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## ARTICLE

# Conspiracy beliefs and intention to use conventional, complementary and alternative medicines: Two vignette studies





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**Abstract**

**Objective:** Conspiracy beliefs (CBs) can have substantial consequences on health behaviours by influencing both conventional and non-conventional medicine uptake. They can target powerful groups (i.e. upward CBs) or powerless groups (i.e. downward CBs). Considering their repercussions in oncology, it appears useful to understand how CBs are related to the intentions to use conventional, complementary and alternative medicines (CAM).

**Design and Methods:** This paper includes two pre-registered online correlational studies on a general French population (Study 1  $N=248$ , recruited on social media  $M_{age} = 40.07$ ,  $SD_{age} = 14.78$ ; 205 women, 41 men and 2 non-binaries; Study 2  $N=313$ , recruited on social media and Prolific,  $M_{age} = 28.91$ ,  $SD_{age} = 9.60$ ; 154 women, 149 men and 10 non-binaries). We investigated the links between generic and chemotherapy-related CBs and intentions to use conventional, complementary and alternative medicines. Study 2 consisted of a conceptual replication of Study 1, considering the orientation of CBs.

**Results:** Generic CBs and chemotherapy-related CBs appear strongly and positively correlated, negatively correlated with intentions to take conventional medicine and positively with intentions to take CAM. The link between generic CBs and medication intention is fully mediated by chemotherapy-related CBs. When distinguished, upward CBs are a stronger predictor of chemotherapy-related CBs than downward CBs.

**Conclusions:** The findings suggest that intentions to use medicine are strongly associated with CBs. This has several

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important implications for further research and practice, notably on the presence and effects of CBs on medication behaviours in cancer patients.

#### KEYWORDS

chemotherapy, complementary and alternative medicine, conspiracy beliefs, conventional medicine, vignette study

### Statement of Contribution

#### *What is already known on this subject?*

- Conspiracy beliefs (CBs) affect health behaviours such as vaccination and sexual prevention
- Beliefs about medication shape behaviours towards conventional, complementary and alternative medicines
- CBs lead to suspicion of conventional medicine and greater use of non-conventional medicine

#### *What does this study add?*

- Chemotherapy-specific CBs mediate the link between generic CBs and medication intention
- Medication intention is better explained by CBs targeting powerful than powerless group

## BACKGROUND

Following medical recommendations in cancer care is crucially important. It is indeed a predictor of quality of life and survival in patients (Jacobs et al., 2019). The use of complementary and alternative medicines (CAM) in oncology impairs treatment adherence (Johnson et al., 2018a) and patients' survival (Johnson et al., 2018b). For those reasons, it seems necessary to identify the predictive factors of CAM use. Among them, conspiracy beliefs (CBs) could be one potential factor. However, the literature lacks fundamental studies on how treatment-specific CBs are determined, notably in the field of oncology. In this paper, we examine to what extent generic CBs and chemotherapy-related CBs were linked to each other and with intentions to use chemotherapy or CAM in two vignette scenario studies conducted in the general population.

### Conspiracy beliefs and health issues

CBs are defined as “attempts to explain the ultimate causes of significant social and political events and circumstances with claims of secret plots by two or more powerful actors [...] that may or may not be true” (Douglas et al., 2019). CBs can relate to numerous political and social events (Jolley & Douglas, 2014; Marinthe et al., 2020; Simione et al., 2021; Swami et al., 2010). These events have in common that they represent a social, existential or health threat to individuals. In that sense, CBs may constitute an attempt to cope with an existential threat (Marchlewska et al., 2022; van Prooijen, 2020), making them common in the general population. For example, in France, 79% of the respondents from a nationally representative survey believe in at least one conspiracy theory. More specifically, 55% of the respondents believe that “The Ministry of Health is conspiring with the pharmaceutical industry to hide the reality of the harmfulness of vaccines from the general public” (Institut Français d'Opinion Publique, 2018). CBs can influence many social, political and behavioural outcomes (Douglas

et al., 2019). Among these, health behaviours represent a fruitful topic in the literature. For example, CBs in men who belong to a group that suffers from prejudice and discrimination can lead to riskier sexual behaviours such as unprotected intercourse (Bogart et al., 2011; Thorburn & Bogart, 2005). On another topic, CBs have consequences on vaccination behaviour (Jolley & Douglas, 2014). Over the past 2 years, many studies focused on CBs relative to COVID-19 (Bierwiazzonek et al., 2022; van Mulukom et al., 2022). COVID-19 pandemic offered a fertile ground for the emergence of health-related CBs as it represents an existential threat with uncertain outcomes (van Prooijen, 2020). Narratives around COVID-19 referred to the origin of the outbreak (e.g. COVID-19 is just a flu), the actors of the pandemic (e.g. government(s), China and pharmaceutical industries), the media (e.g. accidental spreading) and its purpose (e.g. control of the population). Those CBs lead to the non-respect of sanitary recommendations such as physical distancing, mask wearing or vaccination (van Mulukom et al., 2022). The effects of CBs on vaccination behaviours raise the question of the links between CBs and medication intake in general.

## Conspiracy beliefs and complementary and alternative medicines

According to Horne et al. (2013), adherence to medical prescriptions is partially determined by the beliefs people have towards medicine and the pharmaceutical industry. Perceiving a treatment to be harmful or unnecessary leads one to ignore the medical prescription. People suspicious of the pharmaceutical industry are more likely to shift towards CAM (Green et al., 2013). CAM are defined as “medical products and practices that are not part of standard medical care” and can encompass several practices such as mind–body therapies, botanicals, energy healing or naturopathic medicine (National Cancer Institute, 2022). Even if the terms “alternative” and “complementary” are often used indifferently, it is important to point out that they refer to two different practices. Complementary medicines are used together with conventional medicine, whereas alternative medicine is used in place of conventional medicine (National Center for Complementary and Integrative Health, 2021). Oliver and Wood (2014) observed that endorsing medical CBs, trusting non-official sources, avoiding conventional healthcare and a greater use of CAM were strongly related.

Cancer diagnosis significantly increased the rate of CAM use in cancer patients, particularly for biological products (e.g. green tea, ginger and probiotics) and alternative medical systems (i.e. chiropractic, massage and acupuncture; Buckner et al., 2018). Moreover, CAM use is a growing phenomenon in cancer care (Horneber et al., 2012; Keene et al., 2019). This is of great importance because of the deleterious effect of CAM in patients. Indeed, refusing conventional treatment leads to a decreased rate of survival in cancer patients (Joseph et al., 2012). The same pattern holds true with alternative treatments, showing a worse 5-year survival rate for those who choose to use them than for patients who use conventional medicine (Johnson et al., 2018b). The use of complementary medicines is associated with a worse prognosis in cancer patients. However, the impact of complementary medicine on survival is due to mediators including the refusal of some treatments and a delay in conventional treatment uptake (Johnson et al., 2018a).

## Generic or specific conspiracy beliefs?

Endorsing specific CBs predisposes one to endorse other specific CBs and then to develop a generalized conspiracy mindset (Granados Samayoa et al., 2022). However, a conspiracy mindset is also a strong disposition to endorse specific CBs and is more often considered as an antecedent than a consequence of them (van Mulukom et al., 2022). Thus, adherence to generic CBs, which is commonly used as an indicator of the conspiracy mindset (Imhoff et al., 2022), is considered as an antecedent of specific CBs.

Some health-related behaviours are influenced by both specific CBs and generic CBs (Copping, 2022), while others are influenced only by specific CBs (Marchlewska et al., 2022). Although generic CBs are one of the best predictors of specific CBs, the strength of this relationship may be domain dependent (Imhoff et al., 2022). Thus, one can wonder to which extent generic CBs promote chemotherapy-related CBs and intentions to use medicines. If their impact is limited, then interventions could only target specific to promote medical compliance. However, if their impact is strong, reducing only specific CBs may be insufficient and interventions should target generic CBs.

Studying generic CBs calls for a finer description of those. For this reason, Nera et al. (2021, 2023) proposed to distinguish downward CBs and upward CBs. Downward CBs refer to attributing threatening and malevolent intentions to relatively powerless actors (e.g. immigrants, LGBTQ+ people). Upward CBs refer to attributing such intentions to relatively powerful actors (e.g. government, pharmaceutical industry). Both downward and upward CBs lay into the spectrum of conspiracy mindset and are modestly but positively correlated (Nera et al., 2021, 2023). Studies showed that pharmaceutical industry could be perceived as a powerful group (Nera et al., 2021) and that defiance towards the conventional healthcare system was linked with a preference for CAM (Lamberty & Imhoff, 2018; Peterson et al., 2022). Therefore, in oncology setting, refusal of conventional medicine and preference for CAM could be rooted more in upward than downward CBs.

## Current research

### Overview

CBs can have substantial consequences on health. To the best of our knowledge, no study has precisely investigated the links between CBs and use of conventional medicine and CAM in an oncology setting. Yet, understanding the determinants of medicine uptake is crucial. Thus, we propose to examine the links between generic and specific CBs and the intention to use conventional medicines and CAM. In two studies, after completing several questionnaires, participants were asked to imagine themselves in the situation of a cancer patient. The hypotheses are as follows:

**H1.** Generic CBs will be positively associated with chemotherapy-related CBs (Studies 1 and 2).

**H2a.** Generic CBs will be negatively associated with the intention to use conventional medicine (Studies 1 and 2).

**H2b.** Generic CBs will be positively associated with the intention to use CAM (Studies 1 and 2).

**H3a.** Chemotherapy-related CBs will be negatively associated with the intention to use conventional medicine (Studies 1 and 2).

**H3b.** Chemotherapy-related CBs will be positively associated with the intention to use CAM (Studies 1 and 2).

**H4.** The relationship between generic CBs and the intention to use medicines will be fully mediated by chemotherapy-related CBs (Studies 1 and 2).

**H5a.** Both upward and downward CBs will be associated with chemotherapy-related CBs and intentions to use treatments (Study 2).

**H5b.** The links between generic CBs and chemotherapy-related CBs and intentions to use treatments will be stronger upward than downward (Study 2).

The two pre-registered studies were conducted in accordance with the 1964 Helsinki Declaration and its later amendments, the ethical principles of the French Code of Ethics for Psychologists and the 2016 APA Ethical Principles of Psychologists and Code of Conduct. Both received the agreement of the Research Ethics Board of the University of Lille (France). The pre-registration forms, the materials, the datasets and deviations from preregistration (Claesen et al., 2021) are available in the following Open Science Framework (OSF) repository: [https://osf.io/2pfv8/?view\\_only=23a096db6abe420493f09780b20fecb0](https://osf.io/2pfv8/?view_only=23a096db6abe420493f09780b20fecb0).

## STUDY 1

Study 1 aims to investigate the links between generic CBs and chemotherapy-related CBs, on the one hand, and their respective role in the intention to use conventional medicines and CAM on the other hand.

We hypothesized that generic CBs are positively associated with chemotherapy-related CBs (H1) and that both are negatively associated with the intention to use conventional medicine (H2a, H3a) and positively so with CAM (H2b, H3b). The relationship between generic CBs and the intention to use medicines is expected to be fully mediated by chemotherapy-related CBs (H4).

## Methods of study 1

### Participants

The study was proposed for a general cancer-free population. Participants reporting they had or had had cancer were excluded to ensure that participants were naïve regarding the experience of cancer treatments.

A total of 291 French participants were recruited to complete a questionnaire published on several social media (i.e. Twitter, LinkedIn and Facebook groups of advice/mutual aid/sales/students). Outliers were excluded if they reported having or having had cancer ( $n = 28$ ), having been distracted by their environment during the study ( $n = 1$ ), completed the study in less than 6 min (estimated duration from a pre-test;  $n = 4$ ) or with a duration greater than  $+2SD$  from the mean completion duration (i.e. 25 min 30s; this time value was calculated on the remaining participants after application of all the previous exclusion criteria; (Curran, 2016; DeSimone et al., 2015)) ( $n = 10$ ). No participant failed the seriousness check (Aust et al., 2013). Eventually, 248 participants were retained for the analyses ( $M_{age} = 40.07$ ,  $SD_{age} = 14.78$ ; 205 women, 41 men and 2 non-binaries; 18% students, 9% unemployed, 23% employees or workers, 19% intermediate occupations, 4% tradespersons, shop or business owners or farmers, 27% executives or intellectual professions; 82% reporting having a relative who has or had cancer).

An *a posteriori* sensitivity analysis was conducted and showed that the study was powered enough to detect at least a small two-tailed zero-order Pearson correlation ( $r = .18$ ) with an alpha error probability of 0.05% and a power of .80 (Faul et al., 2007). Monte Carlo power analyses for indirect effects indicated an achieved power of  $\geq .93$  for the three mediation models (for details, see Data S1).

### Procedure

The study was presented as exploring people's opinions on different contemporary topics. After being given consent, participants were asked to answer the questionnaire including questions on generic and chemotherapy-related CBs, and then to imagine themselves in the situation of a cancer patient (i.e. scenario

induction). They were then exposed to a definition of chemotherapy and CAM. Chemotherapy was defined as “treatment aiming at destroy abnormal cells or avoiding them to multiply in all body with chemical substances” and CAM were defined as “a set of medical practices based on body manipulations, taking or application of products without synthetic chemical substances. They can also be referred to as alternative or complementary therapies”. Then, participants were asked about their intentions to use conventional medicine and CAM in that situation. Eventually, participants provided some sociodemographic information.

In addition to the hypotheses presented above, this study was initially designed to manipulate the severity of the cancer in the scenario, as a between-subject variable with two modalities (moderate severity vs. high severity). It was hypothesized that the effects of chemotherapy-related CBs on the treatment intentions are moderated by the level of severity. As this hypothesis received no support and that severity did not significantly affect the results presented here, they have not been reported further. Methodological details and detailed analyses concerning this variable are presented in the Study 1 pre-registration form, the deviation from pre-registration file and in the Data S1.

## Measures

### *Generic conspiracy beliefs*

Generic CBs were measured with the French version of Generic Conspiracy Beliefs Scale (GCBS; Brotherton et al., 2013; Lantian et al., 2016, for the French validation) which is a 15-item scale using generic statements (e.g. “Some significant events have been the result of the activity of a small group who secretly manipulate world events”). Answers are measured from 1 = *Definitely not true* to 5 = *Definitely true*. Three items directly referring to health and science were excluded from the mean score calculation because they may artefactually increase the scale correlations with health- and science-related variables (see the deviation from pre-registration file for details). A higher score indicates higher levels of CBs. The observed internal consistency of the scale was high ( $\alpha = .91$ ).

In order to test the predictive validity of a shorter measure of generic CBs, the single-item conspiracy belief scale (Lantian et al., 2016) was used. This measure consists of an affirmation: “I think that the official version of the events given by the authorities very often hides the truth” for which participants are asked to give their likelihood rating (from 1 = *Completely false* to 9 = *Completely true*).

The GCBS mean score and the single-item CBs scale score were highly correlated ( $r = .68$ ;  $p < .001$ ). Following statistical analysis was run independently with both scales and showed similar results. Thus, only the results for analysis with GCBS are exposed here (see Data S1 for details).

### *Chemotherapy-related conspiracy beliefs*

Based on the items from the GCBS, a scale measuring chemotherapy-related CBs was developed. The scale consisted of eight items evaluating conspiracist ideation related to chemotherapy. Four items are related to the exaggeration of chemotherapy efficacy (e.g. “The pharmaceutical industry manipulates scientific data to make people believe chemotherapy is more effective to cure cancer than it really is”) and four items are related to the devaluation of alternative oncological treatments (e.g. “Powerful people work to make complementary and alternative remedies against cancer not accessible”). An exploratory factor analysis suggested a single-factor solution (see Data S1 for details). Thus, all the sub-scores were averaged to compute a mean score, with a higher score indicating higher chemotherapy CBs. The internal consistency of the scale was high ( $\alpha = .91$ ).

### *Intention to use conventional and complementary and alternative medicines*

Intentions to use conventional and CAM were evaluated using one item for each treatment (i.e. “In such a situation, I would consider scrupulously respecting the doctor's prescription by taking my chemotherapy in the right doses, at the right frequency, and for as long as he would ask me to do so”; “In such a situation, I would consider using unconventional medicine *as an alternative to chemotherapy*”; and “In such a situation, I would consider using unconventional medicines *to complement chemotherapy*”). Participants



were asked to rate their accordance from 1 = *Totally disagree* to 5 = *Totally agree*. The intention to use conventional medicine was weakly positively correlated with the intention to use complementary medicine ( $r = .15, p = .016$ ) and highly negatively correlated with the intention to use alternative medicine ( $r = -.65, p < .001$ ). Intentions to use complementary and alternative medicine were not correlated ( $r = .03, p = .674$ ).

#### *Sociodemographic data, attention check and seriousness check*

Sociodemographic data included gender, age, socioprofessional category, education and personal and familial history of cancer (complementary analyses according to those variables are presented in Data S1). The distraction check item was “Were you disturbed or distracted by your environment while taking this survey?” (Not at all/A little/A lot). For the seriousness check item, participants had to indicate if they participated seriously in the study or if they just clicked anywhere.

## Statistical analysis

Correlation analyses were conducted to verify the links between generic and chemotherapy-related CBs (H1), intention to use conventional medicine (H2a), intention to use CAM (H2b) and between chemotherapy-related CBs and intention to use conventional medicine (H3a), and intention to use CAM (H3b). A mediation model was used to verify the mediator role of chemotherapy-related CBs in the relationship between generic CBs and intention to use conventional medicine and CAM (H4).

## Results of study 1

### Links among generic CBs, specific CBs and intention to use conventional medicine and CAM

Descriptive statistics and the zero-order Pearson correlation matrix are reported in Table 1.

Generic CBs are positively correlated with chemotherapy-specific CBs,  $r = .70, p < .001$  (supporting H1). Generic CBs are negatively correlated with the intention to use conventional medicine,  $r = -.40, p < .001$  (supporting H2a), and positively with the intention to use complementary medicine,  $r = .18, p = .003$ , and alternative medicine,  $r = .44^{***}, p < .001$  (supporting H2b). Chemotherapy-specific CBs are negatively correlated with the intention to use conventional medicine,  $r = -.51, p < .001$  (supporting H3a), and positively with the intention to use complementary medicine,  $r = .28^{***}, p < .001$ , and alternative medicine (supporting H3b). For both generic and chemotherapy-specific CBs, the correlation with intention to use alternative medicine is higher than the correlation with complementary medicine, as their confidence intervals do not overlap (see Table 1).

### Indirect effects of generic CBs on intention to use conventional medicine and CAM through specific CBs

Three models of mediation were conducted simultaneously with chemotherapy-specific CBs as the mediator, generic CBs as the predictor and the intention to use conventional medicine, complementary medicine or alternative medicine as the outcome. The analysis was conducted with PROCESS v4.0. macro for SPSS (model 4) with a 95% confidence interval (Hayes, 2022). As shown in Figure 1, the analysis indicates a fully mediated effect of generic CBs through chemotherapy-specific CBs for the three outcomes (supporting H4), totally standardized indirect effects:  $\beta_{\text{conventional medicine}} = -.32, 95\% \text{CI} [-.44; -.21]$ ;  $\beta_{\text{complementary medicine}} = .20, 95\% \text{CI} [.08; .32]$ ;  $\beta_{\text{alternative medicine}} = .48, 95\% \text{CI} [.38; .59]$ . Alternative mediation models, with chemotherapy-specific CBs as independent variable and generic CBs as mediators were tested but received no support. The direct effect of generic CBs on intentions to use treatment



TABLE 1 Means, standard deviations and zero-order Pearson correlations (Study 1, N = 248).

Variable	M (SD)	1	2	3	4	5	6
1. Single-item CBs scale	2.64 (.92)	–					
2. Generic CBs scale	2.63 (.92)	.68** [.61, .74] <i>p</i> < .001	–				
3. Chemotherapy-related CBs <sup>†</sup>	2.81 (1.03)	.64*** [.56, .71] <i>p</i> < .001	.70*** [.62, .75] <i>p</i> < .001	–			
4. Intention to use conventional medicine	4.02 (1.10)	-.33*** [-.22, -.44] <i>p</i> < .001	-.40*** [-.50, -.29] <i>p</i> < .001	-.51*** [-.60, -.41] <i>p</i> < .001	–		
5. Intention to use complementary medicine	3.85 (1.18)	.17** [.05, .29] <i>p</i> = .007	.18** [.06, .30] <i>p</i> = .003	.28*** [.16, .39] <i>p</i> < .001	.15* [.02, .27] <i>p</i> = .016	–	
6. Intention to use alternative medicine	2.09 (1.22)	.43*** [.32, .52] <i>p</i> < .001	.44*** [.33, .53] <i>p</i> < .001	.66*** [.58, .72] <i>p</i> < .001	-.65*** [-.71, -.57] <i>p</i> < .001	.03 [-.10, .15] <i>p</i> = .674	–

Note. Scores in square brackets correspond to 95% confidence interval of the zero-order Pearson correlations.

Abbreviation: CBs, conspiracy beliefs.

\**p* < .05; \*\**p* < .01; \*\*\**p* < .001.

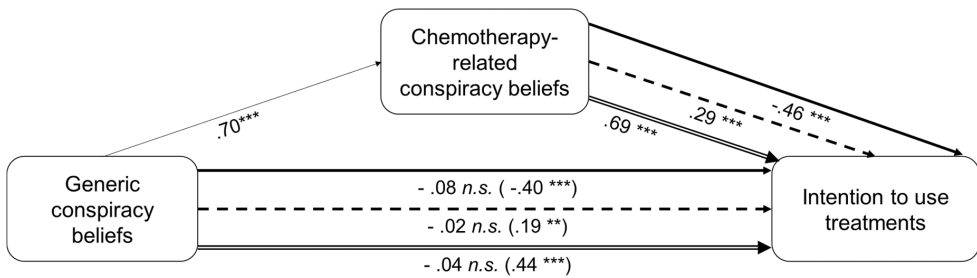


FIGURE 1 Mediation models of the effect of generic conspiracy beliefs on intentions to use treatments by chemotherapy-related conspiracy beliefs. Paths with a continuous arrow (up) refer to the model for the intention to use conventional medicine. Paths with a dashed arrow (middle) refer to the model for the intention to use complementary medicine. Paths with a double-edged arrow (low) refer to the model for the intention to use alternative medicine. Numbers represent standardized beta coefficients for each path. Number of bootstrap samples for percentile bootstrap confidence intervals = 5000. n.s.  $p > .05$ ,  $**p < .01$ ,  $***p < .001$ .

was non-significant (all  $ps > .10$ ) as well as its mediating effect (all 95%CI of indirect effect including the zero value; for detailed outputs, see Data S1).

## Discussion of Study 1

In line with our hypotheses, we found that generic CBs were positively correlated with chemotherapy-related CBs (H1), negatively correlated with the intention to use conventional medicine (H2a) and positively with the intention to use CAM (H2b). The links between chemotherapy-related CBs and the intention to use conventional medicine and CAM followed the same pattern, supporting our hypotheses (H3a and H3b). The hypothesized indirect link through chemotherapy-related CBs was observed (H4). These results support that intentions to reject chemotherapy and use CAM can be explained by endorsement of chemotherapy-related CBs that are deeply rooted in a more general conspiracy mindset.

The second study consists of a conceptual replication with a refinement of the measures. Indeed, in Study 1, the disposition to endorse CBs was considered through its generic aspects (i.e. the conspiracy mindset). In Study 2, we also propose to consider the disposition to endorse downward and upward CBs.

## STUDY 2

### Hypothesis

Study 2 aims to replicate the results of Study 1 (H1, H2a, H2b, H3a, H3b and H4). Additionally, upward and downward CBs are distinguished. We hypothesized that both orientations of CBs will have the same links with chemotherapy-related CBs and the intention to use conventional and CAM rather than generic CBs (H5a), as it is established they are modestly but positively correlated (Nera et al., 2021, 2023). However, these links will be stronger for upward CBs than for downward CBs (H5b).

### Methods of study 2

#### Participants

A total of 348 French participants were recruited to complete a questionnaire either via social media (i.e. Twitter, LinkedIn and Facebook groups of advice/mutual aid/sales/students;  $n = 246$ ) or Prolific

( $n = 102$ ). This change in recruitment methods is due to the obtention of funding leading to recruiting participants on Prolific (for a comparison of the two samples, see Data S1). Outliers were excluded from the analysis if they reported having or having had cancer ( $n = 5$ ), failed the seriousness check (Aust et al., 2013) ( $n = 1$ ), reported having been distracted by their environment during the study ( $n = 6$ ), completed the study in less than 5 min 40 s (estimated duration from a pre-test;  $n = 8$ ) or with a duration greater than  $+2SD$  from the mean completion duration (i.e. 31 min 02 s after application of all the previous exclusion criteria; (Curran, 2016; DeSimone et al., 2015)) ( $n = 15$ ). Eventually, 313 participants were retained for the analyses ( $M_{\text{age}} = 28.91$ ,  $SD_{\text{age}} = 9.60$ ; 154 women, 149 men and 10 non-binaries; 37% students, 3% unemployed, 22% employees or workers, 6% intermediate occupations, 7% tradespersons, shop or business owners or farmers, 25% executives or intellectual professions; 65% reporting having a relative who has or had cancer).

An *a posteriori* sensitivity analysis was conducted and showed that the study was powered enough to detect at least a small two-tailed zero-order Pearson correlation ( $r = .16$ ) with an alpha error probability of 0.05% and a power of .80 (Faul et al., 2007). Monte Carlo power analyses for indirect effects indicated an achieved power of 1.00 for all mediation models (for details, see Data S1).

## Procedure

Except for cancer severity manipulation, Study 2 follows the same procedure as Study 1.

## Measures

### *Generic conspiracy beliefs*

Generic CBs were measured with the single-item CBs scale (see Study 1). In order to limit the duration of the questionnaire, the GCBS was not used in this study as it showed equivalent results to the SIBS in Study 1.

### *Chemotherapy-related conspiracy beliefs*

Chemotherapy-related CBs were measured with the same scale as in Study 1 ( $\alpha = .94$ ).

### *Downward and upward conspiracy beliefs*

The questionnaire used by Nera et al. (2021, Study 3) was included to evaluate the disposition to endorse downward and upward CBs. Participants were asked to rate how likely several groups are likely to work in secret against the rest of the society for the benefit of their group, from 1 = *Extremely unlikely* to 6 = *Extremely likely*. Downward CBs subscale included five items (e.g. immigrants and LGBT+ people). Upward CBs subscale included seven items (e.g. governments and pharmaceutical companies). The item "Pharmaceutical Companies" was excluded from the mean score calculation as it may artefactually increase the subscale correlations with health- and science-related variables (see the deviation from pre-registration file for details). Both subscales show a high internal consistency in this study (respectively,  $\alpha = .90$  and .88).

### *Intention to use conventional and complementary and alternative medicines*

Measurements were identical to Study 1.

### *Sociodemographic data, attention check and seriousness check*

Measurements were identical to Study 1. Complementary analyses according to those variables are presented in Data S1.

## Statistical analysis

The same statistical analysis for hypothesis from H1 to H4 was conducted in Study 2. In addition, correlation analysis was conducted to verify the links among oriented CBs (i.e. upward and downward), chemotherapy-related specific CBs and intention to use conventional medicine and CAM (H5a). A mediation model was used to verify the mediator role of chemotherapy-related specific CBs in the relation between respective oriented CBs and intention to use conventional medicine and CAM (H5b).

## Results of Study 2

### Links between generic CBs, oriented CBs, specific CBs and intention to use conventional medicine and CAM

Descriptive statistics and the zero-order Pearson correlation matrix are reported in Table 2.

Generic CBs measured with the single-item scale are positively correlated with chemotherapy-related CBs,  $r = .52, p < .001$  (replicating H1). H2a and H3a are replicated as generic CBs are negatively correlated with the intention to use conventional medicine,  $r = -.24, p < .001$ , and positively correlated with the intention to use complementary medicine,  $r = .25, p < .001$ , and alternative medicine,  $r = .32, p < .001$ . H2b and H3b are replicated as chemotherapy-related CBs are negatively correlated with the intention to use conventional medicine,  $r = -.44, p < .001$ , and positively correlated with the intention to use complementary medicine,  $r = .42, p < .001$ , and alternative medicine,  $r = .59, p < .001$ . H4 was also replicated as the effect of generic CBs on the intention to use conventional, complementary and alternative medicines was fully mediated by chemotherapy-related CBs, while alternative mediation models received no support (see Data S1).

Results show that upward CBs are positively correlated with chemotherapy-related CBs,  $r = .45, p < .001$ , intention to use complementary medicine,  $r = .27, p < .001$ , alternative medicine,  $r = .28, p < .001$ , and negatively so with the intention to use conventional medicine,  $r = -.23, p < .001$ . Inversely, even if downward CBs follow the same pattern for chemotherapy-related CBs,  $r = .30, p < .001$ , and the intention to use complementary medicine,  $r = .15, p = .007$ , and alternative medicine,  $r = .17, p = .002$ , no significant correlation is retrieved with the intention to use conventional medicine,  $r = -.11, p = .057$ . Thus, H5a was partially supported.

### Indirect effects of generic CBs on intention to use conventional medicine and CAM through specific CBs

Six models of mediation were conducted simultaneously with chemotherapy-related CBs as the mediator, upward or downward CBs as the predictor and the intention to use conventional medicine, complementary medicine or alternative medicine as the outcome. The analysis was conducted with PROCESS v.4.0. macro for SPSS with a 95% confidence interval (Hayes, 2022).

When controlled for the effect of downward CBs, upward CBs are shown to fully mediate effect through chemotherapy-related CBs for the three outcomes (see Figure 2), totally standardized indirect effects:  $\beta_{\text{conventional medicine}} = -.17$ ; 95%CI [- .24; - .12];  $\beta_{\text{complementary medicine}} = .15$ ; 95%CI [.09; .21]; and  $\beta_{\text{alternative medicine}} = .23$ ; 95%CI [.17; .30]. Figure 3 shows no main effect of downward CBs when controlled for upward CBs effect but an indirect effect through chemotherapy-related CBs for the three outcomes (supporting H5b), totally standardized indirect effects:  $\beta_{\text{conventional medicine}} = -.08$ , 95%CI [- .13; -.03];  $\beta_{\text{complementary medicine}} = .06$ , 95%CI [.03; .11]; and  $\beta_{\text{alternative medicine}} = .10$ , 95%CI [.04; .16].

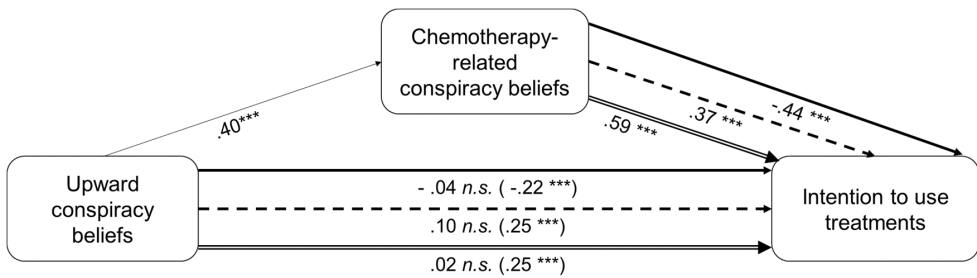
TABLE 2 Means, standard deviations and zero-order Pearson correlations (Study 2, N=313).

Variable	M (SD)	1	2	3	4	5	6	7
1. Single-item CBs scale	4.55 (2.19)	–						
2. Upward CBs	4.44 (1.42)	.46*** [.37, .55] <i>p</i> < .001	–					
3. Downward CBs	2.35 (1.36)	.29*** [.18, .39] <i>p</i> < .001	.32*** [.21, .41] <i>p</i> < .001	–				
4. Chemotherapy-related CBs	2.27 (.97)	.52*** [.42, .59] <i>p</i> < .001	.45*** [.36, .54] <i>p</i> < .001	.30*** [.19, .40] <i>p</i> < .001	–			
5. Intention to use conventional medicine	4.46 (.88)	-.24*** [-.34, -.13] <i>p</i> < .001	-.23 [-.33, -.12] <i>p</i> < .001	-.11 [-.22, .00] <i>p</i> = .057	-.44*** [.53, -.35] <i>p</i> < .001	–		
6. Intention to use complementary medicine	3.34 (1.24)	.25*** [.14, .35] <i>p</i> < .001	.27*** [.16, .37] <i>p</i> < .001	.15** [.04, .26] <i>p</i> = .007	.42*** [.32, .51] <i>p</i> < .001	-.11* [-.22, -.00] <i>p</i> = .047	–	
7. Intention to use alternative medicine	1.56 (.89)	.32*** [.22, .42] <i>p</i> < .001	.28*** [.18, .38] <i>p</i> < .001	.17** [.06, .28] <i>p</i> = .002	.59*** [.51, .66] <i>p</i> < .001	-.65*** [-.71, -.58] <i>p</i> < .001	.26*** [.16, .36] <i>p</i> < .001	–

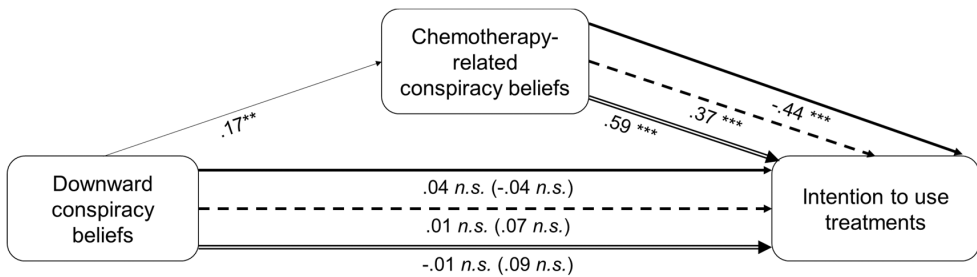
Note: Scores in square brackets correspond to 95% confidence interval of the zero-order Pearson correlations.

Abbreviation: CBs, conspiracy beliefs.

\**p* < .05; \*\**p* < .01; \*\*\**p* < .001.



**FIGURE 2** Mediation models of the effect of upward conspiracy beliefs on intentions to use treatments by chemotherapy-related conspiracy beliefs, controlling for downward conspiracy beliefs. The upward conspiracy beliefs score was considered without the item relative to pharmaceutical industry. Paths with a continuous arrow (up) refer to the model for intention to use conventional medicine. Paths with a dashed arrow (middle) refer to the model for intention to use complementary medicine. Paths with a double-edged arrow (low) refer to the model for intention to use alternative medicine. Numbers represent standardized beta coefficients for each path. Number of bootstrap samples for percentile bootstrap confidence intervals = 5000. n.s.  $p > .05$ , \*\*\* $p < .001$ .



**FIGURE 3** Mediation models of the effect of downward conspiracy beliefs on intentions to use treatments by chemotherapy-related conspiracy beliefs, controlling for upward conspiracy beliefs. Paths with a continuous arrow (up) refer to the model for the intention to use conventional medicine. Paths with a dashed arrow (middle) refer to the model for the intention to use complementary medicine. Paths with a double-edged arrow (low) refer to the model for the intention to use alternative medicine. Numbers represent standardized beta coefficients for each path. Number of bootstrap samples for percentile bootstrap confidence intervals = 5000. n.s.  $p > .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

## Discussion of Study 2

Study 2 replicates all of the findings from Study 1, including the fact that intentions to reject chemotherapy and use CAM can be explained by endorsement of chemotherapy-related CBs that are deeply rooted in a more general conspiracy mindset. However, when the ideological orientation of generic CBs is distinguished, the tendency to attribute malevolent intentions to relatively powerful groups (i.e. upward CBs) appears to be a stronger predictor of chemotherapy-related CBs than the tendency to attribute malevolent intentions to relatively powerless groups (i.e. downward CBs).

## GENERAL DISCUSSION

The two studies aimed at examining the links among generic CBs, chemotherapy-related CBs and the intention to use conventional and non-conventional medicines in the general population, using fictional scenarios through vignette design. The findings globally support our hypothesis. First, a strong positive correlation is observed between generic CBs and chemotherapy-related CBs (H1). Intentions to use conventional medicine were observed to be negatively linked with both generic and chemotherapy-related



CBs. Distinguishing the orientation of CBs (i.e. downward or upward), it is shown that only upward CBs were linked with the intention to use conventional medicines (H2). The intention to use non-conventional medicines to complement or replace conventional medicine was strongly and positively correlated with generic CBs (both with a generic measure in Study 1a and distinguishing their orientation in Study 1b) and chemotherapy-related CBs (H3). The links between generic CBs and the intention to use conventional and CAM were shown to be fully mediated by chemotherapy-related CBs (H4). When distinguished in mediation models, upward CBs are shown to be correlated with intentions to use conventional and CAM, this relation being fully mediated by chemotherapy-related CBs, whereas downward CBs have no main effect, despite having an indirect effect, on those variables (H5).

## Conspiracy mindset and specific CBs

A strong and robust positive correlation between generic CBs and chemotherapy-related CBs was observed in the present studies. This result implies that actions aimed at lessening the impact of CBs could target both generic and specific CBs. Yet, it should be noted that changing a more generalized conspiracist thinking could be more difficult than acting on specific CBs because of their respective nature (Frenken & Imhoff, 2021; Imhoff et al., 2022). Existing interventions (e.g. prebunking, debunking, critical thinking training, and scientific literacy enhancement; (Caroti et al., 2022; Krekó, 2020; van der Linden et al., 2021)) have been shown to be efficient in reducing the endorsement of CBs. However, to the best of our knowledge, none of those interventions have been applied in a cancer care setting. In that sense, further fundamental investigations are necessary to explore in more detail the relations between those variables and their determinants in such a context. Doing so would make it possible to have a lever to develop interventions targeted at decreasing health-related CBs in order to improve medical adherence in patients.

## CBs and medication behaviours

The importance of the links between upward CBs, chemotherapy-specific CBs and the intention to use medication provides strong fundamental information. Indeed, the fact that downward CBs are not as strongly related to those variables denotes a potential suspicion toward dominant groups, including pharmaceutical companies. In that sense, the intention to use conventional medicine or CAM appears to be influenced by two major phenomena: a naturalistic bias (i.e. considering that what is “natural” or organic is safer and healthier than what comes from the industry or is “chemical”; (Green et al., 2013; Horne et al., 2013; Pound et al., 2005)) and a suspicion towards dominant groups. The literature suggests that those two phenomena may fuel each other. Beliefs towards medication are determined by situational stimuli such as lay information retrieved from past experiences with medication or healthcare systems and expert sources (Hagger et al., 2017; Leventhal et al., 2016). In that context, a past experience with chemotherapy has been identified as an independent predictor of dissatisfaction with conventional healthcare and a mediator of seeking out CAM (Peterson et al., 2022). Similarly, Lamberty and Imhoff (2018) observed that defiance towards the conventional healthcare system led to a preference for alternative therapies compared to conventional therapies. Hence, as CAM have a wide scope and cover many different practices, it could be beneficial to distinguish them in future studies. Indeed, it could be argued that the motives behind the use of complementary medicines are different from those behind the use of alternative medicines. It remains unclear if individuals can pass from the use of complementary medicines to the use of alternative medicine, suggesting a continuum of the use of CAM, or if the two types of therapies are fundamentally different, suggesting epistemological distinctions between them.

In this context, it appears coherent to investigate the causality of the links between being suspicious of pharmaceutical companies and conventional health practitioners, CBs and the reluctance to use conventional medicine and an appetite for CAM. Thus, longitudinal or experimental studies – for example, manipulating CBs saliency (Jolley & Douglas, 2014; Natoli & Marques, 2021) – could be implemented.

The crucial interest in studying CBs in clinical populations is reinforced by the recent proposal to consider CBs as attempts to cope with an existential threat (Liekfett et al., 2021; van Prooijen, 2020).

## Importance of dealing with CBs in clinical settings

Given endorsement with health-related conspiracy theories can be related to trust in medical authority, it seems important to primarily encourage the setting of a trustful and empathetic clinical relationship to lever the obstacles in the communication to discuss and prevent CBs (Marques et al., 2022). Indeed, a patient-centred and empathetic communication can alleviate medical mistrust (Cuevas et al., 2019). However, if health practitioners are initially identified as outgroup official sources, a reluctance to communicate with them and to listen to their counterarguments could be observed (Douglas, 2021). Thus, promoting communication on CBs from valued ingroup members could be a valuable way to establish contact with conspiracy believers (Nisbet, 2009). As members of the ingroup, having in common the identity of patients, peer-patients could act as medium between health practitioners and conspiracist patients.

CBs could have emotional roots as it has been found to be linked with stress and anxiety (Douglas et al., 2017; Grzesiak-Feldman, 2013; Swami et al., 2016). Thus, in parallel with the cognitive methods (e.g. debunking, prebunking and psychological inoculation), emotional interventions could be tested and implemented. If their efficacy is observed, then it would offer another path to counteract CBs in healthcare. However, this type of interventions remains to be developed and tested as the vast majority of interventions focus on cognitive aspects of CBs (O'Mahony et al., 2023).

## LIMITATIONS

The present study makes a significant contribution to the literature on the importance of considering CBs in cancer care. However, some should be noted some limitations. First, the sample is composed of cancer-free individuals from the general population who were asked to imagine themselves in the situation of a cancer patient. This could impact the ecological validity. However, vignette studies allow for numerous advantages (Atzmüller & Steiner, 2010), and in the present case, allow for investigating a topic exploratorily without burdening a clinical population. However, hypothetical scenarios could bring results different from studies in more ecological situations (Aguinis & Bradley, 2014; Atzmüller & Steiner, 2010; Butrick et al., 2011). In that sense, the present findings should be further investigated in a clinical population composed of cancer patients. A second limitation is the conceptualization of CAM. Indeed, as a complex construct, CAM encompass several practices that have not been considered separately in this study. Given the diversity of CAM in their scientific and philosophical foundations, it could be appropriate to distinguish different types of CAM in further studies. In addition, a broad definition of CAM was proposed to the participants. Thus, inter-individual differences in their representation may have affected the results. A third limitation is the consideration of generic CBs as an antecedent of specific CBs, as endorsement of the latter can contribute to the endorsement of the former (Granados Samayoa et al., 2022). Longitudinal or experimental studies could compare the strength of the mutual effects of both beliefs. Finally, a limitation of those studies could lay in the recruitment procedure. Indeed, as extreme conspiracy believers can be significantly suspicious towards science, they are not expected to participate in scientific studies. For this reason, participants from the present studies could be considered as “moderate” conspiracists.

## CONCLUSION

This work shows promising results for the investigation of the links between generic CBs, chemotherapy-related CBs and the intention to use conventional medicine and/or CAM in an oncology setting. It has shown that generic CBs were strongly related to chemotherapy-related CBs and that both were linked with the intention to use conventional medicine and/or CAM in two vignette studies. These results represent

a significant contribution to the literature on medication behaviours. Given the importance of CAM, this topic is of crucial interest for further investigations in both the general and the patient population.

## AUTHOR CONTRIBUTIONS

**Valentyn Fournier:** Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing – original draft; writing – review and editing. **Florent Varet:** Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing – original draft; writing – review and editing.

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## CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

## OPEN RESEARCH BADGES



This article has earned Open Data, Open Materials and Preregistered Research Design badges. Data, materials and the preregistered design and analysis plan are available at [[https://osf.io/2pfv8/?view\\_only=23a096db6abe420493f09780b20fecb0](https://osf.io/2pfv8/?view_only=23a096db6abe420493f09780b20fecb0), <https://aspredicted.org/blind.php?x=GNVVCB> + <https://aspredicted.org/blind.php?x=PX1666>].

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in OSF at [https://osf.io/2pfv8/?view\\_only=23a096db6abe420493f09780b20fecb0](https://osf.io/2pfv8/?view_only=23a096db6abe420493f09780b20fecb0).

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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