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Barriers Against Prevention Programs for Iodine Deficiency Disorders in Europe: A Delphi Study

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Background: Although substantial progress has been made in recent decades in eliminating iodine deficiency, iodine deficiency disorders (IDDs) are still prevalent in European countries. Challenges include ineffective public health programs and discontinuation of IDD prevention. However, the barriers against the implementation and continuation of prevention and monitoring of IDD remain unclear. Therefore, the objective of our study was to identify potential barriers against pan-European IDD prevention and monitoring programs and to find solutions for the different challenges.

Methods: We conducted a Delphi study consisting of three rounds. We identified potential participants with expertise and experience in relevant fields from all European countries, including policy makers, health care professionals, health scientists, and patient representatives. The Delphi method was conducted with open-ended questions and item ranking to achieve group consensus on potential barriers against national and pan-European IDD prevention and monitoring programs and related solutions to overcome those barriers. The answers of the Delphi rounds were analyzed using qualitative content analysis and descriptive analysis methods. In addition, we conducted two expert interviews to analyze and discuss the study results.

Results: Eighty experts from 36 countries and different fields of work participated in the first Delphi round, 52 in the second, and 46 in the third. Potential barriers include challenges in the fields of knowledge and information, implementation and management, communication and cooperation, political support, and differences between the European countries. Ranked solutions addressing these barriers include cooperation with different stakeholders, gaining knowledge, sharing information, the development of a European program with national specification, European guidelines/recommendations, and European monitoring. The ranking gives a first overview as to which of these barriers would need to be solved most urgently and which solutions may be most helpful.

Conclusion: In our study, we derived key information and first insights with regard to barriers against IDD prevention programs from a broad range of stakeholders. Most barriers were found in the category of implementation and management. Also a lack of political support seems to play an important role. The findings of our study may help decision makers in health policy to develop more effective IDD prevention and monitoring strategies.

Keywords: Delphi study, barrier analysis, prevention program, monitoring program, iodine deficiency disorders, salt iodization

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Introduction

IODINE DEFICIENCY IS one of the most prevalent causes of mental development disorders in children causing poor school performance and reduced work capacity. In addition, it can lead to impaired thyroid function, goiter, and other iodine deficiency disorders (IDDs) (1).

In Europe, mild-to-moderate iodine deficiency is very common. Approximately 30% of the world's population has an insufficient iodine intake (2). Individuals living in an iodine-deficient area are at higher risk of developing IDD (3), and may even have an increased risk of mortality and coronary heart disease (4).

Health promotion and disease prevention are defined priorities in many countries (5,6). At the same time, prevention programs for iodine deficiency receive only scant attention at the policy and public level. During the last 30 years, the number of countries with mandatory iodized salt programs has reached >100 due to sustained efforts by the World Health Organization, the United Nations Children's Fund, the Iodine Global Network (IGN), and other nongovernmental organizations (7).

Although substantial progress has been made in recent decades in eliminating iodine deficiency, it remains a significant health problem not only for developing countries but also for high-economy industrialized countries. In Europe, challenges remain due to fragmentation and diversity of preventive approaches between countries. In addition, already initiated programs for the prevention of IDD may not remain effective because of changes in the health care policy or commercial factors. Monitoring programs may be cost intensive and therefore often not continued over a longer period of time (8). However, the barriers against the implementation and continuation of the prevention and monitoring of IDD remain unclear.

This work was part of the EUthyroid project, a European Union (EU)-funded research project to evaluate current national IDD prevention programs and to provide evidence for a cost-effective harmonized approach for IDD prevention in Europe. The objective of our study was to identify potential barriers against pan-European IDD prevention and monitoring programs by establishing an expert panel with experts ranging from local politicians to medical practitioners and applying the Delphi method. In addition, we aimed to identify and prioritize solutions for challenges identified.

Methods

Our study included the following steps: (i) the Delphi method, (ii) identification and recruitment of experts for the Delphi Panel, (iii) Delphi rounds, (iv) qualitative and quantitative analysis, (v) expert interviews, and (vi) ethical aspects. The following sections describe these steps in detail.

The Delphi method

Several techniques have been introduced to achieve consensus among different groups of stakeholders on defined issues (e.g., Delphi technique, focus groups, or nominal group technique). For our study, the Delphi method was chosen because it is an accepted method in public health, and it has the advantage that a large number of experts can be included in the qualitative research. In addition, the method is independent of time and location, which was important for our project.

Initially, the Delphi technique was designed as a widely accepted method to achieve consensus of opinions based on real-world knowledge from experts within a certain field (9). It is established as a group communication process aiming to examine and discuss a specific question, for example in the field of policy investigation or to predict the occurrence of future events (10). Delphi techniques can also be useful to obtain a wide range of answers from a heterogeneous group of experts. We decided to apply the RAND/University of California Los Angeles Appropriateness Method (11), a modified Delphi method, including the possibility of discussing given answers within the different Delphi rounds, because this method is widely used in public health research for gathering data from individuals within their domain of expertise.

For our study, the Delphi method was conducted with open-ended questions (see below) and item ranking to achieve group consensus on potential barriers against pan-European IDD prevention and monitoring programs and related solutions to overcome those barriers.

Identification and recruitment of experts for the Delphi panel

For the identification and recruitment of experts for our Delphi panel, we used a Knowledge Resource Nomination Worksheet (12), including information on the disciplines or skills and the related organizations and/or professions, which gave insights into the issues of interest. We selected potential experts according to their field of expertise and their experience in this field. In addition, we searched for experts in all European countries to get a broad overview of topics that are relevant for the entire continent.

For our recruitment step, we sent invitations to all European and national health ministries, all national coordinators of the IGN, national agencies for health technology assessment (if available), national public health institutes (if available), and national patient groups in the field of IDD (if available). In addition, we included chairs and vice-chairs of societies and associations in endocrinology, clinical nutrition, of general and family practitioners and patient organizations in the field of IDD. The contact list for the Delphi panel recruitment was subject to adjustment by clinical, epidemiological, and political experts from the EUthyroid project.

Delphi rounds

Our study included three Delphi survey rounds. We developed and used online-based surveys (Google forms) for each Delphi round, which were specified and discussed with experts from the EUthyroid project and experts in qualitative research. Experts were contacted through e-mail and were asked to participate in our study. If the contacted person agreed to participate, we sent the link to the questionnaire or, if preferred, the paper-based version as a PDF file.

The first questionnaire was mainly based on open questions. Panel experts were asked to list potential challenges and suggestions for solutions when implementing a national or pan-European IDD prevention or monitoring program. Particularly, we included the following open questions:

- What do you think are/were relevant challenges for the implementation of a prevention program for IDD in your country?
- What do you think are relevant challenges for the implementation of a European-wide prevention program for IDD?
- What do you think are/were relevant challenges for the implementation of a monitoring program for the iodine status in your country?
- What do you think are relevant challenges for the implementation of a European-wide monitoring program for iodine status?
- What do you think are possible solutions for these challenges? (for all four categories)

In addition, experts were asked to rate the importance of IDD prevention and monitoring programs on a national and pan-European basis using a four-point Likert scale.

In the second Delphi round, this list of challenges and suggested solutions was sent back to all experts of the Delphi panel. They were asked to rate the challenges according to how important it was to solve these challenges (unimportant—slightly important—important—very important). The solutions were rated according to how helpful for the implementation of the different programs they would be (not helpful at all—slightly helpful—helpful—very helpful). The Delphi panel was also asked to add additional suggestions to the list of challenges and/or solutions, and to state whether they think that any of these challenges or solutions might be extremely important or, at the other extreme, unimportant.

In the third Delphi round, the ordinal ratings with medians and ranges were provided to all experts in the form of a ranking list, and they were asked to review and re-evaluate their own ratings. They were also asked for additional comments or suggestions for each category of challenges and solutions.

Qualitative and quantitative analysis

The answers of the first Delphi round were analyzed using qualitative content analysis, which is a form of systematically analyzing qualitative data (13). It is conducted in a step-by-step manner devising the text material in categories and subcategories according to the research question, which are carefully revised throughout the process. In our study, the categorized answers of the first round were used as a survey instrument for the second round of data collection.

We created an ordinal list for the rankings of challenges and solutions in one category. Challenge and solution categories were ranked according to the proportion of participants who rated the challenge important or very important and the solutions helpful or very helpful. Additional comments or suggestions of study participants were analyzed using qualitative content analysis. If new categories or subcategories were identified, they were added to the list.

In the third Delphi round, comments or suggestions of study participants were qualitatively summarized using qualitative content analysis (13).

Expert interviews

After the Delphi study process, we conducted two interviews with experts in the field of IDD prevention and endocrinology (Prof. Henry Völzke, MD) and public health ethics (Prof. Georg Marckmann, MD, MPH) to discuss the results of the Delphi study. The following open questions were answered by these experts in a semistructured interview:

1. If you look at the results of our Delphi study, which results did you expect? Why?
2. If you look at the results of our Delphi study, which results were unexpected to you? Why?
3. What do you think are the most relevant (ethical) aspects to discuss, if you think of a mandatory population-based prevention program (e.g., fluoridation of drinking water)?
4. What do you think about the iodization of salt as prevention program for IDD?
5. If you would need to conduct a public health concept for the prevention of IDD in Europe, which aspects should be discussed from your perspective? What would be your position in the discussions?

Ethical aspects

Ethical approval was obtained from the Research Committee for Scientific and Ethical Questions of University for Health Sciences, Medical Informatics and Technology in Hall in Tirol, Austria.

Informed consent was obtained from all study participants. They were informed that their participation would be voluntary, and that they could discontinue and terminate filling in the questionnaire any time by closing the browser window or ceasing to answer the questions of the interview. Participants were informed that—due to the content of the survey—it might be possible to trace data provided directly or indirectly to individuals, but that it is not the objective of the current survey to collect or analyze personal data.

Collected data were only processed for research purposes and will be protected according to European data protection standards (protection of data from unauthorized access, confidentiality obligation for staff members, who have access to data, anonymized publication) (14). Participants were also informed about their right to access the data they provided or to restrict the further processing of the data they provided, and that primary data will be stored for $\sim$10 years in a secure way.

Results

Delphi study

Our Delphi panel expert identification process provided 393 potential experts. All 393 individuals were invited through e-mail to participate in the Delphi study. Up to two reminder letters were sent if experts did not answer the first e-mail. After closure of the recruitment process, a total of 94 experts, which reflects a response of 23%, agreed to participate and received the link to the three online questionnaires. Eighty participants answered the first online questionnaire (response rate of 85% based on the group of persons, who agreed to participate), 52 experts (response rate of 65% based on the first-round participants) replied to the second, and 46 experts (response rate of 88% based on the second-round participants) replied to the third questionnaire.

Our study comprised of experts from 36 countries, including Germany, Norway, Spain, Sweden, Hungary, Ireland,

Table 1. Response Analysis Based on the Field of Work of Participants

Field of work	*Participation requested*	*First Delphi round* n *(%) response*	*Second Delphi round* n *(%) response*	*Third Delphi round* n *(%) response*
Endocrinology	71	27 (38)	18 (67)	16 (89)
Nutrition sciences	69	18 (26)	9 (50)	9 (100)
Public health/Epidemiology	61	12 (20)	12 (100)	11 (92)
Health technology assessment agencies	82	6 (7)	3 (50)	2 (66)
General/Family practitioner	43	10 (23)	5 (50)	5 (100)
Patient representatives	29	5 (17)	3 (60)	1 (33)
Health policy/Health ministries	38	2 (5)	2 (100)	2 (100)
Total	393	80	52	46

Percentages of round two and three refer to the participation in the round before.

Italy, Macedonia, Netherlands, Serbia, Switzerland, United Kingdom, Austria, Belgium, Bulgaria, Cyprus, Estonia, France, Latvia, Lithuania, Luxembourg, Poland, Romania, Russia, Slovakia, Ukraine, Belarus, Bosnia and Herzegovina, Croatia, Czech Republic, Denmark, Greece, Iceland, Israel, Montenegro, and Portugal. The different fields of work of the study participants are summarized in Table 1. In addition, we analyzed the response rates of participants based on their field of work. The work field-specific response rate in the first Delphi round ranged from 5% to 38%. In the second Delphi round, the work field-specific response rate ranged from 50% to 100% of the total number of participants in the first Delphi round. The response rate in the third Delphi round ranged from 33% to 100% of the total number of participants in the second Delphi round.

More than 92% of the experts rated a national IDD prevention program important or very important, and 95% of the experts considered a pan-European IDD prevention program important or very important. A national monitoring program was valued as important or very important by >93% of the experts. A pan-European monitoring program was rated to be important or very important by >92% of the study participants (Fig. 1).

We found challenges for the implementation of national prevention and monitoring programs in the following categories: knowledge and information, implementation and management, and cooperation and communication. The categories for challenges for the implementation of a pan-European prevention program were as follows: differences between the countries, political support and implementation and management. The ratings for the different subcategories within each category for barriers and suggested solutions for the implementation of a national prevention and monitoring program are shown in Tables 2 and 3. Ratings for subcategories within each category for barriers and suggested solutions for the implementation of a pan-European prevention and monitoring program are shown in Tables 4 and 5.

In the first round, we found that a large number of experts mentioned that a pan-European IDD prevention and monitoring program would not be necessary, and/or that national or regional approaches would be sufficient. Therefore, in the second round, experts were asked, if they would agree with the following statement: no European program needed, national and regional prevention and monitoring programs are sufficient. Half of the experts did not agree, while 37% partly agreed and 13% agreed with the statement. Additional issues mentioned by single experts in the open spaces for further discussions were as follows:

- Ethical aspects need to be considered when implementing a mandatory program.
- Even if a mandatory program is available, legislation can be unenforceable due to a lack of control.
- There is a lack of a public discourse in Europe about the problem of iodine deficiency.

Expert interviews

In additional interviews, Henry Völzke, MD, Head of the Department of Study of Health in Pomerania/Clinical Epidemiological Research and coordinator of the EUthyroid project, stated that the subcategory ''lack of scientific evidence on effectiveness and safety of IDD prevention programs'' needs to be addressed. Decision-analytic modeling studies could be a helpful tool to provide systematic and evidence-based information on the long-term effectiveness and cost effectiveness of IDD prevention and monitoring programs.

In addition, he focused on the subcategory ''political support for the implementation and management of prevention and monitoring programs.'' Political authorities have to accept their responsibility in this context. He stated that focusing on specific risk groups (e.g., pregnant women) is a good communication strategy. Völzke also indicated that differences between regions can be compensated for by global public health programs (e.g., in Germany). However, regional differences may play an important role for some countries and may need specific information campaigns, a slow increase of the iodine content, and IDD monitoring programs.

Völzke also talked about ethical aspects of a population-based prevention program. Even if an IDD prevention program reduces the risk of IDD in the general population, some individuals are still at risk of developing iodine-induced disorders, such as hyperthyroidism. This effect may even be enhanced by a fast introduction of an IDD prevention program or an excessive increase of the iodine status. In the discussion about ethical aspects, the communication of harms was identified as most important issue. Another important subcategory was the ''involvement of and cooperation with different stakeholders.'' One of the most important stakeholders might be the food processing industry. Public

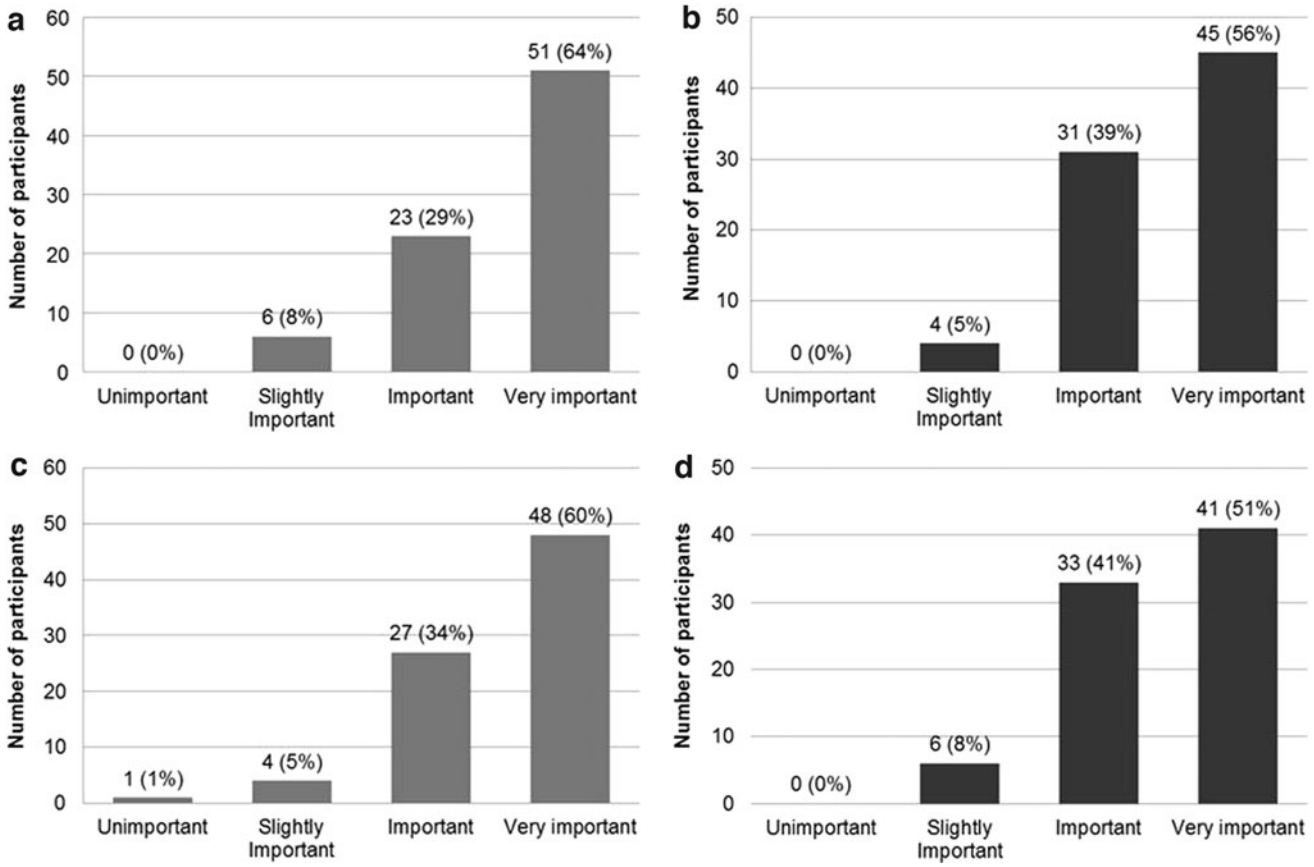

FIG. 1. Rating of the importance of national and pan-European prevention and monitoring programs. **(a)** Rating of the importance of a national IDD prevention program. **(b)** Rating of the importance of a pan-European IDD prevention strategy. **(c)** Rating of the importance of a national IDD monitoring program. **(d)** Rating of the importance of a pan-European IDD monitoring program. IDD, iodine deficiency disorders.

TABLE 2. BARRIERS FOR THE IMPLEMENTATION OF A NATIONAL PREVENTION AND MONITORING PROGRAM

Ranking	*Subcategory*	*Participants who rated this challenge (very) important (%)*
Category: Knowledge and information		
1	Lack of scientific evidence on effectiveness and safety of prevention programs	94
2	Little knowledge/awareness/interest of politicians/doctors/general population	75
3	Specific dietary preferences	52
4	Fear of mandatory prevention program	52
Category: Implementation and management		
1	Lack of coordination/leadership of the program	88
2	Lack of adequate, harmonized measures for IDD monitoring	87
3	Lack of funding/resources	85
3	Difficulties to successfully maintain a prevention program	85
4	No (harmonized) guidelines available	83
5	Lack of regulation of iodine content in different products	63
6	Heterogeneity within a country (e.g., socioeconomic status, iodine status)	62
7	Lack of availability of iodized salt	58
Category: Cooperation and communication		
1	Lack of political support	88
2	Lack of cooperation with stakeholders (food industry, patients, pharmaceutical industry, scientists, etc.)	87
3	Lack of promotion/information campaigns or a successful communication strategy	81
4	Low participation in monitoring studies	65

IDD, iodine deficiency disorders.

Table 3. Suggested Solutions for the Implementation of a National Prevention and Monitoring Program

Ranking	*Subcategory*	*Participants who rated this solution (very) helpful (%)*
1	Involvement of and cooperation with different stakeholders (governments, experts, industry, gastronomy, media, primary care doctors, public organizations, patient organizations)	96
2	Gain knowledge and share information (e.g., education, promotion, effectiveness studies, national registries, studies on mild iodine deficiency)	92
3	Focus on specific risk groups	88
3	International cooperation (e.g., inclusion of international expertise, good-practice examples from other countries)	88
4	Search for (independent) funding possibilities	85
4	Implementation of mandatory prevention and monitoring program	85
4	Develop organizational structures (e.g., working groups, commissions, harmonize laboratories, implementation of screening programs, incorporate iodine status in national health surveys, quality assurance)	85
5	Develop and use management tools (e.g., harmonized measures, guidelines, methods for IDD monitoring)	79
6	Use different iodine sources	69

authorities could support the development of this infrastructure. According to Völzke, the following issues would need to be discussed for planning a public health program for the prevention of IDDs in Europe:

1. A European health survey including the iodine status and monitoring of IDD.
2. Basic European recommendations, for example, on iodine content in table salt or processed food products, to harmonize and open the European market.

In general, there was agreement with Völzke and the other experts on the importance of national and international IDD prevention and monitoring programs. He questioned whether a mandatory IDD prevention program would be the optimal choice. More research is needed to clarify the question, since there is no sufficient evidence of a higher efficacy with a mandatory IDD prevention program as compared with a voluntary program.

In the second expert interview, Prof. Georg Marckmann, MD, MPH, Head of the Institute for Ethics, History and Theory of Medicine at the Ludwig-Maximilians-Universität Munich, commented on the subcategories ''Lack of scientific evidence on effectiveness and safety of prevention programs'' as well as ''Little knowledge/awareness/interest of politicians/doctors/general population of an IDD prevention program.'' In his opinion, these two categories were the most relevant barriers and basic aspects for the implementation of IDD prevention and monitoring program. The evaluation of effectiveness and safety would also be the first step of an extended ethical evaluation. He stated that the benefit–harm

Table 4. Barriers for the Implementation of a Pan-European Prevention and Monitoring Program

Ranking	*Subcategory*	*Participants who rated this challenge (very) important (%)*
Category:	Differences between the countries	
1	Differences in legislation/organization/society/culture/size	83
2	Differences in iodine source and intake/dietary preferences/iodine deficiency/monitoring laboratories public awareness	81
3	Differences in health care systems/costs/information systems	75
Category:	Political support	
1	Lack of support from governments	96
2	No responsibility/regulation/leadership of the EU	87
Category:	Implementation and management	
1	Difficulties to maintain a successful prevention and monitoring program	92
2	No knowledge about the iodine status of the different countries	81
3	Lack of pan-European monitoring	79
4	Difficulties to harmonize measurements	69
5	Lack of quality assurance	65
6	Difficulties to centralize laboratories for monitoring	63
6	Not compatible with existing dietary/prevention programs (e.g., salt reduction program, drinking water fluoridation)	63
7	Difficulties to gain a representative sample for Europe	62
8	Not compatible with free trade agreement	50

EU, European union.

Table 5. Suggested Solutions for the Implementation of a Pan-European Prevention and Monitoring Program

Ranking	*Subcategory*	*Participants who rated this solution (very) helpful (%)*
1	Develop European program with national specification	94
2	Develop European guidelines/recommendations	90
2	Implement European monitoring/National monitoring with reporting to EU	90
3	Cooperation between countries (e.g., multinational surveys, international consensus statement, international research projects)	88
4	EU funding for national prevention and monitoring programs	85
5	Accreditation/Certification of laboratories	79
6	Transfer responsibility to the EU	52

ratio of a population-based prevention program would need to be considered before any other aspect.

''Lack of coordination'' and ''lack of political support'' were also understandable barriers for Marckmann from his implementation experience in public health. Results of our analysis would also be transferable to other public health programs in terms of barriers for the implementation, he said. He added that, for a mandatory program, the need for legitimacy would be particularly important. Therefore, a population-based prevention program can only be provided with appropriate political support and the implementation of political legitimization.

In addition, Marckmann would have expected that the fear of a mandatory IDD prevention program would be seen as a greater barrier. However, he indicated that the relevance of this argument strongly depends on the benefit–harm balance. For Marckmann, the clarification of the benefit–harm ratio and the cost-effectiveness ratio of salt iodization compared with other strategies needed to be addressed to plan a public health initiative. In his opinion, mandatory programs without an opt-out option are only ethically acceptable if programs without compulsion or with opt-out option have already failed. The lower the harm potential and the greater the benefit, the more a mandatory program is justifiable. In addition, a population-wide prevention program should be implemented in a fair political decision-making process, especially if the program is mandatory or without an opt-out option.

In general, Marckmann pointed out that the implementation of an IDD prevention and monitoring program requires a full ethical analysis, at least including an analysis of the trade-off between the benefits and the harms of such a program. From an ethical point of view, other implementation barriers would not need to be addressed, if benefits would outweigh the harms. In his opinion, the discussion of barriers for the implementation would also require implementation expertise to answer the question: Which strategies are successful in achieving specific public health goals?

Discussion

In our Delphi study, we evaluated the barriers against national and pan-European IDD prevention and monitoring programs as well as possible solutions. To date, there has been no knowledge of the reasons for not implementing or continuing a national or pan-European IDD prevention strategy. We found that possible barriers include challenges in the fields of knowledge and information, implementation and management, communication and cooperation, political support, and differences between the European countries. Solutions addressing these barriers were suggested by the experts. The ranking of solutions gives a first overview as to which of these barriers would need to be solved most urgently and which solutions may be most helpful to address them.

Focus on specific risk groups was named as one of the most helpful solutions for the implementation of national IDD prevention programs. Iodine deficiency in vulnerable groups, for example, pregnant and lactating women, is a critically important feature in $\sim$21 European countries where iodine status of the general population is sufficient (15). Therefore, a national program should include specific prevention strategies for these groups.

There are various publications in the field of public health ethics on the evaluation of ethical aspects which need to be considered for the implementation of a population-based prevention program [e.g., Marckmann *et al.* (16); Barrett *et al.* (17); Saarni *et al.* (18,19)]. Public health ethics aims to provide a normative guidance in the field of public health for ethical decision making (20). Normative frameworks for this issue are usually based on general ethical theories such as the utilitarianism based on the principle of utility maximization, the Kantian ethics based on the categorical imperative or the coherentism, a reflective equilibrium of theoretical assumptions, moral principles, and judgments (16,21).

Most health care professionals and health scientists are aware of the four bioethical principles for ethical evaluation described by Beauchamp and Childress, including autonomy (right to self-determination, independence, and freedom), justice (fairness and equity), beneficence, and nonmaleficence. They are widely recognized as a set of moral principles for the field of biomedicine based on the coherentist model of justification (22).

However, in the field of decision making in public health, the consideration of ethical aspects is very complex, and they may or may not match with political priorities (23). This means that these principles need to be adapted and extended. There are conflicts with regard to rights and values that can occur from a tension between individual and community interests or because of availability of resources. Therefore, normative frameworks in the field of public health ethics aim to support decision making in the field of public health.

According to Marckmann *et al.* (16), different ethical aspects need to be taken into account when deciding on the

implementation of a public health intervention (e.g., a mandatory population-based prevention program) (16). Barret *et al.* describe similar aspects in a three-step approach for ethical evaluation (17). The following issues are raised for the ethical evaluation of a public health program among others: What are expected health benefits, risks, and harms of the intervention for the target population? How does the intervention affect the autonomy of the individuals in the target population? Are benefits and burden equally distributed in the target population? What are the costs and opportunity costs of the intervention? What is the scope and legitimacy of legal authority? Is the action necessary? What is the social, cultural, historical, and moral context? Is there a less restrictive public health action available? What are the moral norms and claims of stakeholders? (16,17).

Some of these issues were found in the answers of the Delphi panel. Therefore, a comprehensive ethical evaluation of an IDD prevention program may be needed to overcome barriers against the implementation or continuation of an IDD prevention program.

A pan-European IDD prevention strategy strongly depends on the legal authority of the EU. However, countries within the EU hold primary responsibility for organizing and delivering health services and medical care. The EU health policy therefore supports national policies with the aim to protect and improve the health of EU citizens, serve the modernization of health infrastructure and to improve the efficiency of Europe's health systems. The EU can influence the national policies through the European Commission by proposing legislation, providing financial support, coordinating and facilitating the exchange of best practices between EU countries and health experts and health promotion activities (24). Therefore, the European Commission could help overcome many barriers by providing their support.

To our knowledge, this study is the first to evaluate barriers against the implementation of a national or pan-European IDD prevention program. However, our study has several limitations. The composition of the expert panel in this study comprised of a heterogeneous group, including experts from different countries in Europe and different fields of work. In many Delphi studies, a homogeneous group of experts in a specific field is organized, aiming to provide a high level of expertise input (9). However, due to a wide range of possible barriers against an IDD prevention program depending on different social, economic, and cultural dynamics, a heterogeneous group provides the opportunity of obtaining a broader view in the European context.

We only invited a few specific experts, for example, chairs and vice-chairs of European and country-specific societies and associations in endocrinology and (clinical) nutrition, to participate in our Delphi study. This is a limitation, since there are multiple experts in the different fields and different countries. However, our aim was to use a structured, reasonable, and consistent method for the recruitment of experts. The contact list for the Delphi panel recruitment was reviewed by clinical, epidemiological, and political experts from the EUthyroid project.

Nonrespondents are a common challenge when conducting a Delphi study (25). We tried to actively motivate the experts to maintain robust feedback throughout the process by initiating a first personalized contact to request participation, using different forms of question formats and several follow-up and reminder strategies (25). However, we faced decreasing responses in the consecutive Delphi rounds. Therefore, the validity of the information obtained could be affected. It is not possible to generalize the results for Europe, a single country or a group of experts. Nevertheless, the results of our study can be considered as the first benchmark of the barriers and solutions to implementation of IDD prevention and monitoring programs. The current findings also could be useful for issues to address in future research.

The results of our study, especially the solutions for the different challenges, are formulated in a general manner. Therefore, it can be difficult to derive tangible recommendations from these results with regard to how barriers can be overcome. However, our study identified important issues with respect to barriers and possible solutions for the implementation of national and pan-European IDD prevention and monitoring programs. Further research should be conducted to find out more about specific barriers in each country and to discover and develop individual solutions. Future studies should focus on specific countries and groups of experts from one specific working area. In addition, it would be important to focus on decision makers and opponents of IDD prevention.

In summary, we derived key information and the first insights with regard to barriers against IDD prevention programs from a broad range of stakeholders, including policy makers, health care professionals, health scientists, and patient representatives. The Delphi technique allowed us to identify a broad overview of possible barriers in the different countries and fields of work. The results raise awareness of challenges and possible solutions for the implementation of national and pan-European IDD prevention and monitoring program.

Most barriers were found in the category implementation and management. Also a lack of political support, a lack of scientific evidence on effectiveness and safety of prevention programs, and differences between the countries may play an important role. This information may help decision makers in health policy to develop IDD prevention strategies. An important next step is to share this information with European and national policy makers. In addition, it may be helpful to conduct similar studies in each country to discover country-specific barriers and develop individual solutions. For recommendations regarding the implementation of an IDD prevention and monitoring program, a comprehensive analysis of benefits and harms of such a program would be required.

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