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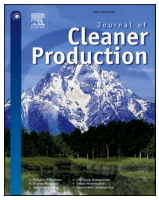

How sustainable are daily medicine consumption practices? *The case of a fragile coastal area, Arcachon Bay (SW, France)*

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ABSTRACT

The potentially negative environmental effects of pesticides and antibiotics are a source of concern for public health. Many studies in recent years have focused on so-called "emerging micropollutants" emanating from domestic activity and found primarily in cleaning products, cosmetics, and medicines. This awareness of potential risks to the natural environment has evolved considerably since the 1970s. Sustained population growth in urban areas has forced public policy makers to pay more attention to the links between health and the environment, and specifically to the complexity of medicine consumption. Using a practice theory approach, this article aims to identify how sustainable daily medicine consumption practices are. Our research is based on the analysis of medicine consumption in relation to four interdependent elements: prescription, treatment, unused medication, and representations of environmental issues. First, the background of practice theory and sustainable medicine consumption are discussed. This approach is then applied to quantitative data from a questionnaire survey on consumers that we conducted in a French coastal area subject to specific demographic pressure and micropollution of the water. A multivariate statistical exploratory analysis of the data set highlights the structure of the practices concerned, and the extent to which environmental issues are considered when unused medication is disposed of. We conclude by highlighting the relevance of our approach in understanding the complex nature of sustainable medicine consumption, which involves diverse communities of practice. We also underline the need for public policy to target all stakeholders in the medicine consumption process, from medical professionals to end users.

1. Introduction

Many recent scientific studies have focused on so-called "emerging micropollutants", found for the most part in substances used for domestic, cosmetic, and medical purposes. This phenomenon is closely linked to urbanization (Liu et al., 2021; Rico et al., 2021). Numerous studies have shown the situation to be critical in highly anthropized urban areas, especially coastal zones, and in the southern hemisphere in particular (Papageorgiou et al., 2019; Feo et al., 2020; Mora et al., 2021). Several ecotoxicological studies have also pointed out the dangers of such contamination for fauna (Kidd et al., 2007; Polverino et al., 2021). Moreover, the consumption of medicines, personal care products and cosmetics shows no sign of decreasing. Some authors have even referred to the "pharmaceuticalization" of society (Fox and Ward, 2008). At the same time, public policy has woken up to the intrinsic links between the environment and public health, and research projects in the environmental field are now increasingly investigating the role of medicines (Gwenzi et al., 2018; Aemig et al., 2021). These developments in monitoring and evaluating environmental and health risks linked to micropollutants call for multi-disciplinary research, to improve techniques and identify the sources of collective and individual contamination (Daughton, 2016). On this basis, several studies have aimed to find alternative, innovative ways for treating micropollutants in water purification stations (García et al., 2021; Igos et al., 2021). Focusing exclusively on the end of the contamination chain will however not be sufficient for reducing the negative impacts of micropollutants, or for achieving sustainable development targets. Other measures focused on the source of pollution – especially the users of harmful medical products – are a key part of managing the propagation of such substances (Kosek et al., 2020).

To define these measures, public decision makers need clear data about more sustainable consumption of medicines. To date, most work in the social sciences relating to medicine consumption has been confined to economics and psycho-sociology, where the focus has been

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on the effects of pricing, age, income, gender, and individual behaviour on individual and collective well-being (Cardon and Showalter, 2015; Dubois and Lasio, 2018; García-Gómez et al., 2018). In short, little research has been carried out into sustainable consumption of medication, and the few existing studies in this area focus on what happens to unused medication (Vatovec et al., 2017; Chung and Brooks, 2019). There has been broader research on sustainable consumption in general and, in the environmental and social sciences, on the drivers of greener and more ethical consumption of products (Steg and Vlek, 2009; Jaeger-Erben et al., 2015; Fischer et al., 2021). Many definitions of sustainable consumption have been proposed (Quoquab and Mohammad, 2020), the most common of which seems to be the one from the Oslo Symposium: "the use of goods and services that respond to basic needs and bring a better quality of life, while minimising the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardise the needs of future generations" (Norwegian Ministry of the Environment, 1994).

In line with the above definition, this paper examines different facets of sustainable medicine consumption. It also echoes recent claims that policy makers should focus their attention on the source of medicine-based micropollution, rather than end-of-pipe environmental strategies. We address the subject from a practice theory perspective, grounded in the work of Schatzki (1996), Reckwitz (2002) or Shove and Pantzar (2005), who study everyday practices interwoven with the context of healthcare organization and individual health pathways (Spaargaren, 2020). This approach implies a focus on both individual and collective factors (infrastructure, institution, value systems, etc.), in support of sustainable practices in medicine consumption. It also introduces a new conception of public policy, based on practices, their related components and their social context, and not just on policy instruments designed to change individual decisions towards greater sustainability. In this article we present an empirical investigation conducted among the population of a French coastal territory. We use an innovative multivariate statistical method, *ClustOfVar* – which stands for Clustering of Variables – (Chavent et al., 2012), rather than traditional exploratory approaches based on principal component or multiple correspondence analysis. This enables us to shift from an individual to a variable scale, in line with practice theory. This focus on the associations between variables and thus on identifying the structuring of practices affords a clearer understanding of the institutional and systemic dimensions of this consumption (Daenekindt and Roose, 2017; Jacobsen, 2019).

The paper begins, in Section 2, with a presentation of the links between different elements that may constitute sustainable consumption practices. Section 3 describes data and methods. Section 4 highlights the structuring variables of our survey data and introduces public policy implications. The article concludes that, through dedicated public policy actions, physicians and pharmacists have a key role to play in promoting and supporting sustainable practices among consumers of medicines.

2. Medicine consumption and environmental issues through a practice theory perspective

Micropollution, such as that found in surface water, has been examined by many previous studies, which have highlighted its persistence and the resulting effects on human health, even at relatively low concentrations (Jiang et al., 2019; Kar et al., 2020). There is consensus among scientists and decision-makers on the need for a clear strategy to reduce this contamination, the toxicity of which is often difficult to quantify due to the many combinations of chemicals that can be detected (Papageorgiou et al., 2019; Tosun et al., 2020). While scientists have extensively examined methods to reduce pollution within the water treatment plants, a real reduction in chemical transfer into water systems also calls for changes in the behaviour both of medical professionals (i.e. doctors and pharmacists) and of the patients who consume medication (Toma and Crişan, 2018). In the substantial body of existing social science literature, approaches based on social practice theory are increasingly advocated to analyse the social contexts that allow for the development of sustainable modes of consumption (Røpke, 2009; Spaargaren, 2011; Sahakian and Wilhite, 2014; Shove, 2014; Kennedy et al., 2015; Munir, 2022). To our knowledge, very little research has focused on sustainable consumption of medicine. When social practice theory is applied to a given issue, a dedicated methodology needs to be defined, to characterize practices (Halkier and Jensen, 2011; Castelo et al., 2021; Omer and Roberts, 2022). This perspective introduces a new approach to public policies that currently focus on quantitative targets, individual behaviour, and choices (Labanca and Bertoldi, 2018; Watson et al., 2020). In line with Spurling et al. (2013), analysing practices enables us to identify three ways in which practice theory can support policy implications. It can: i) reshape a practice by changing its internal components; ii) support alternative practices; and iii) transform interdependencies between practices.

Following on from this approach, the present study considers the sustainable consumption of medication as a complex act composed by bundles of more or less sustainable practices, determined not only by individual characteristics (the patient's health) but also by institutional specifications (organization of the health system), and material infrastructure (hospital, medical centres, etc.). To take this complexity and diversity into account, we analyse medicine consumption practices through four interdependent elements: prescription, treatment, unused medication, and environmental representations.

Prescription is generally the first step in the cycle of medicine consumption. It involves numerous actors, including doctors, pharmacists, and pharmacy employees, each with their own role in regulating medicine consumption practices. The French healthcare system is structurally based on the delivery of care shared between private physicians and public hospitals. It currently covers almost 100% of the resident population and constitutes what has been rated as the best overall health care, in *The World Health Report (2000)* (World Health Organization, 2000; Chevreul et al., 2015). In this institutional context consumers play a relatively small role in the type and quantity of medicine purchased. However, this asymmetric relation depends on the decision-making model adopted by the physician. Among the main models discussed in the literature, the shared decision making model is the one that includes an exchange of information and deliberation in a shared decision between health professional and patient (Emanuel and Emanuel, 1992; Charles et al., 1997). It allows the patient to express their environmental awareness and/or the physician to propose a more sustainable treatment (reduction to a minimum of the duration of the treatment, herbal medicine or even alternative medicine) (Zuercher, 2022). Even if this mode of decision-making is not practiced to the same degree, depending on the country (Härter et al., 2011) and clinical situation (Stiggelbout et al., 2015), its continuous diffusion since the 1990s constitutes an opportunity to change medicine consumption practices (Légaré and Thompson-Leduc, 2014).

Treatment is based on a patient-doctor relationship, where the doctor (the expert) has most of the knowledge. As doctors have a degree of control over the volume and types of medicine used, they have an important role to play in encouraging environmentally friendly practices. However, as home telehealth is becoming increasingly prevalent in the patient-doctor relationship (Koch, 2006; Huang et al., 2021), and information about illnesses and treatments is more widely available on social media, people are more likely to self-medicate. This form of self-medication depends on several social and cultural factors, and often involves re-using medication that has previously been prescribed. As a growing amount of medication is available over the counter, a considerable part of current consumption is entirely beyond the control of healthcare professionals and can be (un)sustainable.

What happens to out-of-date or **unused medication** is the last link in the consumption cycle, and is the subject of a substantial body of existing research. These studies have sought to understand why stocks of unused medication build up (Braund et al., 2009; Vellinga et al., 2014;

Zorpas et al., 2017). Ruhoy and Daughton (2008) point out that the phenomenon can be linked to patients not following prescriptions, treatments being stopped or modified, sometimes due to unwanted side-effects, or to the storage of medicines in an unsuitable environment. Other studies have focused on practices and opinions related to how unused and out-of-date medication is disposed of (Glassmeyer et al., 2009; Al-Shareef et al., 2016). The issue of unused medicines refers to a diversity of practices that have changed with the COVID-19 pandemics (Coman et al., 2022). Disposal of unused pharmaceuticals presents risks for human beings and the environment (Thomas and Depledge, 2015; Ortúzar et al., 2022), and the development of collection points for unused medicines is unequal between emerging and developed countries (Okoro and Peter, 2020; Lago et al., 2022).

In this context, where authorities have focused their efforts on specific initiatives to collect unused medication, and although such initiatives were initially aimed at avoiding risks to children in the home (Seehusen and Edwards, 2006; Kotchen et al., 2009), awareness of the environmental impact of medicine consumption is growing and building on a diverse range of environmental representations. As nature cannot express itself, the socio-economic actors who are taking a stand to protect the environment are defending different representations of forms of environmental degradation and responsibility. Thus, based on a conception of **environmental representations** that takes into account the diversity of value systems and experiences involved (Boström and Uggla, 2016), we consider that awareness of how medication disposal methods can affect the environment is determined by the severity of an individual's illness or ailment (Dohle et al., 2013). These environmental representations are a category of factors that determine environmental practices (Omer and Roberts, 2022). In order to achieve sustainable medicine consumption practices, however, these environmental representations are necessary but not sufficient to drive effective change (Lago et al., 2022).

It therefore appears that each component of medicine consumption may include more or less sustainable practices, the diffusion of which is affected not only by individual factors but also, above all, by material and institutional determinants. To grasp these different practices and their interconnections, we opted for a quantitative survey of users developed from the four previous elements and the (un)sustainable intertwined practices characterizing them. We used a multivariate statistical exploratory approach to identify the structuring variables making up sustainable medicine consumption[1].

3. Material and method

3.1. Study area: the ten coastal cities of Arcachon Bay

Arcachon Bay is a shallow tidal lagoon located on the south-western part of the French Atlantic coast. It resembles an equilateral triangle of 20 km on each side, connected to the Atlantic Ocean by a 3-km wide inlet between the mainland and an elongated sand spit (Fig. 1). Its particular semi-sheltered shape makes it a semi-confined space, in which not all the water running along the channel network reaches the exchange zone between tides (Chouvelon et al., 2022). Like all coastal areas, Arcachon Bay attracts and concentrates high densities of ageing populations and tourist activities, with a strong residential and seasonality appeal. First of all, 30% of the population is over 65, which is in line with the fact that 27% of the population of the coastal cities along the Atlantic coast is aged 60 and over (Béoutis et al., 2008). Then, this is a very popular area for new arrivals, given its interconnection with the Bordeaux Metropole area and its sought-after living environment. For

Fig. 1. The study area: the 10 coastal cities around Arcachon Bay.

the period 2015–2030, demographic projections show an increase of 25,496 inhabitants, i.e. 19.67% of the total population (GIP Littoral Aquitain, 2020). In comparison, the coastal territories of Nouvelle-Aquitaine (SW, France) could reach nearly 182,635 additional inhabitants (an increase of 16.65%) in the same period. In Europe as a whole, where the coastlines are diverse, the demographic scenarios predict a growth rate of between 5.6% and 9% (Neumann et al., 2015). Finally, the population is subject to seasonal variations. There is a high number of tourists during summer: 46% of overnight stays in the Arcachon Bay are during this period. This seasonality of tourism is also characteristic of European coastal regions.

The resulting increase in anthropic pressures make Arcachon Bay a fragile coastal ecosystem, for which recent "ecological crises" (e.g. decline in eelgrass coverage, and oyster mortality) have raised the question of the rate at which micropollutants establish themselves in the Bay. It is currently the subject of many scientific surveys, conducted by the French network for monitoring and expertise on micropollutants in the waters of the basin (REMPAR[2]). These substances, causing diffuse contamination of water, emanate from a wide variety of chemical products used in various human activities, including medicines. As it has recently been shown that, even in small quantities, some of these compounds have the potential to cause harm to aquatic life (Wilkinson et al., 2022), it is important to focus on the analysis of the domestic source. In France, this is a crucial issue as the country remains one of the largest consumers of medicine in Europe, particularly for antibiotics (Goossens et al., 2005). Even if the population living around Arcachon Bay has a consumption profile that reflects the national one: paracetamol (analgesic) and metformin (antidiabetic) are the most consumed molecules, this problem is accentuated by the ongoing trend of migration to the coast of elderly people. In this context, the monitoring network commissioned a survey to analyse sustainable medicine consumption practices in the 10 coastal cities around the Bay.

[1] The questionnaire used for data collection is specifically designed around questions relating to these four elements (see Appendix 2). Data generated and used for this statistical analysis are available from the corresponding author by e-mail.

[2] https://www.siba-bassin-arcachon.fr/qualite-de-leau/des-actions-dediees-la-qualite-de-leau-rempar/quest-ce-que-le-reseau-rempar (last accessed on 11 April 2023).

3.2. Data

The data analysed in this article are based on a quantitative survey that we conducted in 2016 by means of an anonymous self-administered questionnaire (https://doi.org/10.5281/zenodo.3135076). The target group was made up of inhabitants and visitors present during the summer in the Arcachon Bay area. The questionnaire was distributed online and by post[3], and we collected a sample of 351 respondents (234 residents of the 10 coastal cities around Arcachon Bay and 117 visitors). Our questionnaire consisted of three thematic sections (medicine use practices, disposal of unused medicines, and perception of environmental risk), each composed of questions linked to sustainable practices (see variables annotated with a star in Appendix 1). All practices were selected from the studies presented in Section 2. Classical socio-demographic questions were also included and enabled us to characterize our sample of spontaneous respondents and possibly identify relationships between socio-demographic characteristics and sustainable consumption (Vicente-Molina et al., 2018; Hansmann et al., 2020; Lago et al., 2022) (see Appendix 1). In brief, our sample includes more females than males. Not surprisingly for this territory, almost 30% are in the older age group and are retired. The majority of respondents are graduates and have monthly household incomes ranging from €1500 to €2999. A brief univariate description of the responses allows us to identify initial figures on the respondents' relationship to medicine consumption and its sustainable components. First, the respondents are in good health (80% do not suffer from any form of chronic illness). Second, almost two thirds state that they make use of alternative medicine in addition to or instead of conventional medicine. Third, self-medication is a prevalent feature in our survey sample (86% make use of it). Fourth, 87% of respondents state that they return their unused medication to a pharmacy, due to the specificity of French "Cyclamed" initiative[4]. Finally, 70% of respondents return their medication based on environmental concerns and, of those, 79% consider that residues from pharmaceutical products pose a serious risk to human health and the environment.

To capture how sustainable practices are intertwined with medicine use, we constructed a relevant dataset consisting of 40 categorical variables, of which 25 are indicators of sustainability.

3.3. Variable clustering with ClustOfVar

The challenge of the statistical analysis of our data set is to focus on variables rather than individuals, and to identify the mechanisms whereby practices are formed, disseminated, and then transformed. To reveal this multidimensionality, we adopt a multivariate statistical exploratory analysis based on variable clustering. In some respects, our work is consistent with the recent work of Marulanda-Grisales and Figueroa-Duarte (2021), who use Principal Component Analysis coupled with rotation to highlight the underlying factors of environmental behaviour patterns. In the present paper, we propose an alternative approach using the *ClustOfVar* method (Chavent et al., 2012). We argue that it is better suited to the identification of structuring variables, insofar as it focuses not on the explanation of inertia contained in the data set, but rather on the associations between variables, by rearranging closely related variables into clusters. It is thus possible to identify the different ways in which medicines are consumed, simultaneously rearranging the initial variables into homogeneous groups of variables and summarizing each one by its representative variable (the Synthetic Variable, SV). The proposed approach therefore aims to represent data with a clustered structure, by revealing the associations between variables and the interrelations between different aspects of practices. Applied to our survey data, the method highlights the structure of practices around the SVs. Mathematical details and properties of the *ClustOfVar* method are presented in Appendix 3.

4. Results and discussion

We apply the *ClustOfVar* method to the 40 categorical variables extracted from our questionnaire with the R dedicated package (Chavent et al., 2017). The dendrogram of the variables thus obtained shows the successive aggregations between them, and the way in which they are linked together (Fig. 2). We observe that a four-cluster partition is the first suitable choice for our data, thus revealing four main groups of medicine consumption practices. For a finer analysis of practices, we go slightly further down the tree until the next relevant choice of number of clusters: the 9-cluster partition. We thus highlight nine Synthetic Variables that are interpreted through the four groups of practices and read as a gradient, using both the variables that compose the corresponding cluster and the plotting of the Synthetic Variables. In this way, we can reveal how sustainable or not the identified practices are.

4.1. First group of Synthetic Variables: Medication as a commonly consumed commodity

Using the three sub-clusters (and their associated Synthetic Variables) that compose this first group, we identify a category of practices which shows consumption of medication as being very similar to that of an ordinary day-to-day commodity.

Synthetic Variable 4 (see Fig. 3, Cluster 4) was labelled "**Frequency and motive for medication use**" as it combines six variables related to frequency of consumption, motives for taking the medicine, and self-medication. The plotting of SV4 as a gradient shows the contrast between, on the one hand relatively infrequent use of medicine for benign illnesses such as headaches and seasonal illnesses, sometimes with recourse to self-medication (negative values of SV4), and, on the other hand daily consumption for more serious problems, such as blood pressure (positive values). We now look for relations between these structuring variables of consumption, the SVs, and certain socio-demographic characteristics of patients. For that purpose, we apply PCAmix (Chavent et al., 2022) to the variables of that cluster and project the socio-demographic variables onto the SV as supplementary (illustrative) variables. We check whether the obtained coordinates of the modalities of these variables are positive or negative, as this indicates whether they tend to be associated on average with a positive or negative value of the SV. We can thus determine whether certain socio-demographic characteristics of individuals are associated on average with specific frequencies and motives for medication use. Unsurprisingly, this is linked to health and age: medicine consumption is higher among people with health concerns and/or older people over 60 (see Appendix 5). These results show that some consumption of medicines is part of routines where reduction of personalized consumption is barely questioned or not at all. Only physicians and pharmacists can introduce these dimensions during their interaction with patients.

Synthetic Variable 5 (Fig. 3) associates four variables: reading labels on medication; handling unused medication; self-medication (with the lack of time to go to a doctor given as the reason); and medication for underlying conditions (allergies). These are potentially variables that may mirror some (un)sustainability in the consumers' practices. The

[3] Multiple responses from the same individual have been avoided because these are spontaneous and voluntary responses with no incentive to respond neither compensation.

[4] Cyclamed is a non-profit organization comprised of a large number of professionals involved in the medication supply chain (dispensing pharmacists, wholesale distributors and drug companies), which collects (non-)expired unused medication that patients return to pharmacies for disposal and energy recovery. This collection effort, which has become a professional obligation for pharmacists, is driven by consumers' strong environmental concerns. It was set up to avoid discharging drugs into the natural environment (dumps, ground and surface water, etc.). Source: https://www.cyclamed.org/cyclamed/(last accessed on 6 June 2023).

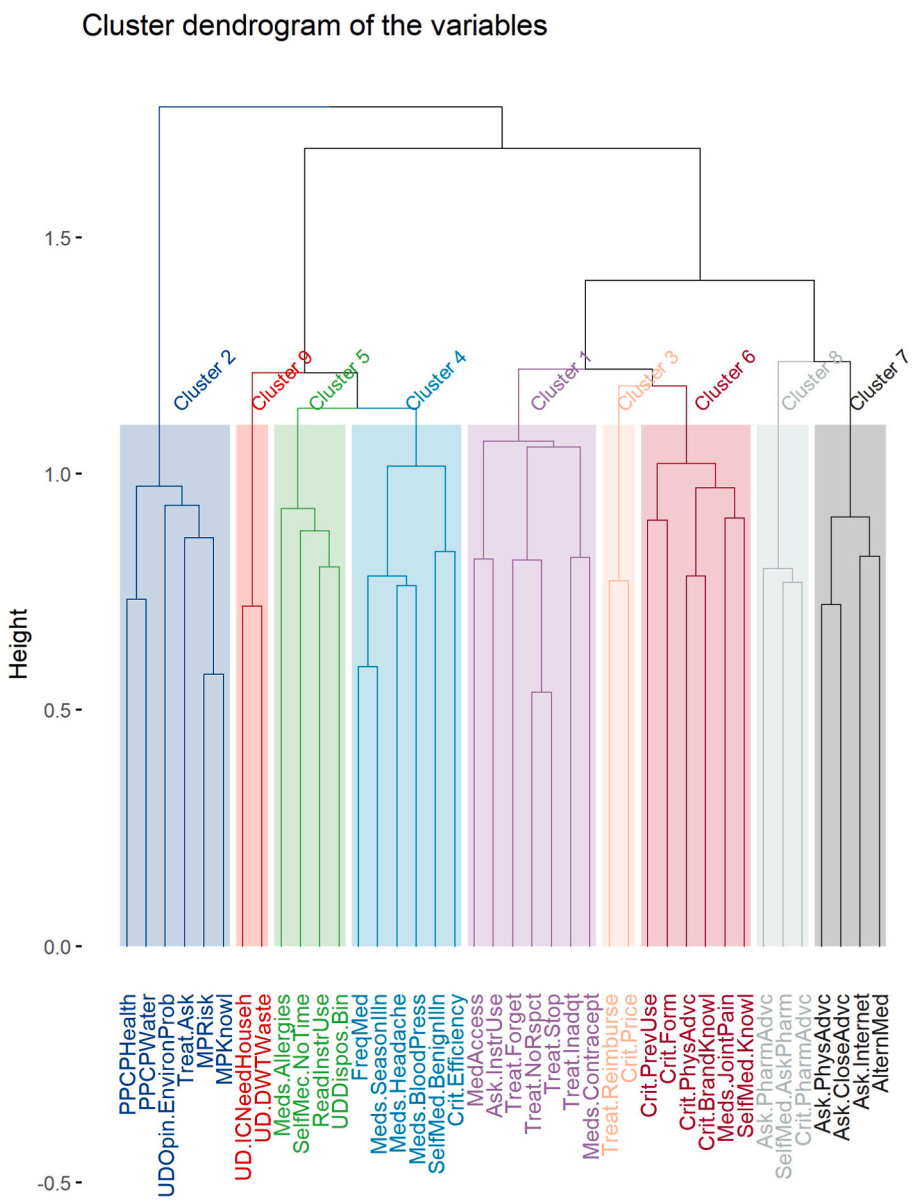

Fig. 2. Dendrogram of the 40 categorical variables built with *ClustOfVar*.

plotting of SV5 shows the contrast between, on the one hand some sustainable practices (negative values of SV5), where the patient is an actor in their own healthcare (careful use by reading instructions, taking the time to go to the doctor) and properly disposes of unused medication (not discarding it in the rubbish bin), and, on the other hand some unsustainable practices (positive values of SV5), where the patient is simply an executor following instructions that do not prevent him or her from discarding unused medicines in the bin. It is the values of individuals on this specific SV that will differentiate between them in the study area and point to their having sustainable practices or not. These results corroborate the studies of Kusturica et al. (2020) and Lago et al. (2022) which found that diverse even contrasting practices can coexist in the same territory, in a group of actors. Based on this description, we label SV5 "**Various coexisting consumption postures**".

Synthetic Variable 9 (Fig. 3) contains two variables explaining why unused medication continues to be stored. We label it **"Disposal of unused medication".** Consumers tend to store these medicines, for two contrasting reasons: either to re-use them later, or simply because they refuse to throw them away. Acting on the motives of this storage could contribute to reducing medication wastage. The first reason for keeping leftover or unwanted medication, in case it is needed later, aligns with the findings of several studies (Braund et al., 2009; Gidey et al., 2020). The second reason differs from results reported in the literature, stating that "disposal in the garbage" remains the most widespread way of getting rid of unused medication (Tong et al., 2011; Fenech et al., 2013; Quadra et al., 2019). This finding may reflect a particularity of the French case that may be explained by the efficiency of the Cyclamed take-back programme. It may also be the result of sustained communication around the fragility of this coastal area, which is led by the Intercommunal Syndicate of the Arcachon Bay. If so, it probably reflects growing awareness in the population of environmental concerns, as previously observed in Sweden, where national campaigns seemed to have raised the awareness of the general public, fifteen years ago already (Persson et al., 2009). Finally, in line with recent findings (see for instance Foon et al. (2020)), demographic variables do not clearly impact disposal behaviour, which seems to be a more complex cognitive decision implying perceived convenience, personal and social norms, and so on.

These three SVs seem to indicate the central actions of the daily consumption of medicines to treat "ordinary" pathologies, outside of

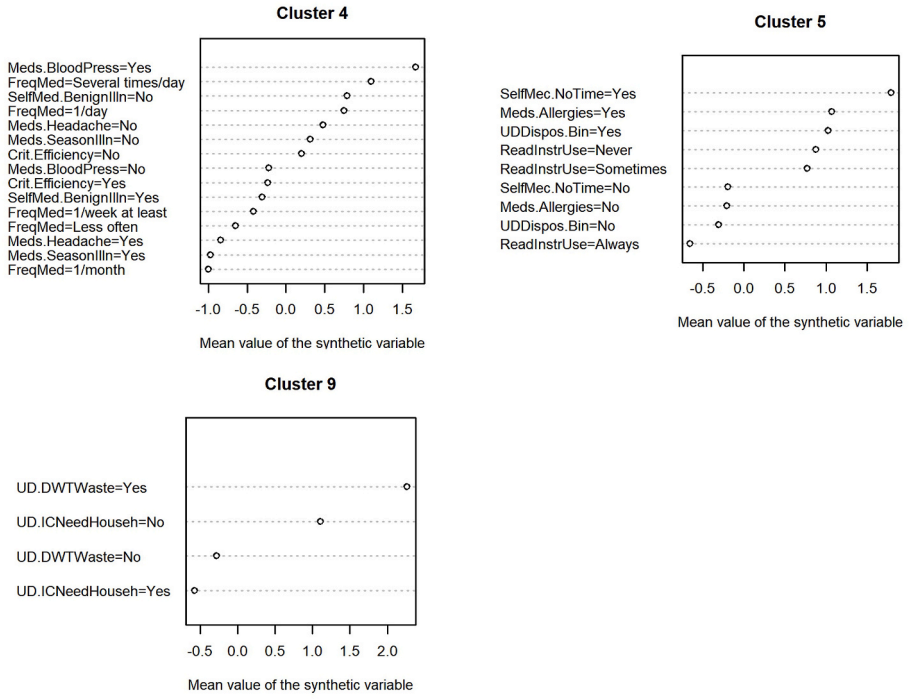

Fig. 3. SV4, SV5 and SV9: Medication as a commonly consumed commodity.

those usually managed by health professionals and without real consideration of the environment of these practices. Examining in detail the intercorrelations between the SVs of this first group (see Appendix 5 for details), we see how these structuring variables are correlated among individuals of our dataset. First, the slight negative correlation between SV4 and SV5 shows that when medicine consumption of the surveyed individuals is daily (positive values of SV5), their behaviour tend to be more precautionary on average (negative values of SV4). Conversely, a less cautious behaviour seems to be observed in case of infrequent use for benign illnesses such as headaches and seasonal illnesses. The disposal of unused medicine seems however to be largely independent of frequency and use or consumption posture (as shown by the correlation of SV9 to SV4 and SV5, which is close to zero).

4.2. Second group of Synthetic Variables: Consumption affected by a strictly defined institutional framework

The second category of practices, made up of SV1, SV3, and SV6, relates to the way in which the French national health service oversees medicine consumption.

Synthetic Variable 1 (Fig. 4), which is the largest, contains seven variables related to different actions linked to medicine consumption, ranging from strict adherence to a treatment programme, to patients taking no notice of the instructions on their prescription and forgetting or stopping their treatment, sometimes because they think it is inadequate. We therefore refer to this SV as "**Adherence to treatment**". In the literature it has been shown that patients' non-adherence to a medical prescription, due to an improvement in their medical condition, is a major cause of medication wastage (Fenech et al., 2013; Insani et al., 2020). This highlights the major role of medical professionals in explaining and informing patients on the prescribed treatment.

Synthetic Variable 6 (Fig. 4) is "**Self-medication**", mainly for therapeutic reasons. Such practices can include purchasing medication on the advice of a doctor, or choosing medicines that are in the cupboards or have been favourably reviewed by consumer bodies. In this particular case, consumers will buy medication either because they are familiar with a particular brand, have used it before, or because it is presented in a certain way. Looking for relationships between these structuring variables of consumption, the SVs, and some socio-demographic characteristics of patients, reveals a tendency among young patients (partly students), as well as stay-at-home parents and households with a lower income, to practice self-medication. This result corroborates that of a recent study showing that 95% of the French students surveyed had self-medicated (Gras et al., 2020). While the literature has regularly dealt with the safety problems posed by self-medication (Khalifeh et al., 2017) and shown that this question is posed differently according to the countries and their culture (Torres et al., 2019), the COVID-19 pandemic has renewed the need to take into account the diversity of self-medication practices (Kazemioula et al., 2022; Shrestha et al., 2022).

Synthetic Variable 3 (Fig. 4) is made up of two variables focused on the economic characteristics of medicine consumption. We label SV3 "**Cost of medication**". Given that French healthcare is available free or virtually free for most people, it is logical to assume that most respondents are not particularly sensitive to the financial aspect of medicines. This is corroborated by the 89% of respondents who stated that financial criteria were not important for them. However, the two variables making up this SV would tend to indicate that some consumers still pay attention to the price of medication, particularly in terms of what percentage is reimbursed by the French national health service (positive values of SV3). However, studies comparing prescriptions in France, Denmark, Norway, and Sweden have shown that France is the only country where there is no advance payment for pharmaceutical expenses. This could be a factor in the actual increase of medicine consumption, which thus limits sustainable practices. This study also stresses that prescribing behaviours depend on social and cultural factors (Dezileaux and Martinez, 2016).

This particular group of Synthetic Variables shows the major role played by the relationship with healthcare professionals, and by the configuration of the public health system in the way medicine is consumed. Self-medication nevertheless remains a feature in this category of practices, which would appear to show variations in behaviour and, potentially, patients straying from the treatment programmes prescribed to them (as shown by the slightly positive correlation of 0.21

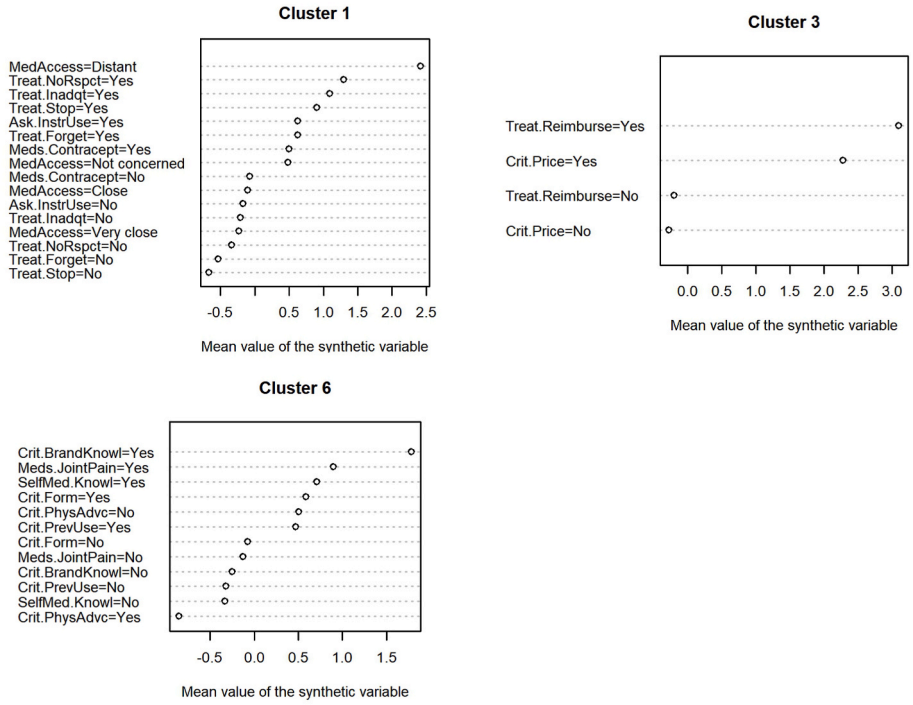

Fig. 4. SV1, SV3 and SV6: Consumption influenced by the institutional framework.

between SV1 and SV6).

4.3. Third group of Synthetic Variables: What alternative types of consumption exist?

The third category relates to medicine consumption in treatments referred to as "alternative". While treatment practices are generally defined by an overarching institutional framework, there is still some room for diversity, particularly when environmental issues are taken into account. Two of our SVs relate to these practices.

Synthetic Variable 7 (Fig. 5) highlights the relatively large proportion of patients seeking advice outside of conventional medical channels and using alternative forms of treatment (homeopathy, acupuncture, osteopathy, etc.) (Youn et al., 2022). Analysis of the variables would appear to show that in this context, some consumers rely on family, friends, and social media, in addition to or instead of medical advice from more conventional sources. We note a negative correlation of SV7 with SV1 (Appendix 4), indicating that patients who do not completely adhere to prescribed treatment (stop or forget) tend to question the treatment prescribed by their doctor, and seek alternative treatments in addition to conventional ones. This is consistent with the results of a study carried out in Australia on the profile of consumers of alternative medicine. It highlights the fact that these practices are strongly linked to chronic diseases and a healthy lifestyle (Leach, 2016). We have called SV7 "**Change care pathways**".

Synthetic Variable 8 (Fig. 5) is called "**Medical advice**". It relates to whether patients do or do not seek information from other medical professionals such as pharmacists, who are particularly influential, given the extent to which individuals are likely to follow their prescriptions, as well as the way in which they will deal with unused medicine. The importance of this role will increase, depending on how committed the pharmacist is to customer relations and to providing advice. It is also influenced by the Internet, which plays a significant but controversial role in providing access to resources that allow patients to modify their medicine consumption practices (Bernardi and Wu, 2022). This trend is confirmed by literature which highlights that healthcare consumers are increasingly using the Internet to find information to complement that provided by physicians during their brief consultations, to share their experiences and find help, and sometime to criticize the decisions made (Broom, 2005; Lemire et al., 2008). Finally, as a complement to physicians and pharmacists, the Internet enables patients to improve their understanding of their health problems and become active players in their own health care.

4.4. Fourth group of Synthetic Variables: From awareness of environmental issues to changing medicine consumption

The fourth and last category of practices is made up of a single SV,

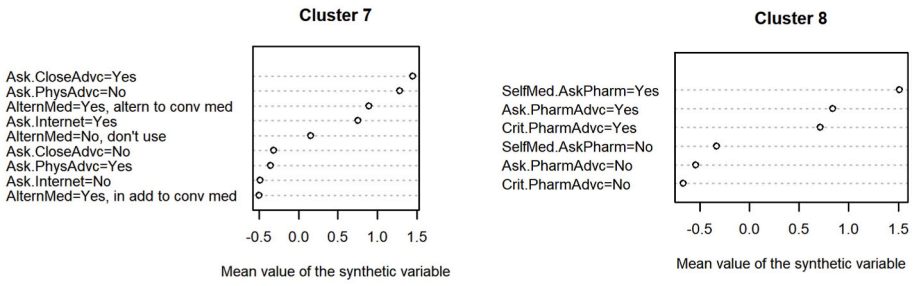

Fig. 5. SV7 and SV8: What alternative types of consumption exist?.

SV2 (Fig. 6), which combines six initial variables illustrating environmental awareness with regard to medicine consumption. While actions relating to the disposal of unused medication are of course included, four of the six variables composing the cluster relate to the environmental impacts of medicine consumption (knowledge on medication residues and associated risks, impact on water quality and health). The last variable reflects a proactive approach in the care process, where patients ask their doctor to prescribe certain medications. This increased awareness would seem to challenge the effectiveness of end-of-pipe solutions (i.e. water treatment and unused medication), calling for a greater focus on behaviour earlier on in the process. Our statistical analysis does not appear to show any radically innovative practices coming out of this new-found knowledge, especially given that this particular group of variables appears fairly independent (not correlated to the other Synthetic Variables). This is also reflected by the aggregation with the other eight clusters at the last stage of the clustering. Finally, as Lago et al. (2022) show, environmental awareness is not enough to transform consumption practices. While our results show evidence of growing concern around environmental issues, health remains the strongest influence on medicine consumption practices. We therefore conclude that medicine consumption will decrease only when treatment programmes prescribed by healthcare professionals are changed.

4.5. Policy implications to reduce medicine consumption

In line with Spurling et al. (2013), our results distinguish three public policy approaches designed to inform policy initiatives to reduce medicine consumption.

4.5.1. Identifying and supporting alternative practices

Careful analysis of the extracted Synthetic Variables, especially those of the third group, clearly shows the extent of the use of complementary and alternative medicine in daily practices (Thomson et al., 2014). Beyond the framework of our survey, recent research (Youn et al., 2022) shows the increasing use of such medicines, which are widely diverse: proposals related to nutrition, phytotherapy, health exercises, therapies through artistic expression, discussion groups, patient groups, and so on. More specifically, complementary and alternative medicine treatments (e.g. acupuncture, homeopathy, reflexology, massage) are delivered by practitioners or relate to self-care practices (homeopathic remedies, herbs, vitamins) (Tavares, 2015) based on an integrative approach to medicine, and are linked to preferences for organic and non-chemical solutions. Beyond their diversity, they are directly linked to a reduction of prescribed medicine. Therefore, to encourage the development of alternative practices and convert general environmental awareness into a reduction of medicine consumption, it is necessary to clarify how conventional and non-conventional medicine can be complementary (Ernst, 2000). The few research papers published on this complementarity – beyond personal characteristics and psychosocial factors (Thomson et al., 2014) – show the importance of national regulations, which makes it difficult to compare countries to one another (von Ammon et al., 2012). Current policies in favour of these healing practices focus on defining a legal framework to limit the risks of abuse, regarding both users and practitioners. They nevertheless maintain the logic of segmentation between the different scientific approaches (medical, socio-anthropological, psychological, political, and legal sciences) involved in this general movement. Yet integrative medicine, which is the simultaneous use of conventional and alternative medicine, represents an exemplary form of complementarity, consistent with the *shared decision making* model presented above, as developed in North America. In France, this complementarity has been more structured through the treatment of certain diseases such as cancer and AIDS, which have received national political support (Joël and Rubio, 2015). The idea would therefore be to improve the mechanisms allowing for this complementarity, and thus to work towards integrated healthcare provision and making alternative medicine accessible to the greatest number of people under controlled conditions.

4.5.2. Transforming existing practices through the evolution of their components

The change in medicine consumption can also be achieved by the introduction of innovation at the level of its various components. As in other fields, current public policies on sustainable medicine consumption focus on technical efficiency and individuals' behavioural change through both the recovery of unused medication and the improvement of the performance of waste-water treatment plants. However, a policy targeting transformation within each of the four stages of medicine consumption would be more effective.

Therefore, in addition to these instruments, our work allows us to identify relevant drivers. At the level of medicine production, the implementation of a "green" medicine label enables patients and physicians to choose a treatment according to their environmental awareness.

All the conditions of production, use or recycling that contribute to improving the sustainability of the pharmaceutical industry are part of the recognition of green medicines (Rampi and Bisazza, 2023). For chemical medicines (manufactured from active substances of chemical origin) and organic medicines (manufactured from a source of biological origin, i.e. living organisms), this sustainability is part of a regulatory framework. This framework applies to manufacturers through the assessment of environmental risk at the time of marketing authorization,

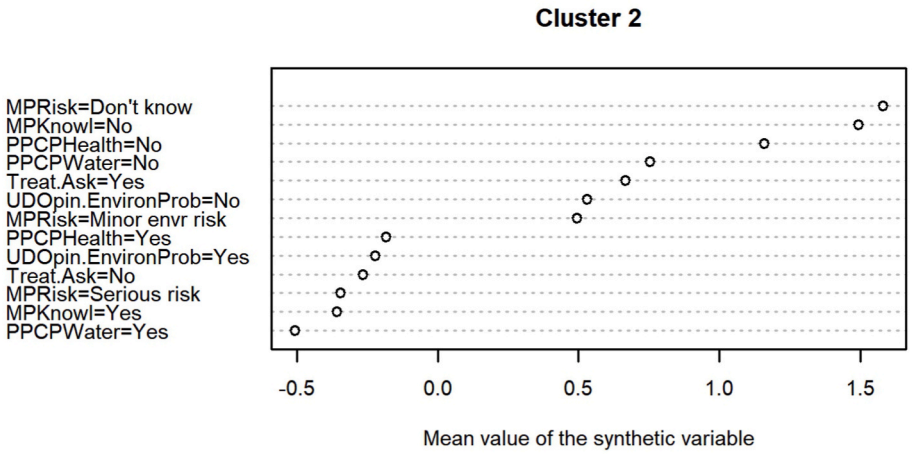

Fig. 6. SV2: From awareness of environmental issues to changing medicine consumption.

and through the recovery of unused medicines in the context of extended producer responsibility. Currently, there are no regulations for prescribers and users. Only a few experiments have been carried out in this respect, for instance in Stockholm with a classification of the active ingredients of medicines according to their environmental impact[5], and in some French regions[6] with the delivery of medicines by the unit. Our results show that the prescription stage is a determining factor in the evolution of medicine consumption. The adoption of a work organization for physicians that promotes interaction with their patients and compliance with prescriptions appear to be relevant innovations for reducing medicine consumption. The COVID-19 pandemic has however led to an increase of self-medication practices (Coman et al., 2022) and panic buying of medicine that will require specific measures designed to reduce medicine consumption.

4.5.3. *Changing practices for better human and environmental health*

Finally, in this work we explore how medicine consumption is not reducible to individual choices and attitudes. The first, second and fourth group of Synthetic Variables emphasize the patient's state of health as one of the primary factors determining medicine consumption. However, health status is part of a lifestyle, a work environment, and a culture that can increase the occurrence of certain diseases, particularly chronic ones. Thus, information and education of citizens to promote a balanced diet and daily physical activity, and to help patients stop smoking, are all actions likely to reduce medicine consumption. Moreover, our work highlights the key role played by physicians in disease prevention (sport, healthy eating, regular way of life, etc.). Nevertheless, prevention currently plays a limited role in the activities of healthcare professionals (physicians and pharmacists), as it involves additional consultation time compared to traditional care pathways, and therefore requires a change in these professions' economic model (Valadaud et al., 2022). Moreover, significant changes to their training to better take into consideration the environmental consequences of the treatments prescribed, along with a more holistic approach to care that leaves room for preventive and alternative medicine options, should foster more sustainable practices.

5. Conclusion

In this article, we have explored from a practice theory perspective the diversity of sustainable medicine consumption practices. We first identified four groups of clusters of consumption practices, interwoven with the four elements of medicine consumption (prescription, treatment, unused medicines, and environmental representations), and which are sustainable to a greater or lesser degree.

The first two groups of Synthetic Variables highlight the structural components of the resistance to changing medicine consumption practices. Some practices suggest that a decrease in medicine consumption would be possible. Yet all the SVs in this group refer mainly to regulated practices, meaning that structural changes in the healthcare system will be required for practice shifts to be effective. For example, the dissemination of a classification of medicines according to their environmental impact and the implementation of a differentiated scale of reimbursement for treatments, according to this impact, would make it possible to establish these changes in practices in the long term.

The second group of Synthetic Variables shows practices explicitly linked to environmental issues. They can be described as sustainable medicine uses. While society as a whole is beginning to take an interest in environmental issues, it would appear that awareness of the environmental impacts of medicines is insufficient to generate a reduction of medicine consumption. As it stands, the most widespread sustainable practice is the collection of unused medications, which is an end-of-pipe solution dependent on the patient-pharmacist relationship and the effectiveness of the French system for disposal of unused medicines.

In this context and with a view to bringing about a real reduction of medicine consumption, we highlight the need to support the development of alternative medicines, to transform the patient-physician relationship by integrating all facets of self-medication, and to develop an ambitious programme for the prevention of recurrent diseases. For instance, supporting the use of acupuncture for chronic pain as a substitute for conventional painkillers can be an important driver to develop the most advanced alternative practices. Herbal remedies, acupuncture and traditional Chinese medicine could also limit the side effects of antibiotics, as well as the progression of antimicrobial resistance.

Currently, the environmental issues associated with medicine residues in the environment are reflected in the European regulatory framework, which imposes an environmental risk assessment when placing new products on the market, and in the collection systems for unused medicines. Our results show that between these two stages, from the beginning to the end of a medicine's life, the consideration of these environmental issues is scattered and relies on individual environmental awareness and the practices of prescribers and consumers. Structural transformations of the health system are necessary if these practices are to become widespread and to generate a substantial reduction in medicine consumption.

Our empirical findings therefore argue for a public policy strategy targeting all actors involved in the medicine consumption process, as well as actors interconnected beyond the medical sphere per se. In this perspective, this study of practices in everyday routines allows us to analyse how consumers and prescribers deal with institutional changes and the actual impacts in terms of medicine consumption. While the results obtained should certainly be situated within the ecological and institutional context of Arcachon Bay, this research should be replicated in another study area. As we have seen, the coastal areas of Western countries share similar demographic and socio-economic characteristics to Arcachon Bay (increasing ageing and sustained attractiveness). The conditions are therefore in place to develop comparative approaches (Sartori, 1991). Such comparison will allow for a more in-depth examination of the commonalities and differences between our study area and other coastal regions on sustainable medicine consumption practices. Furthermore, by focusing on specific questions such as the role of alternative medicine, this approach may enable assessments of the potential for change within a dominant model and thus offers opportunities for analysis beyond coastal areas. It moreover seems important to reread the contribution of our research in light of the COVID-19 pandemic, which has probably changed the care practices of patients and healthcare professionals alike.

CRediT authorship contribution statement

Clarisse Cazals: Conceptualization, Methodology, Study design, Investigation, Data curation, Writing – original draft, Writing – review & editing, Supervision, Funding acquisition. **Sandrine Lyser:** Methodology, Study design, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing, Visualization, Funding acquisition. **Vanessa Kuentz-Simonet:** Conceptualization, Methodology, Study design, Formal analysis, Writing – original draft, Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

[5] https://janusinfo.se/beslutsstod/lakemedelochmiljo/pharmaceuticalsandenvironment/environment/classification.5.7b57ecc2 (last accessed on 11 April 2023).

[6] https://www.acadpharm.org/dos_public/Rapport_Medicaments_Environnement_2019.04.24_VF.pdf (last accessed on 11 April 2023).

the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix 1

Socio-demographic characteristics of the 351 respondents.

Variable	N (Percentage)
Gender	
Male	97 (28)
Female	254 (72)
Age (years)	
15–29	51 (15)
30–44	90 (26)
45–59	95 (27)
60–74	93 (27)
$\geq$ 75	22 (6)
Education	
No degree	6 (2)
Vocational diplomas	60 (17)
High school diploma	27 (8)
Undergraduate	110 (31)
Master's degree	107 (30)
More	41 (12)
Household monthly income (€)	
<1000	22 (6)
1000–1499	38 (11)
1500–2999	142 (40)
3000–3999	69 (20)
$\geq$ 4000	80 (23)
Occupation	
(Pre) Retired	100 (28)
Unemployed	14 (4)
Employed	204 (58)
Student	21 (6)
Stay-at-home parent	12 (3)
Geographic origin	
Coastal cities around Arcachon Bay	234 (67)
Arcachon Bay not including coastal cities	10 (3)
Gironde not including Arcachon Bay	66 (19)
Nouvelle-Aquitaine not including Gironde	11 (3)
France not including Nouvelle-Aquitaine	30 (9)
Health status	
You are healthy, you rarely visit the doctor	160 (46)
You are generally healthy, you visit the doctor from time to time	118 (34)
You need to look after yourself due to a chronic illness	65 (18)
You suffer from a serious illness	8 (2)

Appendix 2

Variables used in the *ClustOfVar* method. The variables related to sustainable medicine consumption are mentioned with an *

Thematic	Question	Variable	Modality	Frequency (in %)
Interaction with the prescribing physicians				
	From your home or place of residence in the Arcachon Bay area, how is your access to a doctor?	MedAccess	Very close	46.44
			Close	29.06
			Distant	0.85

(*continued on next page*)

(*continued*)

Thematic	Question	Variable	Modality	Frequency (in %)
			Not concerned	23.65
	When you have a health-related question about yourself or a family member:			
	- you seek advice from your doctor	*Ask.PhysAdvc	Yes	78.35
			No	21.65
	- you seek advice from your pharmacist	*Ask.PharmAdvc	Yes	39.32
			No	60.68
	Do you sometimes:			
	- ask your doctor to prescribe certain medicines	*Treat.Ask	Yes	28.49
			No	71.51
	- don't follow the doctor's prescription	*Treat.NoRspct	Yes	20.51
			No	79.49
	- forget to take your treatment	*Treat.Forget	Yes	46.15
			No	53.85
	- voluntarily suspend or stop a medication yourself	*Treat.Stop	Yes	42.45
			No	57.55
	- have an inadequate treatment	*Treat.Inadqt	Yes	16.24
			No	83.76
	- ask your doctor for a medicine based on the reimbursement rate	Treat.Reimburse	Yes	5.98
			No	94.02
Consumption practices				
	How often do you take medication, with or without a prescription?	FreqMed	1/day	29.63
			1/month	12.54
			1/week at least	5.98
			Less often	36.75
			Several times/day	15.10
	When you take medicines, is it to treat …			
	- headache, migraine	Meds.Headache	Yes	36.18
			No	63.82
	- seasonal illness	Meds.SeasonIlln	Yes	24.50
			No	75.50
	- allergies	Meds.Allergies	Yes	16.24
			No	83.76
	- contraception	Meds.Contracept	Yes	12.82
			No	87.18
	- joint pain	Meds.JointPain	Yes	12.54
			No	87.46
	- blood pressure	Meds.BloodPress	Yes	11.68
			No	88.32
	Why do you self-medicate?			
	- you know how to treat by yourself	*SelfMed.Knowl	Yes	31.62
			No	68.38
	- you have asked a pharmacist for advice before	*SelfMed.	Yes	17.95
		AskPharm	No	82.05
	- you treat benign illnesses	SelfMed.BenignIlln	Yes	71.79
			No	28.21
	- you don't have time to go to the doctor	SelfMed.NoTime	Yes	9.69
			No	90.31
	Which factors do you consider when you choose over-the-counter medication?			
	- the pharmacist's advice	*Crit.PharmAdvc	Yes	48.43
			No	51.57
	- the efficiency	*Crit.Efficiency	Yes	46.44
			No	53.56
	- the brand knowledge	*Crit.BrandKnowl	Yes	12.25
			No	87.75
	- the form of medication	*Crit.Form	Yes	10.83;
			No	89.17
	- the doctor's advice	*Crit.PhysAdvc	Yes	37.32
			No	62.68
	- a previous use	Crit.PrevUse	Yes	40.17
			No	59.83
	- the price	Crit.Price	Yes	10.54
			No	89.46
	Do you consult doctors practising alternative medicine (homeopathy, acupuncture, osteopathy, etc.)?	*AlternMed	Yes, as an alternative to conventional medicine	17.95
			Yes, in addition to conventional medicine	43.87
			No, don't use it	38.18
	Do you read the instructions for the use of your medication?	*ReadInstrUse	Never	6.27
			Sometimes	39.03
			Always	54.70
	When you have a question about your own or a family member's health:			
	- you seek information on the internet	*Ask.Internet	Yes	39.03;
			No	60.97
	- you read the instructions for the use of the medication	*Ask.InstrUse	Yes	21.37
			No	78.63

(*continued on next page*)

(*continued*)

Thematic	Question	Variable	Modality	Frequency (in %)
	- you seek advice from people you know	*Ask.CloseAdvc	Yes	17.95
			No	82.05
Unused medication				
	Why do you keep unused medicines?			
	- you keep them in case of need for yourself or a family member	*UD.ICNeedHouseh	Yes	65.81
			No	34.19
	- you don't want to waste them	*UD.DWTWaste	Yes	11.11
			No	88.89
	Usually, when you dispose of your unused or expired medicine, do you discard them in the rubbish bin?	UDDispos.Bin	Yes	22.79
			No	77.21
Representation of the environment				
	In your opinion, is the management of unused or expired medicines an environmental problem?	*UDOpin. EnvironProb	Yes	70.37
			No	29.63
	Before this questionnaire, had you ever heard of "medication residues" or "pharmaceutical residues" in water?	*MPKnowl	Yes	80.63
			No	19.37
	Are residues from pharmaceutical products a …	*MPRisk	Serious risk for the environment and health	79.20
			Minor environmental risk of little concern	5.13
			Don't know	15.67
	Do you think that medicines can:			
	- be harmful to your health if they are misused	PPCPHealth	Yes	86.32
			No	13.68
	- have an impact on water quality	*PPCPWater	Yes	59.83
			No	40.17

Appendix 3

The ClustOfVar method

The aim of the *ClustOfVar* method (Chavent et al., 2012, Chavent et al., 2017) is to find a partition $P_K = (C_1, \ldots, C_K)$ of a set of p categorical variables $z_j, j = 1, \ldots, p$ into K disjoint clusters within which variables are strongly related to one another[7]. For that, the homogeneity of a partition is simply the sum of the homogeneity of its clusters $H(P_K) = \sum_{k=1}^{K} H(C_k)$ where $H(C_k) = \sum_{z_j \in C_k} \eta^2_{y_k|z_j}$ measures the link between the variables belonging to cluster C_k and its numeric Synthetic Variable y_k. Note that $\eta^2_{y_k|z_j}$ denotes the correlation ratio between y_k and the categorical variable z_j (part of the variance of y_k explained by the categories of z_j).

The Synthetic Variable $y_k \in R^n$ of C_k is the numeric variable that is the "most closely linked" to all the variables in the cluster, that is, which maximizes the homogeneity of the cluster. It is defined as the first principal component of PCAmix (extension of Principal Component Analysis, PCA, to mixed data, that is numerical and categorical variables) applied to variables of cluster C_k (Chavent et al., 2022). Finally, to maximize the homogeneity criterion, a hierarchical ascendant algorithm is proposed to successively aggregate the variables, starting with a partition into singletons (p clusters) and ending with the partition into a single cluster (made up of all variables). The *ClustOfVar* method has some useful mathematical features. Aside from its capacity to handle mixtures of numeric and categorical variables, it always provides numeric Synthetic Variables (SVs), whatever the type of initial data. In addition, each of these SVs is only related to variables of its cluster (contrary to principal components in PCA that are related to all variables). The final important mathematical property of the method is the possibility to read and label each SV as a sort of gradient. Theoretical aspects of this central point of the *ClustOfVar* approach are detailed in Kuentz-Simonet et al. (2015), who also discuss its application to a survey data set.

Appendix 4

Correlation between the nine Synthetic Variables (in bold: values interpreted in the text).

	SV1	SV2	SV3	SV4	SV5	SV6	SV7	SV8	SV9
SV1	1	−0.06	0.07	−0.12	0.17	**0.21**	**−0.24**	0.03	**−0.08**
SV2		1	0.06	0.12	0.14	0.03	0.16	0.14	**0.03**
SV3			1	−0.09	0.09	0.04	−0.02	−0.03	**0.01**
SV4				1	**−0.27**	−0.07	0.20	−0.05	**0.12**
SV5					1	0.09	−0.13	0.01	**−0.02**
SV6						1	−0.13	−0.10	**−0.06**
SV7							1	0.16	**0.06**
SV8								1	**0.06**
SV9									1

[7] The *ClustOfVar* method was initially proposed to address the problem of clustering a set of both numeric and categorical variables. For simplicity, we present the method here for solely categorical variables in accordance with the nature of our data set.

Appendix 5

Coordinates of the modalities of the socio-demographic supplementary variables in the corresponding PCAmix.

"Age" and "Health" variables for SV4

Values in bold indicate that the corresponding modalities (here elderly patients –over 60–, and people with health concerns) are associated with a positive SV4 value, which in turn reflects daily medicine consumption.

Coordinates of the modalities	dim1
Age = > = 75	**1.09**
Age = 15-29	−0.36
Age = 30-44	−0.43
Age = 45-59	−0.24
Age = 60–74	**0.60**
Health = You are generally healthy, you visit the doctor from time to time	0.06
Health = You are healthy, you rarely visit the doctor	−0.46
Health = You need to look after yourself due to a chronic illness	**0.92**
Health = You suffer from a serious illness	**0.79**

"Age", "Occupation" and "Household resources" variables for SV6

Values in bold indicate that the corresponding modalities (here young patients – partly students –, stay-at-home parents, and households with a lower income) are associated with a positive SV6 value, which in turn reflects the practice of self-medication.

Coordinates of the modalities	dim1
Age = ≥75	−0.02
Age = 15–29	**0.39**
Age = 30-44	0.03
Age = 45-59	−0.17
Age = 60-74	−0.07
HousehIncome = <1000	**0.21**
HousehIncome = ≥4000	−0.15
HousehIncome = 1000–1499	**0.31**
HousehIncome = 1500–2999	−0.01
HousehIncome = 3000–3999	−0.05
Occupation=(Pre)Retired	−0.10
Occupation = Professional	0.01
Occupation = Stay-at-home parent	**0.30**
Occupation = Student	**0.37**
Occupation = Unemployed	−0.27

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