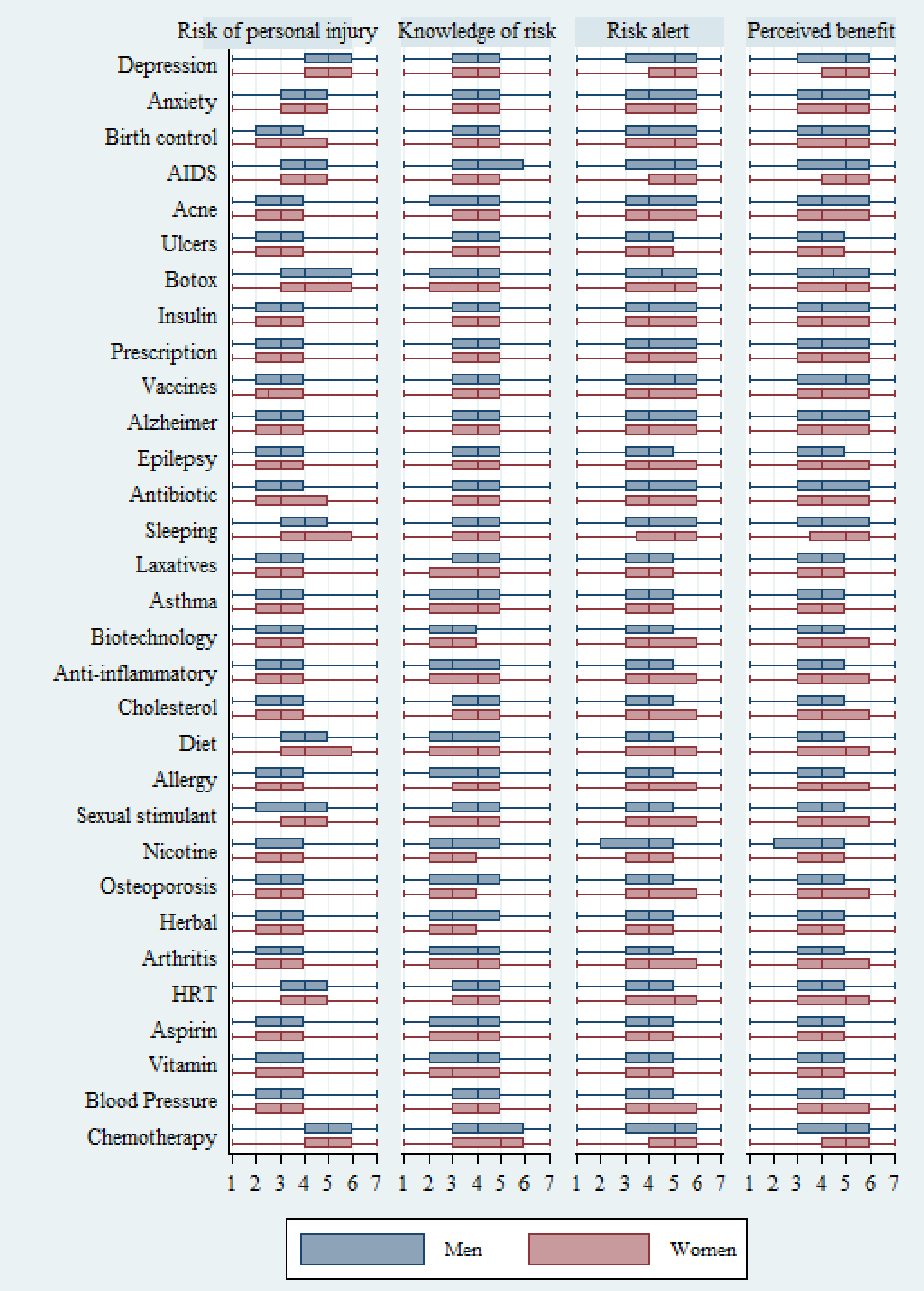
Figure 1

Perception of benefits and risks of medications according to gender



Source: Elaborated by the authors based on data and questionnaire from Mendes-Da-Silva (2022).

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In the non-medical items category, the highest benefits were found for automobiles and air travel, possibly due to the transportation optimization they provided. Yet, in the benefit-risk relationship, there were four items (smoking, high-fat foods, nuclear power plants, alcoholic beverages) with a negative relation. The respondents indicated a higher average risk than the offered benefit (Hoover et al., 2018; Slovic et al., 2007). Afterward, differences were observed in the means between men and women in risk aspects, including personal injury, risk awareness, risk alertness, and benefits (Table 4).

In the analysis of benefits in the medication category, there were differences in means for ten products. Respondents assigned greater benefits to vaccines, and women perceived a greater benefit. Significant differences in means for prostate exams and acupuncture are shown for medical procedures. In both, women had higher means of perceived benefits. The lower benefits men assign to prostate exams may be related to beliefs, such as some analogies and even fear of cancer (Farrel et al., 2002). Confirming this result, in the analysis of the risk of personal injury, men obtained higher means, *i.e.*, they perceived greater personal injury risk than women did. For non--medical risks, the significant difference corresponds to alcoholic beverages, for which women were more aware of the risk and had a greater perception of risk alertness. Men's lower risk perception of alcohol consumption corroborates Flynn et al. (1994), Kauffman et al. (1997), and Maričić et al. (2013).

In the dimension of personal injury, mean differences are seen in several items. For medications, the highest means of personal injury were indicated for sleeping pills and the lowest for aspirin. In both cases, women had a higher perception of the risk of personal injury. The study by Slovic et al. (2007) showed a greater perception of the risk of personal injury for nuclear power plants by women, a result also evidenced by the research in Brazil. Flynn et al. (1994) pointed out that women had higher risk perceptions of technological dangers than men. In the dimension of risk awareness, differences are evident in three cases, of which the highest mean represents Alzheimer's medications, of which men claimed to have greater risk awareness than women.

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Figure 2

Perceived benefits and risks of the consumption of medications and non-medical items

Source: Elaborated by the authors based on data and questionnaire from Mendes-Da-Silva (2022).

Note. Circles represent medications, and triangles represent non-medical items. N = 1,191.

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Table 4

Evaluation of risk and benefit by gender and product type

Items	Benefits			Personal injury			Risk awareness			Risk alert		
	M	W		M	W		M	W		M	W	
Panel A: Medications												
Vaccines	5.28	5.48	*	2.78	2.88		3.99	3.90		4.56	4.41	
Medications for Alzheimer's	4.95	5.08		3.35	3.39		3.95	3.76	*	4.27	4.23	
Medication for asthma	4.80	4.89		2.94	3.28	*	3.69	3.71		4.04	4.19	
Antibiotics	4.79	4.81		3.32	3.55	*	4.10	4.06		4.35	4.44	
Medications from biotechnology	4.72	4.67		3.08	3.28	*	3.48	3.39		4.13	4.20	
Chemotherapy	4.70	4.73		4.83	5.00		4.38	4.56		4.40	4.69	*
Contraceptive pill	4.62	4.89	*	3.42	3.44		4.17	4.14		4.40	4.52	
Prescription drugs	4.53	4.61		3.22	3.25		3.90	3.69	*	4.32	4.40	
Medication for osteoporosis	4.52	4.75	*	2.99	3.06		3.63	3.49		4.14	4.21	
Insulin	4.51	4.70	*	3.45	3.43		3.95	3.89		4.39	4.39	
Medication for arthritis	4.48	4.69	*	3.40	3.36		3.62	3.64		4.05	4.25	*
Medications for cholesterol	4.46	4.66	*	3.21	3.33		3.85	3.73		4.23	4.22	
Hormonal replacement therapy	4.46	4.43		3.84	4.00		3.94	4.02		4.15	4.37	*
Aspirin	4.46	4.45		2.82	3.01	*	3.64	3.62		4.05	4.11	
Medications for allergy	4.37	4.53		3.30	3.45		3.64	3.71		4.11	4.42	*
Phytotherapeutic medications	4.32	4.65	*	2.91	2.86		3.51	3.43		4.09	4.11	
Vitamin pills	4.30	4.54	*	2.69	2.76		3.76	3.53	*	4.01	4.11	
Laxatives	4.02	3.94		2.92	3.24	*	3.82	3.73		4.09	4.08	
Nicotine patches	3.84	4.05	*	2.84	3.07	*	3.52	3.41		3.93	4.09	
Medication for erectile dysfunction	3.78	3.77		3.65	3.90	*	3.85	3.68		4.27	4.20	
Sleeping pills	3.69	3.75		4.15	4.35	*	3.86	3.88		4.42	4.60	
Diet pills	3.57	3.48		3.82	4.28	*	3.59	3.72		4.24	4.50	*
Botox injection	3.01	3.30	*	4.44	4.29		3.67	3.61		4.39	4.56	
Panel B: Medical procedures												
Prostate exam	5.10	5.32	*	2.93	2.71	*	4.01	3.84		4.34	4.15	
CT scan	4.97	5.02		2.94	3.05		3.66	3.76		3.97	4.21	*
Appendix surgery	4.94	4.89		3.49	3.69	*	3.83	3.92		4.20	4.31	

(continues)

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Table 4 (conclusion)

Evaluation of risk and benefit by gender and product type

Items	Benefits			Personal injury			Risk awareness			Risk alert		
	M	W		M	W		M	W		M	W	
Cardiac surgery	4.85	4.92		4.63	4.80		4.52	4.49		4.38	4.68	*
X-ray	4.57	4.41		4.10	4.27		4.06	4.10		4.35	4.56	*
Acupuncture	4.54	4.80	*	2.40	2.40		3.51	3.44		3.91	3.96	
Intrauterine device (IUD)	3.92	4.05		3.55	3.40		3.97	3.85		4.24	4.47	*
Panel C: Non-medical risks												
Air travel	4.92	4.95		3.16	3.39	*	4.41	4.39		4.07	4.25	
Automobiles	4.87	4.91		3.83	4.10	*	4.75	4.63		4.25	4.45	
Genetically modified food	3.52	3.45		3.60	3.93	*	3.48	3.52		4.28	4.44	
Nuclear power plants	3.23	3.21		5.06	5.32	*	4.36	4.35		4.59	4.80	
Alcoholic beverages	3.01	2.75	*	4.67	5.15	*	4.72	4.99	*	4.52	4.80	*
High-fat foods	2.79	2.71		5.13	5.50	*	4.86	4.82		4.57	4.77	
Smoking	1.89	1.81		5.92	6.13	*	5.51	5.65		4.82	5.11	*

Source: Elaborated by the authors based on data and questionnaire from Mendes-Da-Silva (2022).

Note. *t-test, p-value < .05; M = men; W = women. This table presents the means for men and women in the dimensions of perceived risks and benefits, showing products with at least one difference of means.

In risk alertness, women had higher risk perceptions from diet and arthritis medications and medical procedures for chemotherapy and tomography. Regarding chemotherapy, this result may be related to women's higher perception of cancer risk (Taber et al., 2017). In the benefits and risk assessment (personal injury and alertness), women presented higher means than men, results that may be related to the higher general risk perception of this gender (Flynn et al., 1994). Women are also more likely to believe in the prevention and effectiveness of treatments, perceiving medications as powerful products that, therefore, have higher perceived benefits (Kauffman et al., 1997). The risk awareness category for medications is an exception, as for the three medications with a significant difference, men's perception was higher. Behavior in the alcoholic beverages category stands out, as it is the only product with significant differences in all dimensions analyzed. Women's perception of benefits was significantly lower than men's, and their perception of all risks was significantly higher. This result corroborates the incentive men receive to consume alcoholic beverages (Mahalik et al., 2015).

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Regressions

The ERM was used to estimate the regressions. The model-building considered that the perceived benefit of using medications is influenced by the perception of the dimensions of the risk of medications (risk alertness, personal injury, and risk awareness), gender, and experience in healthcare and care of the elderly and sick (Table 5).

Model 1 shows that the perception of the benefits of medications can be explained by the dimensions of the risk of medications (personal injury, risk alertness, and risk awareness), gender, regular medication usage, and the benefits of medical procedures. Regarding risk dimensions, the lower the perceptions of personal injury and the higher the perceptions of risk alertness and risk awareness, the greater the perceived benefits of medication usage, confirming hypothesis 1. Regular use of medications also contributed to broadening the perception of benefits. The three risk dimensions and acts influenced the risk perception of medical procedures as an endogenous variable positively related to the benefits of medications. Individuals who saw greater benefits from medical procedures also tended to see greater benefits in medications. On the other hand, no evidence was obtained that the perception of benefits relative to the category of non-medical items influenced medication benefits.

Table 5

Models for determining medication benefits

	Model 1: Endogenous covariates			Model 2: Endogenous covariates and exogenous treatment			
				Men		Woman	
Variables	Coeff.		Std. error	Coeff.		Coeff.	
Dummy gender	0.085	**	0.028	2.545	***	3.287	***
Dummy works in an industry	-0.035		0.047	0.043		-0.111	
Dummy aware of prescription problems	0.032		0.029	-0.019		0.065	
Dummy live with the elderly or sick	0.012		0.034	-0.033		0.047	
Dummy takes care of the elderly or infirm	-0.056		0.038	-0.020		-0.092	
Dummy uses medication regularly	0.066	*	0.028	0.078		0.065	
Dummy has dysfunctions	-0.014		0.030	0.030		-0.051	

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Table 5 (conclusion)

Models for determining medication benefits

	Model 1: Endogenous covariates			Model 2: Endogenous covariates and exogenous treatment			
				Men		Woman	
Variables	Coeff.		Std. error	Coeff.		Coeff.	
Dummy health insurance	0.028		0.037	0.101		-0.034	
Dummy side effect	0.010		0.029	-0.020		0.038	
Personal injury medication	-0.177	***	0.029	-0.169	***	-0.167	***
Risk awareness medication	0.069	***	0.020	0.095	***	0.039	
Risk alertness medication	0.085	***	0.019	0.074	***	0.084	***
Benefits of medical procedures – endogenous	0.241	*	0.115	0.308	***	0.254	*
Benefits non-medical items – endogenous	-0.012		0.099	0.036		0.004	
Constant	3.186	***	0.681				
Endogenous covariates – benefits medical procedures							
Personal injury MP	-0.217	***	0.034	-0.214	***		
Risk awareness MP	0.100	***	0.031	0.104	***		
Risk alertness MP	0.125	***	0.026	0.126	***		
Constant	4.632	***	0.192	4.602	***		
Endogenous covariates – benefits non-medical items							
Personal injury NMI	-0.264	***	0.031	-0.264			
Risk awareness NMI	0.043		0.028	0.046			
Risk alertness NMI	0.037		0.022	0.039			
Constant	4.432	***	0.161	4.409			

Source: Elaborated by the authors' conclusions based on data and questionnaire from Mendes-Da-Silva (2022).

Note. *p < .05, **p < .01, ***p < .001. Results of the extended regression models, in which the dependent variable is perceived benefits in using medication. Endogenous variables correspond to the benefits of medical procedures (MP) and the benefits of non-medical items (NMI). The independent variables are risk of personal injury of medications, risk awareness of medications, risk alertness of medications, dummy gender (0 = men, 1 = women), dummy works in industry (0 = no, 1 = yes), dummy aware of prescription problems (0 = no, 1 = yes), dummy lives with the elderly or sick (0 = no, 1 = yes), dummy takes care of the elderly or infirm (0 = no, 1 = yes), dummy uses medications regularly (0 = no, 1 = yes), dummy has dysfunctions (0 = no, 1 = yes), dummy health insurance (0 = no, 1 = yes), and dummy side effect (0 = no, 1 = yes). Model 1: extended regression model with exogenous covariates. Log Likelihood = -3220.2496; Wald chi-square (188.88, sig 0.0000); number of obs. = 1.009. Model 2: extended regression model with exogenous covariates and exogenous treatment (gender). Log Likelihood = -3209.1452; Wald chi-square (50156.63, sig 0.0000); number of obs. = 1.009, margin average treatment effect (0.088, sig 0.002).

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Considering the significant effect of gender in model 1, indicating that women perceived greater benefits of medications (Beyer et al., 2013), model 2 was estimated (gender as an exogenous treatment variable). It is observed that the perceptions of injury and risk alertness and the benefits of procedures contributed to women's perception of medication benefits. The results support hypothesis 2. In the group of men, besides these three significant variables for women, risk awareness is evidenced as positively related to the benefit of medications. For the variables related to experience in healthcare and care for the elderly and sick and for side effects, the results did not show gender significance, as in model 1. In summary, the marginal effect of gender on medication benefits is approximately nine percentage points for women compared to men. For both, the risks of personal injury decrease, and the risk alerts increase the perception of benefits. Only in the group of men does risk awareness become relevant to the perceived benefits.

DISCUSSION

In the group of medications, it was observed that for six items, the average risk perception outweighed the perception of benefits: antidepressants, anxiety medication, sleeping pills, Botox, diet pills, and erectile dysfunction medication. Among these, there is low consumption by society, with sleeping pills being consumed by 11.6% and erectile dysfunction medication by only 1.5% of respondents. However, medications for blood pressure, asthma, and Alzheimer's have a benefit/risk relationship higher than 1, *i.e.*, their perceived benefits outweigh their perceived risks by more than one point on the scale. In this group, the high level of benefits, low perception of personal injury, and reasonable perception of risk alert assigned to vaccines by both men and women also stand out. Considering several governments use a vaccination schedule, especially for children, the population apparently understands the benefits of joining the campaigns. However, they remain on risk alert, possibly due to commonly established adverse reactions.

The results for non-medical procedures show that all evaluated items had a positive benefit/risk relationship, especially the prostate exam, with the largest difference, and the IUD, with the smallest. For the prostate exam, women attributed more benefits and less risk of personal injury than men did. These results seem to explain men's "resistance" to this test. The non-medical risks category was established for comparison with other categories that directly involved health-related aspects. It is noteworthy that, in this category, for all items except alcoholic beverages, men and women had

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similar perceptions of benefits, but women perceived greater risks of personal injury. Thus, while both genders perceived similar benefits and risk awareness levels for actions such as smoking, driving, flying, and eating genetically modified or high-fat foods, women viewed higher risks of personal injury.

In this category, alcoholic beverages are the only item for which women's perception of benefits was significantly lower than that of males, and their perception of all risks was significantly higher. The fact that men perceive more benefits and fewer risks from drinking alcohol is related to its being a symbol of masculinity, as highlighted in the literature. Another highlight is the risk of smoking, which obtained the highest average risk perception and the worst average benefit in the men's and women's groups. This demonstrates that campaigns on the consequences of smoking, such as those printed on cigarette packs and those carried out by government media, and the creation of laws to prevent smoking in public places, such as companies, bars, and restaurants, among others, contribute to the public's awareness of the benefits and risks involved in smoking.

In the analysis by gender, it was observed that women presented superior benefit perceptions but similar risk perceptions for several medications. For medications for which differences in risk perception were observed, such as diet pills, aspirin, and laxatives, and for procedures such as IUD implantation and non-medical risks like drinking alcoholic beverages, women had higher perceptions than men, consistent with results from developed countries. Women had a higher risk perception in personal injury and risk alertness than men. By inquiring more about medicines and seeking help with health issues, women realize less risk awareness, greater risk alertness, and personal injury. Because of overconfidence, men think they know the risks better and underestimate the perception of alertness and injuries. The analysis by items indicates there are differences between emerging and developed countries. In Slovic et al.'s (1991, 1989, 2007) studies, men had higher risk perceptions than women for items such as medications for depression, blood pressure, Aids, osteoporosis, and ulcers, which were not found in this study. Still, vaccines are the medications with the highest perceived benefits, a distinct result from developed countries, where medications such as insulin and antibiotics have the greatest perceived benefits.

The results are representative of Brazil. However, they cannot be considered a standard for emerging countries. In other words, geographic, cultural, political, and other aspects can influence the perception of risks and benefits. It would be interesting to explore further how risk and benefit

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perceptions are formed, especially considering the emergence of new drugs and vaccines, as seen in the Covid-19 pandemic. Public policies and health-care professionals should ensure that patients are well informed about the medicines they take, as how patients perceive the risks of drug prescriptions can influence treatment preferences and drug-taking decisions (Hughes et al., 2002). Providing clear and understandable information about diseases and treatments, including risks and side effects, can have beneficial effects on patient satisfaction and bring important health outcomes (Riva et al., 2012), as empirical evidence has shown that the likelihood rating for infectious disease (affecting humans) was impacted by gender (Brown et al., 2021).

Health policy is about giving information and how to present it, at what time, and how it will be interpreted. Studies in cognitive psychology and health prevention have shown that information must go beyond traditional reports, so presenting information in different formats can help people think about the risks and benefits more actively and deliberately (Riva et al., 2012). Using new technologies, such as cell phones, has the potential to reduce medication errors, ensure replenishment, and digitally verify patient records, helping to minimize risks (WHO, 2009).

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