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Review

Health effects of climate change – Are they sufficiently addressed in pediatric settings in Germany to meet parents' needs?



Stephan Bose-O'Reilly^{a,b}, Maximilian Edlinger^a, Lena Lagally^a, Hannah Lehmann^a, Thomas Lob-Corzilius^c, Michael Schneider^d, Julia Schorlemmer^e, Peter van den Hazel^f, Julia Schoierer^{a,*}

^a LMU Munich, University Hospital, Institute and Clinic for Occupational, Social and Environmental Medicine, Unit Global Environmental Health and Climate Change, Ziemssenstr. 5, Munich D-80336, Germany

^b Department of Public Health, UMIT - Private University for Health Sciences, Medical Informatics and Technology, Health Services Research and Health Technology Assessment, Institute of Public Health, Medical Decision Making and Health Technology Assessment, Eduard Wallnoefer-Zentrum 1, Hall i.T. A-6060, Austria

^c DAPG (Deutsche Akademie für Prävention und Gesundheitsförderung im Kindes- und Jugendalter), Freiligrathstr. 25, Bochum D-44791, Germany

^d Department of Sociology, LMU Munich, Konradstr. 6, Munich D-80801, Germany

^e FOM University of Applied Sciences, Institute for Health and Social Sciences, Bismarckstr. 107, Berlin D-10625, Germany

^f INCHES (International Network on Children's Health, Environment and Safety), Ellecom, the Netherlands

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ABSTRACT

Children today are particularly vulnerable to direct and indirect health effects of climate change. Exposure to health hazards related to climate change will increase in the future. These health impacts increasingly pose additional challenges for the health care system, both in curative treatment and in preventive care. This paper therefore examines whether health care facilities for children and adolescents ("pediatric settings") in Germany are adequately preparing for the impact of climate change on children's health. For this purpose, we combine the results of two studies that investigated the relevance assessment of climate change-related health effects on children's health and the level of information on this topic among pediatricians ($n = 408$) and parents ($n = 292$). In addition, a narrative literature review was conducted. We have found that parents' need for information on this topic is currently not being met by pediatricians, as the topics of climate change and health are inadequately addressed in pediatric settings in Germany. Thus, there is a gap between the demand for information and the lack of supply that needs to be closed. To close the gap between parents' need for information on the impact of climate change on children's health and pediatricians' insufficient provision of information, more training materials, more trained staff and more climate change and health information resources are needed in pediatric settings. In order to provide all parents with evidence-based knowledge, the communication of the complex health effects should be readily accessible and target group-oriented.

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1. Introduction

The continuously growing adverse health impacts of climate change became more obvious within the last years in Europe and elsewhere [1,2]. Children are a particular risk group for the immediate health effects, which can be both direct (e.g. health risks from increased extreme weather events) and indirect (e.g. in the form of allergic and newly emerging or re-emerging infectious diseases) [3,4]. Furthermore, the increasingly noticeable but also uncertain

future consequences of climate change can also negatively affect children's mental health [5]. In 2015, the Lancet Commission took up the concept of solastalgia, which encompasses the impacts of climate change on human health and well-being [6]. The WHO European Regional Office noted in 2018 that the evidence to date on the health impacts of climate change provides a "solid basis" for implementing key prevention interventions [7]. However, this presents health professionals in particular with the challenging task of further developing both primary prevention and adaptation measures and curative care approaches to respond to changing environmental conditions and health risks. With regard to the practical implementation of these preventive and curative measures, results to date show that, despite all efforts, not all vulnerable groups can always be reached and there are gaps in the access pathways, especially for hard-to-

Abbreviations: LMU, Ludwig-Maximilians University; TBE, tick-borne encephalitis; TV, television; UV, ultraviolet radiation; WHO, World Health Organization

* Corresponding author.

E-mail address: julia.schoierer@med.uni-muenchen.de (J. Schoierer).

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reach people in precarious living situations [8]. In this case, “pediatric settings” in their various forms would provide a good environment to reach whole families and thus different at-risk groups across socioeconomic boundaries. In the following, we use the term “pediatric settings” to refer to settings in which pediatricians usually have professional contact with children, adolescents, and parents, such as pediatric practices, children’s hospitals or other health care facilities for children and adolescents.

The European Child Health Care System relies on different pillars, such as (i) pediatric practices; (ii) children’s hospitals with inpatient, emergency care and specialized sectors; (iii) public health services for children [9]. An essential part of pediatric care in Germany are the examinations for “early detection of diseases” (“U examinations”) in children (U1–U9), more than 95% of which are performed in pediatric practices [10]. These screenings are important for early detection of disease but could also be “the” perfect framework to integrate climate change-related health topics into routine pediatric care.

But is pediatric care even adequately prepared for these new challenges posed by climate change? Are pediatricians giving parents expert advice on the health impacts of climate change on their children? And in return, do pediatricians learn from parents and patients what fears and concerns they associate with the risks that climate change already poses to children? Or is the information provided not sufficiently aligned to adequately inform parents?

1.1. Objectives

Using Germany as an example, the objectives of this narrative review include answering the following key questions: (i) What are the most important health impacts of climate change that are of concern to parents and pediatricians? (ii) Are climate change issues adequately addressed in pediatric settings? (iii) How can pediatricians better respond to parents’ information needs now and to new challenges in the future?

2. Materials and methods

To assess the current state of research on the role of pediatricians in addressing the impact of climate change on children’s health, a narrative literature search was conducted in the PubMed electronic data base. The following terms were used as keywords: “climate change AND health AND pediatrics*” and “climate change AND children* health AND pediatrics*”. For the keywords “climate change AND health AND pediatrics*” there were 161 search hits and for “climate change AND children* health AND pediatrics*” there were 89 hits published on these topics by October 30, 2021. However, some of these publications overlapped. Furthermore, the reference lists of the retrieved studies were searched for additional literature. This resulted in a total of 12 articles included in this review. In addition, data from two surveys conducted by the LMU Munich, University Hospital were used. Here, the relevance assessment, the current state of knowledge, and the sources of information used on the topic were studied. All figures were created with Excel or RStudio version 4.0.3 using the packages “likert”, “sjPlot”, “sjmisc”, “parameters” and “tidyverse”.

3. Results

A survey from the United States on the sources of information used by parents regarding children’s health issues in general showed that pediatricians are the most consulted source and parents follow this advice up to 94% [11]. While 96% of parents also seek information via the internet, less than 10% act on it, highlighting the privileged status of medical advice [11]. In terms of addressing climate change, an increasing body of literature attributes a key role to health workers and calls on them to take up this challenge [12–14]. In this regard,

medical professionals should learn more about the health impacts of climate change [12], actively communicate these to citizens [14] and engage them in preventive and adaptive measures [12]. However, despite evidence that climate change is already having an impact on children’s health and will have an increased impact in the future [2,15–17], little is known about the preparedness of health care providers worldwide [14] and about child-specific preventive measures [15].

In this context, a nationwide online survey was conducted by LMU Munich, University Hospital in which pediatricians from various sectors of the pediatric care system in Germany (e.g., children’s hospitals, pediatric practices, social pediatric centers, public health services, and rehabilitation facilities) were asked about their relevance assessment regarding the impact of climate change on children’s health as well as about their needs and sources of information on this topic. 408 pediatricians had answered at least 50% of all questions, so these questionnaires were included in the analysis. Results show that respondents considered the risks of climate change to be relevant to children’s health now as well as in the future [18]. The greatest relevance was attributed to the effects of a stronger and longer pollen season (93.5%), neophytes and neozoa (89.2%), ultraviolet radiation (UV) (86.1%), tick-borne encephalitis (TBE) and Lyme disease (85.6%), and air pollutants (82.1%). The majority of respondents also rated the remaining health risks queried as relevant or totally relevant (see Fig. 1). In addition, pediatricians in pediatric practices estimated the impact of climate change on children’s health in the next 25 years to be more relevant than pediatricians in pediatric hospitals [18]. However, despite high relevance assessment of the topic and agreement on the effectiveness of health prevention measures related to climate change, especially information materials for parents and staff support in implementing such measures, more than three quarters of the pediatricians surveyed do not currently implement any of these measures, mainly due to time constraints [18].

The study also investigated what sources of information pediatricians use to learn about climate change and children’s health. Among those who had already engaged with the topic, journals (47.3%) were most frequently cited as a source of information, followed by reports and documentaries on television (37.1%) and daily newspapers (36.6%). 27.6% of the respondents did not use any sources of information on this topic at all (see Fig. 2) [18]. The results also show that pediatricians in pediatric practices were significantly more likely to obtain information about climate change and children’s health than their colleagues in pediatric hospitals. Overall, the more the topic had already been dealt with, the higher the relevance assessment of the health risks for children [18].

In order to also reflect the parents’ side of this issue, another online survey was conducted by the LMU Munich, University Hospital on the relevance and risk assessment as well as the information status and the use of information sources on the health effects of climate change for children among parents living in Germany (n= 292 with answers to at least 50% of all questions) [19]. 89.8% of parents surveyed indicated that they already consider the health effects of a changing climate to be relevant today, and about two-thirds are concerned about them. Air pollutants (90.8%), UV radiation (85.6%), contamination of water bodies with pathogens such as cyanobacteria (71.0%), tick-borne infectious diseases (66.5%), and heat and warmth (65.7%) were most frequently cited as perceived risks to children’s health (see Fig. 3) [19].

To learn about climate change and children’s health, parents mainly use the Internet and social media as sources of information (73.3%). Following far behind are newspapers (46.9%) and books and magazines (43.5%). Pediatricians (16.8%) and general practitioners (11.0%) hardly play a role in obtaining information (see Fig. 2) [19]. Although over two-thirds of parents reported knowing where to find information on climate change and health, about half of the respondents felt uninformed on the topic [19].

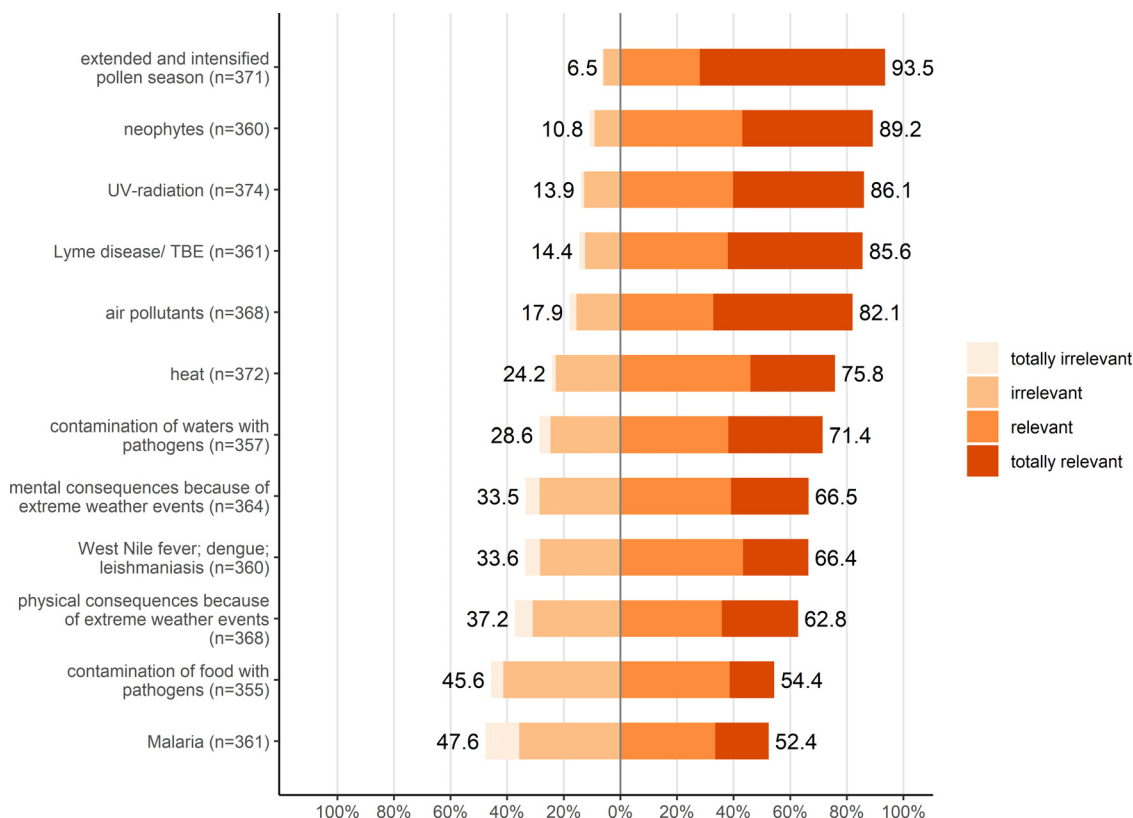


Fig. 1. Relevance assessment of pediatricians in Germany regarding the predefined climate change-related health effects for children in the next 25 years. Adapted from [18].

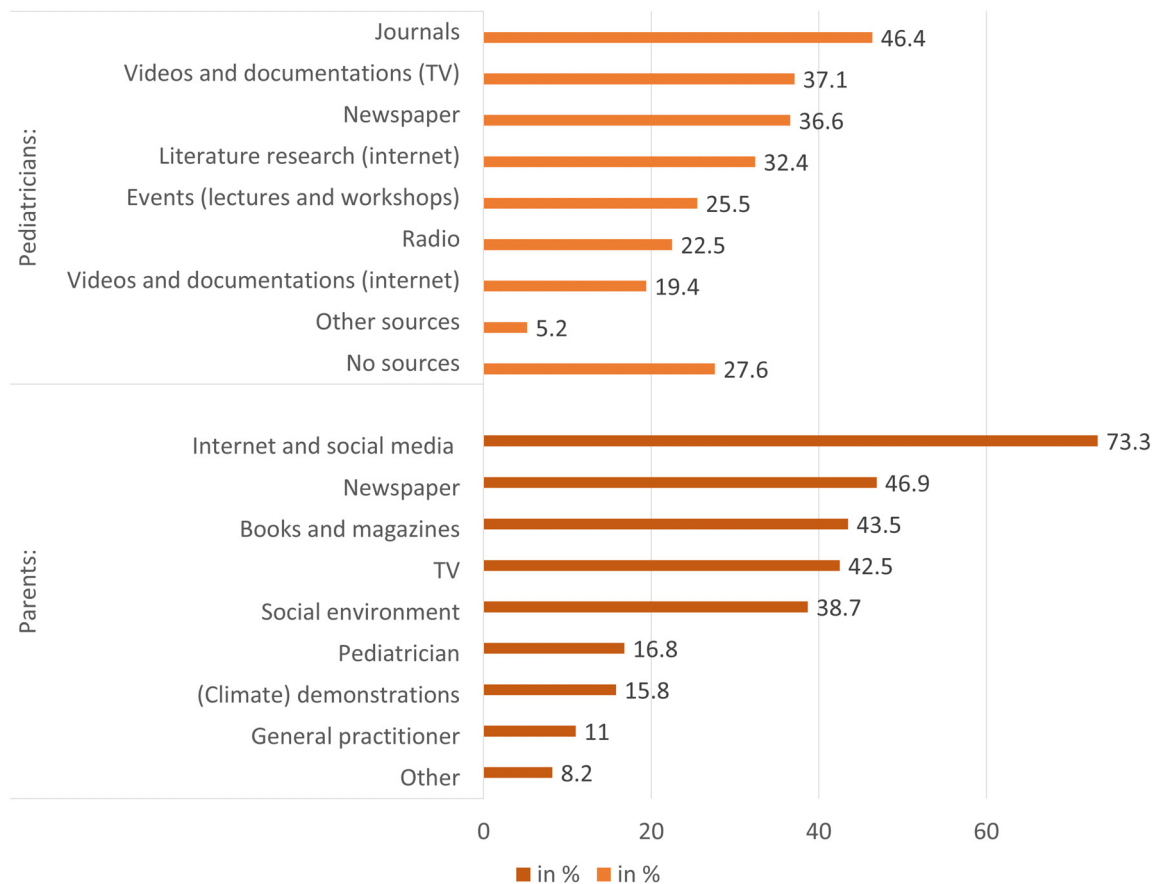


Fig. 2. Currently used information sources of pediatricians and parents in Germany regarding health effects of climate change (information sources given, multiple answers possible). Number of pediatricians n = 378; number of parents n = 292. Adapted from [18,19].

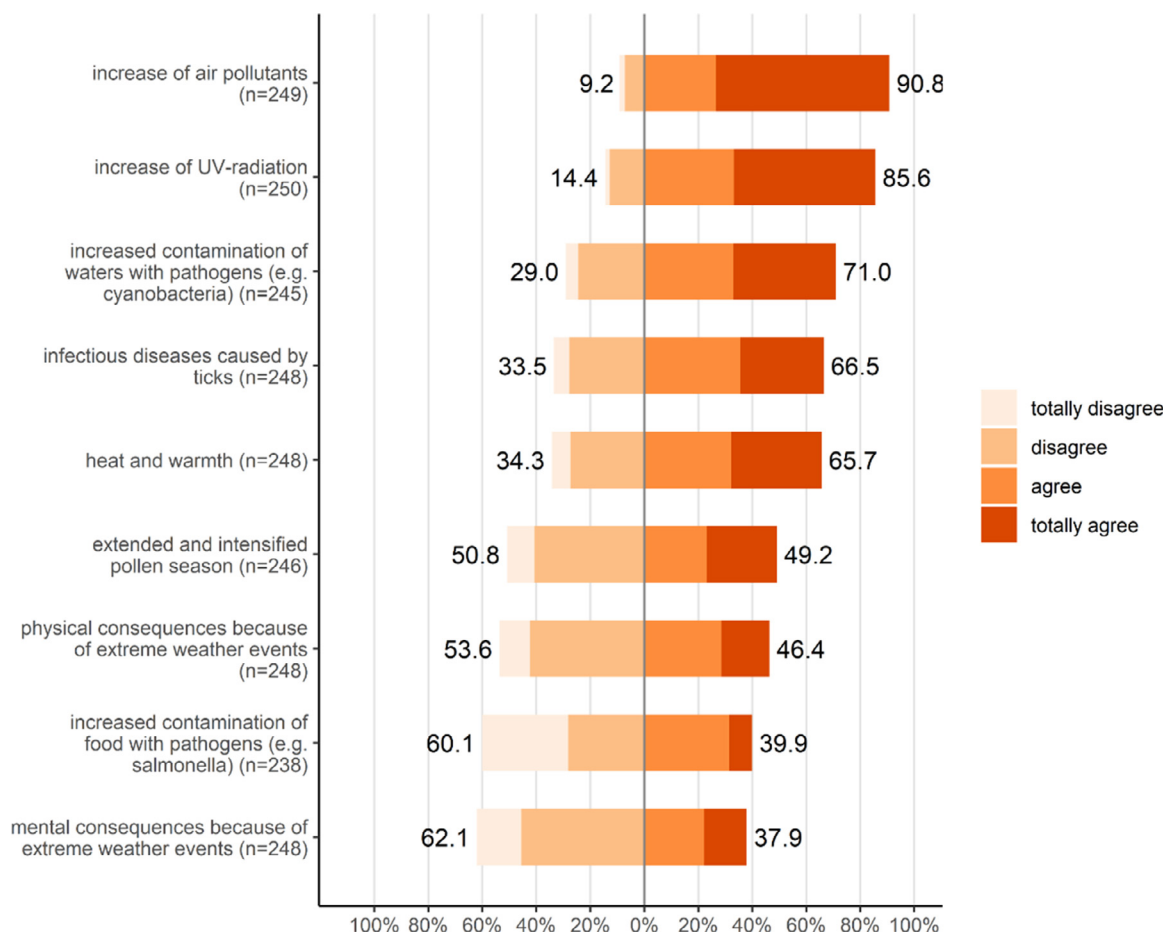


Fig. 3. Current relevance assessment of parents living in Germany regarding the predefined climate change-related health effects for children. Adapted from [19].

The results of these two studies demonstrate that the impact of climate change on children's health is considered highly relevant by both pediatricians and parents [18,19]. However, when comparing the ranking of health impacts, it is noticeable that while they largely coincide thematically (UV radiation, tick-borne infectious diseases, and air pollutants are each among the five most frequently mentioned health effects), they partly differ significantly in their order. It is striking, for example, that 93.5% of pediatricians ranked a longer and intensified pollen season as the most important impact, while this impact was perceived as a risk by only 49.2% of parents, placing it sixth in the ranking. In turn, parents surveyed ranked the health risk from air pollutants highest (90.8%), while pediatricians ranked this fifth with 82.1%. It should be noted, however, that pediatricians generally ranked the relevance of all health hazards significantly higher than parents (see Figs. 1 and 3) [18,19]. The engagement with the issue of climate change and children's health and the assessment of relevance seem to take place largely independently on both sides.

This reflects the findings of a study conducted in the United States in 2021 that examined parents' perspectives on the need for and frequency of discussion about climate change during well-child visits [20]. Of the 371 parents who participated, only 4% reported that climate change-related health topics were part of well-child visits in the past year. However, 80% of parents felt it was important to include the topic in well-child visits and to be educated by their pediatrician about the health effects of climate change and how to deal with them. It also appeared that the more concerned parents were about climate change, the greater the desire to include the topic in pediatric visits [20].

4. Discussion

Children are particularly vulnerable to the effects of climate change on their physical and mental health, both now and in the future. This vulnerability is seen as relevant by pediatricians and parents alike, and the anticipated impact on children's health is perceived as a concern on both sides. The presence of climate change-related health effects and an increasing awareness and interest of parents raise the demand for scientifically sound and patient-oriented information plus corresponding prevention options in terms of behavioral changes. However, the results of the present studies show that only a small part of the climate change-related answers are given by pediatricians, but parents resolve their questions mainly with the help of the internet and newspaper articles or book and TV contributions. The sources currently used, however, seem to poorly satisfy parents' need for information, as the majority of parents do not feel adequately informed on the topic of climate change and children's health. There is also a question about the trustworthiness of these sources, and it must be assumed that not all parents use evidence-based results and information. Furthermore, most pediatric settings in Germany do not yet offer preventive measures, such as information services on the health consequences of climate change, but they might be more capable to provide correct and useful information. As a result, parents' desire and need for information is currently not being met by pediatricians, as the issues of climate change and health are insufficiently addressed in pediatric settings in Germany. This gap between the existing need of parents and the lack of pediatric information services needs to be closed.

But how can the high level of trust in medical advice, as well as the high utilization of pediatric services, be used to provide parents with adequate and scientifically up-to-date comprehensive advice, information and treatment? The principle of supply and demand seems to be crucial here, with the idea of increasing the supply of patient-centered information and appropriate prevention and behavioral options in pediatric settings to meet parental demand. The key to expanding this supply may lie in building pediatricians' expertise in climate change-related health effects on children. This could be done, for example, by incorporating the topic into medical curricula, residency training, and continuing medical education. First, to disseminate evidence-based and targeted information and appropriate prevention and behavioral options, and second, to advocate for children's health when addressing the issue of climate change and health. In terms of implementing this knowledge in routine clinical practice and counseling, the high reliance on medical advice offers a great opportunity to bridge this gap. In particular, a behavioral preventive approach plays a major role, through which parents should be motivated and guided to take measures of heat protection, air pollution prevention, UV protection or allergen avoidance. In addition, since behavioral change depends on several factors such as individual relevance assessment, it is particularly important to support pediatric staff with appropriate techniques, to communicate abstract health problems in a target group-specific way, and to provide advice for behavioral change. In this context, it should not be overlooked that the relevance assessment regarding health effects currently seems to differ between parents and pediatricians. The health risks perceived most strongly by parents may be underestimated by pediatricians, which could be another reason why information needs in this regard are currently insufficiently met. Against the backdrop of increasing cost pressures and workloads for pediatricians, the delegation principle can remedy this by integrating climate change counseling with support from trained medical staff into regular care services, such as well-child checkups. However, it is important that access routes are kept low-threshold and a target group-oriented communication approach is chosen (e.g., through individual counseling sessions, distribution of information brochures and flyers, information via the practice homepage) [21].

Therefore, to adequately address the new challenges of climate change-related health threats, it is even more important that all pediatricians, regardless of their area of practice, are on the same page, speak with one voice, and communicate with each other. In order to reach all parents, regardless of social class, place of residence, education level, and language barriers, pediatricians should offer their services in an available, appropriate, affordable, and easily accessible manner, as shown in the work of Ehrlich et al [9]. Not many pediatricians are thoroughly trained in climate change and health issues, so communication between parents and pediatricians could benefit from both better medical training for pediatricians on children's health and climate change, as well as mutual exchange and learning about relevance assessment of health risks and issues. In this way, the relevance of health risks related to climate change can be more tangible and appropriately assessed for parents, and potential discrepancies on both sides can be resolved.

5. Conclusion

The presence of direct and indirect climate change-related health effects for children and the increasing awareness and interest of parents raise the need for evidence-based and patient-centered information and appropriate prevention and behavioral options. However, the topics of climate change and health are currently insufficiently addressed in most pediatric settings in Germany. As a result, parents' need for information is currently not being met by pediatricians. This gap needs to be closed. By increasing their expertise on climate change and health, pediatricians could create an appropriate

environment for communicating accurate and useful information during routine care. To reach all families in this process, it is critical that these climate change consultations are offered at low thresholds and delivered by well-trained staff [22]. The more interprofessional and broadly structured pediatric care is, the easier it is for parents to access these services.

Data sharing statement

The data can be shared upon reasonable request, by sending an e-mail to the corresponding author.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Stephan Bose-O'Reilly: Conceptualization, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing. **Maximilian Edlinger:** Investigation, Formal analysis, Writing – review & editing. **Lena Lagally:** Conceptualization, Formal analysis, Visualization, Writing – original draft, Writing – review & editing. **Hannah Lehmann:** Conceptualization, Visualization, Writing – original draft, Writing – review & editing. **Thomas Lob-Corzius:** Conceptualization, Writing – review & editing. **Michael Schneider:** Conceptualization, Writing – review & editing. **Julia Schorlemmer:** Writing – review & editing. **Peter van den Hazel:** Writing – review & editing. **Julia Schoierer:** Conceptualization, Funding acquisition, Project administration, Supervision, Writing – review & editing.

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