



# Infectious Disease Specialists' awareness, perceptions and attitudes toward ecological transition in healthcare: a cross-sectional study in France

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## Abstract

**Introduction** Climate change is having a major impact on public health. The healthcare system is responsible for around 8% of greenhouse gas emissions in France. Infectious diseases (ID) lie at the heart of these consequences.

**Objectives** The primary aim of this study was to assess the expectations of French ID specialists in terms of a sustainable healthcare transition. Secondary objectives included the assessment of awareness regarding this subject, perceptions, adopted attitudes and opportunities for actions.

**Methods** A survey on sustainable healthcare transition was sent to all the French Society for ID members.

**Results** Of the 860 physicians approached, 220 responded. More than 78% of respondents responded correctly to questions concerning the impact of climate change on public health. The environmental impact of the healthcare system was less well understood. A higher level of environmental anxiety was associated with a higher rate of declaration of concrete actions. People under 40 years of age declared themselves to be more active. Regarding attitudes towards the roles of different stakeholders in a sustainable healthcare transition, the role of medical societies is prominent. Respondents' main expectations and suggestions are the following: (1) creation of a cross functional group dedicated to a sustainable healthcare transition, (2) creation of a training program, to meet the training needs of 94% of respondents, (3) continuation of the French Society for ID's lobbying for the relocation of antibiotic production in Europe, research on life-cycle analysis of anti-infective drugs, single-dose packaging for antibiotics, (4) reflection on the concept of "sustainably designed healthcare" in ID, (5) continued exploration of the "One Health" concept and (6) development of recommendations for sustainably designed hygiene practice.

**Conclusion** This national survey of French ID specialists is a prerequisite for the implementation of actions within the French Society for ID.

**Keywords** Ecological transition · Infectious disease · One health · Sustainable healthcare transition

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## Introduction

According to the World Health Organization (WHO), climate change is one of the greatest threats to public health in the twenty-first century [1]. The United Nations (UN) reports that human-made environmental factors were responsible for 13.7 million deaths worldwide in 2016. Air pollution accounts for around 40,000 deaths a year in France [2, 3]. Climate change exacerbates environmental factors such as heat waves, extreme weather events, altered air and water quality, food and water supply challenges, and the proliferation of disease vectors. Combined with social factors like climatic migration, conflicts, and violence, these changes degrade human health by affecting all organ systems [4].

Infectious Disease (ID) medicine is one of the most affected specialties, both in terms of the number and severity of diseases. These include (1) emerging diseases, in particular zoonoses and vector-borne illnesses; (2) food and waterborne diseases (*Campylobacter*, *Salmonella*, *Vibrio*, etc.); (3) respiratory infections (exacerbations of respiratory diseases, tuberculosis, etc.) and (4) antimicrobial resistance [5–12].

Furthermore, these health threats often manifest as cascading events during episodes of extreme weather and the repercussions reflect underlying societal vulnerabilities. For instance, heavy rainfall may precipitate waterborne infections and zoonoses associated with mosquito proliferation

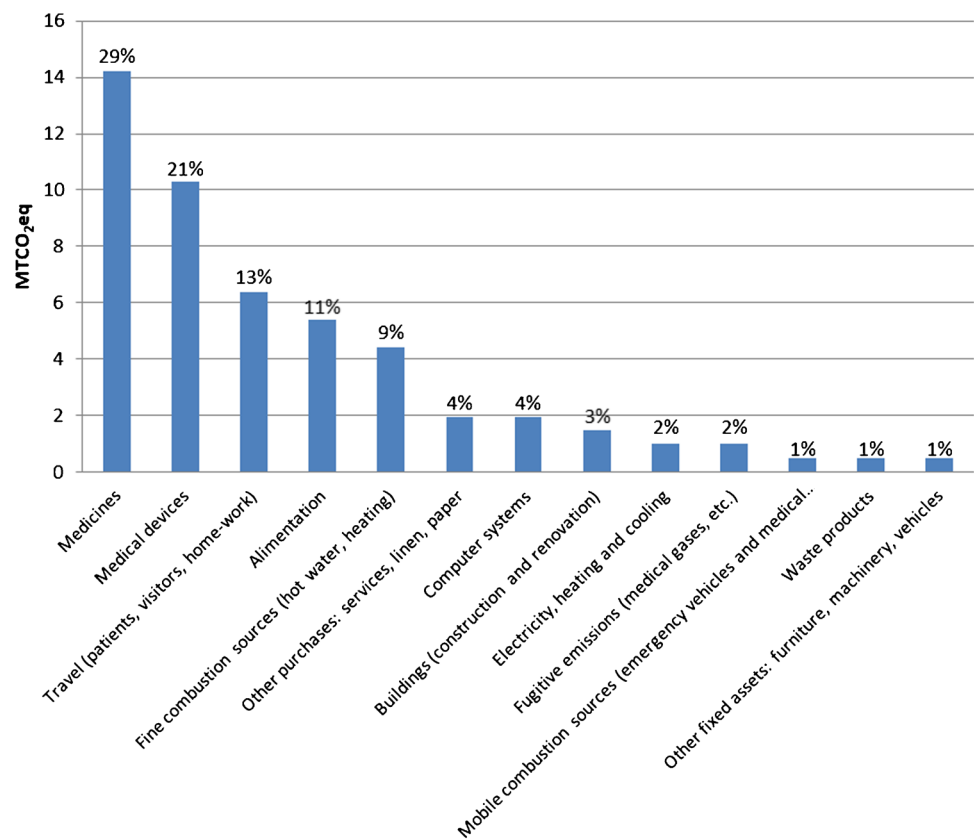
[13]. Other anthropogenic factors including the pressure on ecosystems exerted by numerous pollutants (microplastics, heavy metals, biocides, pollution from antibiotics manufacturing...) and the growing scarcity of water resources are also significant contributors to this phenomenon [14–18].

This situation leads to a self-perpetuating cycle: the increase in healthcare consumption will in turn further impact the climate through the emission of greenhouse gases [19].

In fact, in France, the total greenhouse gases (GHG) emissions from healthcare systems are estimated at 49 million tons of CO<sub>2</sub>-eq, representing approximately 8% of the national carbon footprint. The primary contributors to this figure are pharmaceuticals and medical devices, accounting for 50% of the total [16, 17] (Fig. 1). Furthermore, healthcare activities contribute to fine particle emissions and the depletion, contamination and acidification of water and groundwater resources [2].

Following the example of other learned societies, we believe that the establishment of a committee dedicated to a sustainable healthcare transition within the French Society for ID is an essential prerequisite for climate impact reduction [21, 22]. ID physicians have a particular focus on environmental factors, as exemplified by the "One Health" concept [23]. They collaborate extensively with various prescribers, notably through antimicrobial stewardship

**Fig. 1** Carbon footprint of the healthcare sector. Data from the Shift Project in 2023 [20]



programs. Their emphasis on the judicious use of antibiotics and infection prevention measures aligns closely with the sustainable healthcare transition's recommendations. We define a sustainable healthcare transition as an adoption of medical practices, supplies and treatments that aim to reduce environmental impact while maintaining the standard quality of care for patients.

The primary aim of this study was to assess the expectations of French ID specialists for a transition towards more sustainable healthcare. Secondary objectives included assessment of awareness regarding the consequences of climate change on public health and the environmental impacts of healthcare; perceptions and attitudes already adopted of the sustainable healthcare transition; the initiatives and opportunities for action within the French Society for ID and the raising of physicians' awareness of their individual roles in the context of a sustainable healthcare transition.

## Methods

This cross-sectional observational survey was conducted between April and June 2023. A questionnaire in French was created on the Google Forms® platform, for reasons of simplicity.

The survey was anonymous and consisted of 35 questions (available in Supplementary Document 1) divided into five parts: (1) participants' characteristics; (2) assessment of the respondents' awareness of the impact of climate change on ID; (3) assessment of the respondents' awareness of the impact of healthcare systems on the environment; (4) attitudes and perceptions towards the ecological transition, in particular the transition of healthcare systems, (5) personal and professional measures taken by respondent for reduction of environmental impact, proposals for initiatives within the French Society for ID and the perceived role of individual physicians in the sustainable healthcare transition and (6)

a final section devoted to open comments. These last two sections comprised open-ended questions.

The second and third sections of the questionnaire were built with statements extracted from the 6th synthesis report of the Intergovernmental Panel on Climate Change [24] and from the Shift Project report on "How to reduce carbon footprint in Healthcare" [20]. The Shift Project is a non-profit French think tank advocating the transition to a post-carbon economy.

The survey was distributed via email to French ID specialists via the French Society for ID's member mailing list, which includes both ID specialists and residents. It remained open for a period of two months, during which one reminder was sent. No exclusion criteria were applied. Quantitative variables were summarised as median ranges and interquartile ranges (IQR), while qualitative variables were summarised as percentages.

Subgroups were formed according to age group (< 40 and ≥ 40 years) and level of environmental anxiety (score > 6 and ≤ 5/10) and compared. Comparisons between different subgroups of respondents were made using Chi-squared tests. All statistical tests were two-sided at a 5%-significance level. Open-ended responses were subject to a qualitative analysis.

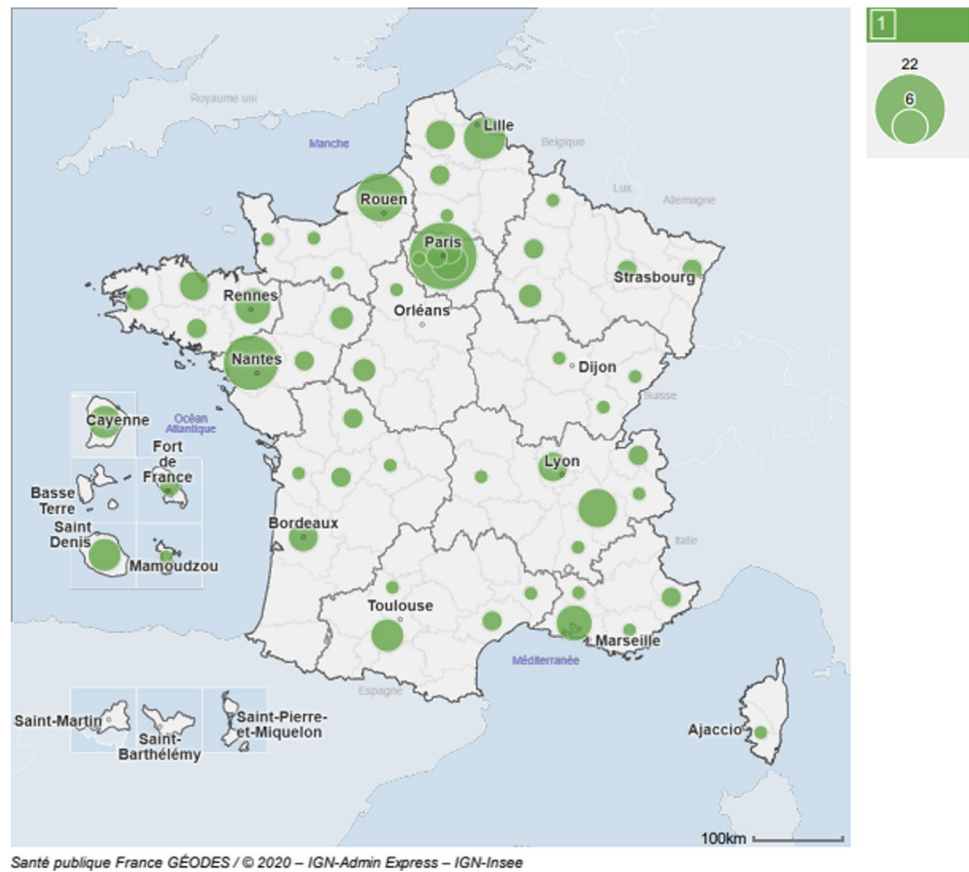
## Results

A response rate of 25.6% was achieved: 220 responses were collected from 860 individuals contacted via the mailing list. Women accounted for 55% of responses ( $N = 123$ ) (see Table 1). The age group under 40 accounted for 58.8% of the total (see Table 1). Of the respondents, 186 people were senior doctors (84.3%), followed by 25 residents (11.6%) and pharmacists and biologists (see Table 1). A wide variety of establishments (university and general hospitals, private practitioners, private establishments) and towns was represented (see Fig. 2).

**Table 1** Characteristics of respondents: age, gender, profession

		Men N (%)	Women N (%)	Total N (%)
		Total: 97 (44%)	Total: 123 (56%)	Total: 220
Age	< 29 years old	9 (31%)	20 (69%)	29 (13%)
	30–39 years old	48 (48%)	52 (52%)	100 (45%)
	40–49 years old	23 (41%)	33 (59%)	56 (25%)
	50–59 years old	13 (57%)	10 (43%)	23 (10%)
	> 60 years old	4 (33%)	8 (66%)	12 (5%)
Profession	Senior doctor	86 (46%)	102 (54%)	188 (85%)
	Resident	9 (36%)	16 (64%)	25 (11%)
	Pharmacist	0	2 (100%)	2 (1%)
	Biologist	2 (40%)	3 (60%)	5 (2%)

**Fig. 2** City and department of origin of respondents (220 respondents)



The majority of participants (78%–97%) responded correctly to 10 questions concerning the impact of climate change and human activities on the environment and public health, while 2 questions gathered mostly incorrect responses (see Table 2).

The environmental impact of healthcare was less well understood: 30.6% of answers were correct concerning "the healthcare system's share of national GHG emissions", 24.1% of respondents indicated familiarity with the Shift Project report, entitled "How to reduce carbon footprint in Healthcare" (see Table 2). Furthermore, the majority of respondents incorrectly identified waste as the main GHG emissions contributor, ahead of transport and drug purchases, instead of pharmaceuticals and medical devices.

An assessment of the health care institution's commitment to a sustainable healthcare transition was requested: this was assessed on average at 3.5/10 (median = 3 [range: 0–9], IQR 2–5) (Supplementary Document 1).

On average, self-assessed environmental anxiety was rated at 5.6/10 (median = 7 [range: 0–10], IQR 5–8). Anxiety was self-reported on a scale of 1–10.

The doctors' role in the sustainable healthcare transition was rated on average at 6.3/10, that of facility management at 7.6/10 and that of medical societies at 8/10 (see Fig. 3)

(Supplementary Document 1). The roles of doctors and medical societies were rated in the same way according to the age of the respondents.

The overwhelming majority of respondents ( $N = 208$ , 94.5%) indicated a demand for training.

When questioned on actions already taken *at a personal level*; 20.9% of respondents ( $N = 46$ ) indicated that they were "calculating their carbon footprint to reach the target of 2 tons of CO<sub>2</sub>-eq per year set by the Paris agreements" (see Table 3).

*From a professional standpoint*, 58.2% of the practitioners surveyed ( $N = 138$ ) said they had implemented "concrete actions as part of their professional practice" (see Table 4). "Sustainably designed healthcare in patient treatment" was practised by 2.7% of respondents ( $N = 6$ ).

In response to the open question "Could you list a few actions that you are carrying out/have put in place within your establishment?" 153 (69.5%) people gave free responses; grouped into the following categories (all answers are available in Supplementary Document 2):

- Waste sorting (89 responses),
- Emission free transportation (39 responses),
- Digital sobriety (36 responses),
- Energy savings (35 responses),
- Eco-designed healthcare (18 responses),

**Table 2** Percentages of correct responses to the survey on the sustainable healthcare transition within the French Society for ID – 220 respondents

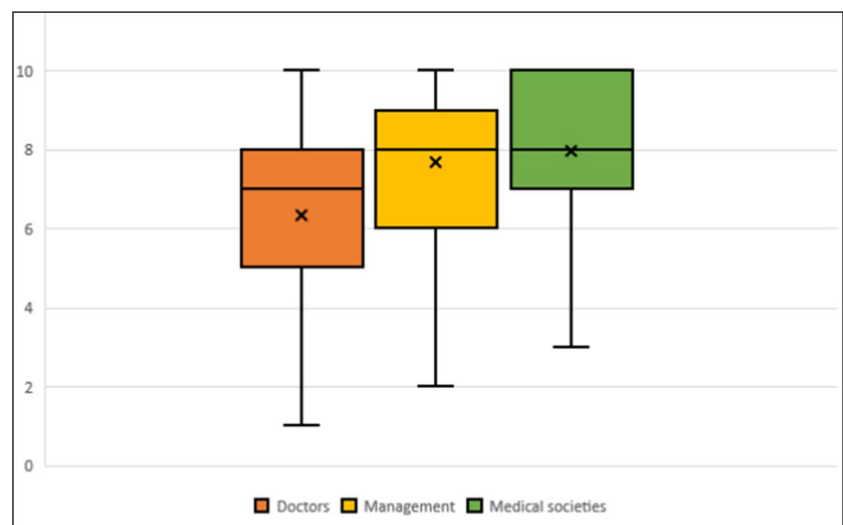
Questions	Correct responses (N—%)
Is there a scientific consensus on the anthropogenic origin of climate change? ( <i>Correct answer: Yes, there is</i> )	184—83.6%
In France, how many deaths are linked to environmental degradation every year? ( <i>Correct answer: 50 000</i> )	80—36.4%
Will climate change be a minor factor in population displacement? ( <i>Correct answer: No, it will be a major factor</i> )	189—85.9%
What proportion of Europe's arable land is used for animal feed? ( <i>Correct answer: 70%</i> )	61—27.7%
A large number of species are disappearing at a high rate, the so-called 6th mass extinction. ( <i>Correct answer: true</i> )	199—90.5%
The IPCC report states: "We still have the choice of mitigating the effects of climate change, but there is an urgent need to act". ( <i>Correct answer: true</i> )	212—96.4%
75% of medical students say they are poorly informed and have received no training on environmental issues. ( <i>Correct answer: true</i> )	182—82.7%
Over 80% of the same students believe that they should be trained in this subject. ( <i>Correct answer: true</i> )	176—80%
The carbon impact of medicines is clearly indicated on their labels. ( <i>Correct answer: No, it isn't</i> )	172—78.2%
Loss of biodiversity is a risk factor for zoonoses. ( <i>Correct answer: true</i> )	210—95.5%
Around 70% of antibiotics are manufactured in India and China, having a major impact on water resources and serious environmental consequences. ( <i>Correct answer: true</i> )	203—92.3%
The WHO considers climate change and antibiotic resistance to be the most important public health threats of the twenty-first century. ( <i>Correct answer: true</i> )	213—96.8%
Are you familiar with the Shift Project report « How to reduce carbon footprint in healthcare»?	52—23.6%
How much does our healthcare system contribute to the national greenhouse gas emissions? ( <i>Correct answer: 8%</i> )	66—30%

- Sustainable food (13 responses),
- Awareness-raising initiatives (13 responses),
- Corporate / management of a Sustainable Healthcare Transition (12 responses).

In response to the open question "Could you name a few actions that the French Society for ID could implement to promote the sustainability of our healthcare system?" a number of concrete proposals were put forward (full responses are available in Supplementary Document 3):

- *Training* ( $N=52$  proposals). This category includes the following actions: "training for healthcare professionals (including veterinarians), in the initial curriculum of medical students" and "as ongoing training for practitioners"; "raising awareness among the general public"; "implementing a distance learning format", "limiting professional air travel" and "promoting low-carbon transportation at conferences".
- *Healthcare products* ( $N=46$  proposals): "promote the relocation of antibiotic production in Europe, with stand-

**Fig. 3** Evaluation of the role of the various stakeholders in a sustainable healthcare transition (boxplot): doctors / prescribers (average 6.3/10, median = 7, IQR 5–8); management (average 7.6/10, median = 8, IQR 6–9) and medical societies (average 8/10, median = 8, IQR 7–10). The horizontal lines inside the boxes represent the medians, while the crosses indicate the means



**Table 3** Implementation of actions at a personal level, among all respondents, by age category and by level of environmental anxiety—220 respondents

“Yes” to the following question including “Yes that’s right” and “Yes I’m starting to get into it”	Total (220) N (%)	<40 years (= 129) N (%)	>	≥ 40 years (= 91) N (%)	<i>p</i> =0.047	Level of environmental anxiety > 6/10 (= 140) N (%)	>	Level of environmental anxiety ≤ 5/10 (= 80) N (%)	<i>p</i> =0.002
On a personal level, I’m calculating my carbon footprint to try to reach the target of 2 tonnes of CO <sub>2</sub> eq per year set by the Paris agreements?	86 (39%)	58 (45%)	>	28 (31%)	<i>p</i> =0.047	66 (47%)	>	20 (25%)	<i>p</i> =0.002
Personally, I limit my consumption of animal products?	195 (89%)	120 (93%)	>	75 (82%)	<i>p</i> =0.026	132 (94%)	>	63 (79%)	<i>p</i> =0.001
Personally, I no longer fly for leisure or holiday?	145 (66%)	90 (70%)	=	55 (60%)	<i>p</i> =0.196	103 (74%)	>	42 (53%)	<i>p</i> =0.002
Personally, I prefer to buy second-hand as much as possible?	135 (61%)	102 (79%)	=	60 (66%)	<i>p</i> =0.288	116 (83%)	>	46 (58%)	<i>p</i> =0.00008
On a personal level, I use digital technology sparingly (I sort my emails; turn off my computer, etc.)?	198 (90%)	120 (93%)	=	78 (86%)	<i>p</i> =0.12	129 (92%)	=	69 (86%)	<i>p</i> =0.24
On a personal level, I get involved in associations or politics to change things?	61 (28%)	36 (28%)	=	25 (27%)	<i>p</i> =1	44 (31%)	=	17 (21%)	<i>p</i> =0.14

ards more respectful of the environment and labor laws”, “conduct life cycle analyses to label antibiotics according to environmental impact”, and “advocate for single-dose dispensing of medicines”.

- *Environmentally friendly healthcare products* (*N*=37 proposals): “assess the environmental impact of pharmaceutical products, follow-up appointments and examinations, and diagnostic tests to be made available to prescribers and those drafting recommendations for good practice.”
- *“One health” concept* (*N*=27 proposals): “fight against intensive livestock farming to prevent zoonosis, pursue actions for the proper use of antibiotics and screen-

ing/prevention of ID in animals”, “emphasize the link between human and animal health and environment with climate change”.

- *Creation of a cross-functional working group* (*N*=10 proposals): “implement research projects on sustainable healthcare transition”, “apply for specific grants, and activate collective reflection to modify practices”.
- *Sustainability-designed hygiene recommendations* (*N*=10 proposals): “search for the right balance between prevention and reasonable use of personal protective equipment”, “reduce reliance on single-use materials and biocides”.

**Table 4** Implementation of actions at a professional level, among all respondents, by age category and by level of environmental anxiety—220 respondents

“Yes” to the following question including “Yes that’s right” and “Yes I’m starting to get into it”	Total (220) N (%)	< 40 years (= 129) N (%)		≥ 40 years (= 91) N (%)		Level of environmental anxiety > 6/10 (= 140) N (%)		Level of environmental anxiety ≤ 5/10 (= 80) N (%)	
On a professional level, I implement concrete actions within my professional activity	128 (58%)	64 (50%)	<	64 (70%)	$p=0.003$	85 (61%)	=	43 (54%)	$p=0.38$
On a professional level, I limit my business trips by plane because of the carbon impact of this type of transportation	182 (83%)	111 (86%)	=	71 (78%)	$p=0.17$	125 (89%)	>	57 (71%)	$p=0.001$
On a professional level, I make my patients and colleagues aware of the issues related to climate change and environmental health	127 (58%)	72 (56%)	=	55 (60%)	$p=0.58$	92 (66%)	>	35 (44%)	$p=0.002$
On a professional level, I practice sustainably designed health-care in patient treatment	37 (17%)	17 (13%)	=	20 (22%)	$p=0.12$	22 (16%)	=	15 (19%)	$p=0.69$

The concluding section of the survey, which invited open comments, elicited expressions of gratitude for the research and a willingness to participate in any future working groups (20.9% of respondents,  $N=46$ ): “thank you for this work”, “very good initiative”, “thank you for raising awareness”, “to be distributed widely”, “I hope it will move things forward”, “Interested and curious about the conclusions”, “I’d like to be part of working groups and promote clinical research on the subject”, “We really need to mobilise doctors” (all responses are available in Supplementary Document 4).

Two sub-groups were formed: 1) according to the age group of respondents: < 40 years (129) and ≥ 40 years (91); and 2) according to the level of environmental anxiety: score > 6/10 (140) and score ≤ 5/10 (80).

The feeling of environmental anxiety was significantly higher among respondents aged under 40, compared to those aged over 40: respectively 70% versus 54%— $p=0,02$ .

On a personal level, respondents under 40 were significantly more likely than older respondents to have

calculated their personal carbon footprint (see Table 3). Subjects who reported a feeling of environmental anxiety greater than 6/10 said that they calculated their carbon footprint more often, were more likely to limit air travel for personal reasons (leisure, holidays) and favoured second-hand purchases compared to those less prone to environmental anxieties (see Table 3). Furthermore, younger respondents and those with a feeling of environmental anxiety greater than 6/10 were significantly more likely to report limiting their consumption of animal products (see Table 3).

Significantly, respondents aged over 40 declared that they had taken more concrete action at a professional level (see Table 4). People reporting a feeling of environmental anxiety greater than 6/10 do not report having carried out more concrete actions at a professional level. However, this latter group said they were more likely to limit air travel for professional reasons and to raise awareness among patients and colleagues about the impact of climate change on health (see Table 4).



Respondents with a level of environmental anxiety greater than 6/10 were more likely to make concrete proposals compared to those when a lower level of environmental anxiety: 70% versus 54% ( $p=0.023$ ). There was no significant difference between age or gender groups.

## Discussion

To the best of our knowledge, this cross-sectional study is the first to assess the awareness of a community of ID specialists towards climate change. To date, there have been only a handful of studies published on the awareness and attitudes of healthcare workers, even though such a study is an essential preliminary step in the implementation of an effective sustainable healthcare transition [25].

At 25%, the response rate to this survey was substantially higher than in the cross-sectional survey of all healthcare professionals recently conducted in France and abroad (8%) [23, 24].

The geographical spread of respondents is fairly evenly distributed across France, though some smaller towns and departments are not represented, and it is difficult to draw any conclusions as to why.

The level of environmental anxiety exhibited by respondents was relatively high, although there was considerable variation among individuals and difficulty in comparing these findings to those of similar studies due to the lack of consensus regarding the measurement of this concept [25, 26].

The under-40 age group provided the largest number of responses, suggesting that younger people are likely more concerned about the matter [27]. However, the age distribution of all members of the surveyed society is not available.

General statements about global warming and its impact on public health were mostly correctly identified, reflecting the interest of ID specialists in this topic, as already evidenced by other studies [25, 26, 28].

By contrast, the environmental impact of the healthcare system itself was poorly understood. Awareness of this lack of knowledge was likely perceived by the respondents as evidenced by their almost unanimous expression of need for training in the field of sustainable healthcare transition and as already shown in another study conducted in France [25].

This survey confirms a strong demand for sustainable healthcare transition training, as has already been shown by both users of healthcare establishments and professionals working in the healthcare sector [20, 25, 26, 28–30]. This need has also been highlighted on a number of occasions by medical students, for example by the International Federation of Medical Student Associations, which in 2020 called on medical schools to integrate teaching on climate change into their curricula [31], and by UK medical students, who urged "urgent action to safeguard the health of our future patients" [32].

This study showed that people under 40 years of age were more proactive, on certain items than older respondents, and had significantly higher environmental anxiety scores. This higher level of environmental anxiety was in turn associated with a higher rate of declaration of concrete actions.

This finding confirms a previous qualitative study which showed that the three motivating factors for physicians were: concern about the public health implications of climate change, frustration with healthcare waste and recognition of their influence as doctors [33].

At the professional level, only a small majority of respondents indicated that they were taking action to promote sustainable healthcare transition. The term "sustainably designed healthcare" was not familiar to respondents, although many practitioners stated that they were taking actions that reflected this approach. This finding confirms both a willingness to act and a lack of knowledge about how to implement a sustainable healthcare transition [25, 33].

Regarding the perceived roles of different stakeholders in a sustainable healthcare transition, the assessment was that the role of medical societies is foremost, exceeding that of hospital managers and prescribers. Individual practitioners may feel isolated and lack the authority and expertise to implement significant changes in their practice.

We have summarised the respondents' main suggestions for the implementation of sustainable healthcare transition as follows (see Fig. 4):

- Creation of a cross-functional group dedicated to a sustainable healthcare transition is a proposal that has already been put forth by numerous authors and is a practice that has been adopted within various specialities [21, 22, 34].

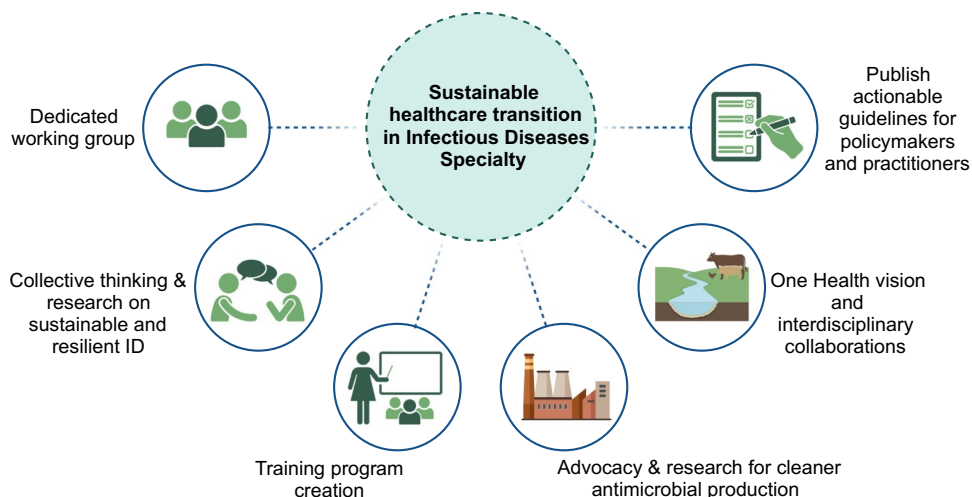
- Creation of a training program. Doctors can in fact play a role in raising awareness for a sustainable healthcare transition [32, 35–37].

- Continue the French Society for ID's involvement in lobbying for the relocation of antibiotic production to Europe. The contamination of waste water with high concentrations of antibiotics, particularly during manufacturing process has led to the emergence of multi-resistance pathogen outbreaks [16, 38]. Research to conduct life-cycle analyses, which evaluate the impact of products from inception to disposal by patients, would provide greater transparency on the environmental footprint of anti-infectives [39]. Continue lobbying to limit waste and unused medicines, notably by offering single-dose packaging for antibiotics [40].

- Reflection on the concept of "sustainably designed healthcare" in ID. This term refers to healthcare that is less harmful to the environment why maintaining the same quality of care for patients [20]. Recent French Society for ID guidelines offer an underestimated environmental benefit: time-dependent continuous antibiotic administration confers an environmental benefit (see Table 5) [41]. Preventive medicine, which is a fundamental aspect of ID specialities,



**Fig. 4** Summary of the main French society of ID’s actions for a sustainable healthcare transition deemed important by the participants. Created in <https://BioRender.com>



encompasses strategies such as hygiene and vaccination, providing a dual benefit for the patient and the environment [42].

- Continue to explore the "One Health" concept. ID specialists are aware of the need to prepare for the emergence of new pandemics and cascading events, while taking into account the multiple anthropogenic risk factors and societal vulnerabilities [34–36, 43–47]. The French Society for ID also addressed the issue of antibiotic resistance, which is closely linked to climate change [14, 40–42, 48–50]. To

achieve this objective, it seems imperative to overcome the practice of working in silos and to establish robust connections with professionals from diverse fields.

- Continue to work on recommendations for sustainably designed hygiene practice, reducing single use products and the widespread use of biocides [51].

Our study has several limitations.

Firstly, it is possible that practitioners who were already aware of and committed to the subject in question may have

**Table 5** Continuous versus discontinuous administration of parenteral Orbenin (12 g per 24 h for 6 weeks)

<b>Continuous infusion:</b> <b>6 grams over 12 hours, twice a day</b> <b>For 6 weeks of treatment</b>	<b>Discontinuous administration:</b> <b>2 grams every 4 hours</b> <b>For 6 weeks of treatment</b>
Materials (per day) :	Materials (per day) :
2 pink needles (2g)	6 pink needles
2 bottles of 250 ml saline solution (28g)	6 bottles of 100 mL saline solution
2 syringes of 20 mL (11g)	6 syringes of 20 mL
2 bags of sterile compresses (3 g)	6 bags of sterile compresses
2 infusion sets (28 g)	6 infusion sets
Total weight of consumables: 6 kg	Total weight of consumables: 18 kg



been more inclined to respond to the survey. This would have resulted in selection bias that overestimates the level of awareness and willingness to act.

As this is a declarative study, it is subject to reporting bias. In particular, respondents may have overestimated the actions taken due to social desirability bias.

Furthermore, an evaluation of the perceived barriers to the implementation of environmental sustainability-related projects has yet to be conducted, despite the potential value of such an exercise in facilitating the development of effective actions. In a separate survey conducted in France, the most frequently cited barriers were identified as a lack of dedicated time, a lack of hierarchical or methodological support, and insufficient access to training [25].

## Conclusion

This national survey of French ID specialists is a prerequisite for the implementation of actions within the French Society for ID. Aware of the impact of climate change on human health, the ID specialists surveyed have high expectations for a sustainable healthcare transition, starting with a request for training and a call for the ID medical society to play a major role in this transition.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s10096-025-05064-1>.

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**Author Contribution** MRI and VM contributed to the study conception and design. Material preparation, data collection and analysis were performed by MRI, VM and ALB. The first draft of the manuscript was written by MRI and all authors (MRI, VM, EP, SD, LB, ALB) commented on previous versions of the manuscript. All authors read and approved the final manuscript. ALB created the graphical summary of the entire study and the graphics summarising the main French society of ID's actions.

**Data Availability** No datasets were generated or analysed during the current study.

## Declarations

**Competing Interests** The authors declare no competing interests.

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