The Prevention of Thalassemia Revisited: A Historical and Ethical Perspective by the Thalassemia International Federation

Michael Angastiniotis, Mary Petrou, Dimitrios Loukopoulos, Bernadette Modell, Dimitrios Farmakis, Panos Englezos & Androulla Eleftheriou

To cite this article: Michael Angastiniotis, Mary Petrou, Dimitrios Loukopoulos, Bernadette Modell, Dimitrios Farmakis, Panos Englezos & Androulla Eleftheriou (2021): The Prevention of Thalassemia Revisited: A Historical and Ethical Perspective by the Thalassemia International Federation, Hemoglobin, DOI: 10.1080/03630269.2021.1872612

To link to this article: https://doi.org/10.1080/03630269.2021.1872612

Published online: 18 Jan 2021.
The Prevention of Thalassemia Revisited: A Historical and Ethical Perspective by the Thalassemia International Federation

Michael Angastiniotis, Mary Petrou, Dimitrios Loukopoulos, Bernadette Model, Dimitrios Farmakis, Panos Englezos and Androulla Eleftheriou

Thalassaemia International Federation, Nicosia, Cyprus; Institute of Women’s Health, University College London, London, UK; National and Kapodistrian, University of Athens Medical School and Biomedical Research Foundation of the Academy of Athens, Athens, Greece; WHO Collaborating Centre for Community Genetics, Centre for Health Informatics and Multiprofessional Education (CHIME), University College London, London, UK; University of Cyprus Medical School, Nicosia, Cyprus

ABSTRACT
Hemoglobinopathies are the most common monogenic disorders in humans; among them, thalassemia constitutes a serious medical and public health problem in high prevalence regions, in a geographical zone ranging from the Mediterranean Basin to China. In addition, migrations over the years have introduced thalassemia to many parts of the world. Although disease-specific programs are in place and accessible to most patients in prosperous countries, this is not the case in developing economies, where more than 75.0% of the patient population is born and lives; this concerns both prevention and treatment programs. In view of the significant improvements in public health and healthcare systems over the past few years, the Thalassemia International Federation has revisited the thalassemia prevention programs, initiatives and policies in some of its member countries, discussing their effectiveness and whether any changes in policy or public attitudes to thalassemia prevention have occurred through the recent years.

Introduction
The Thalassemia International Federation (TIF) is a patient-oriented nonprofit, non-governmental umbrella federation, with 232 member organizations from 64 countries across the globe. The TIF adopts and advocates the position of the World Health Organization (WHO) that a genetic control program should be an intrinsic part of national health care systems encompassing the components of prevention, clinical management and social care.

In this article, TIF revisits the thalassemia prevention programs, initiatives and policies in some of its member countries since, having the largest experience on prevention strategies, this disorder constitutes the main focus of its work. It discusses their effectiveness and whether any changes in policy or public attitudes to thalassemia (in particular) prevention have occurred through the years, in view of the significant improvements in patient outcomes, public health (including prevention of communicable diseases) and healthcare systems. An effort will be made to answer the following questions: (i) has the improved prognosis, due mainly to the increasing use of oral chelating agents, the improved monitoring, the provision of multi-disciplinary care and the expectations of new innovative drugs and curative therapies, influenced the public health decision makers and/or the attitude of the public-at-large with respect to prevention of thalassemia? (ii) Are public awareness, screening, genetic counseling and prenatal diagnosis (PND) still recognized and considered as essential components of an effective prevention program? (iii) Are these principles and the essential elements of national coordination and funding, which aim at the reduction of birth incidence, still regarded as the main pillars of an effective prevention program and is the possibility of an increasing birth incidence in countries where optimal care is available, for example, a real one?

Hemoglobin (Hb) disorders are a group of hereditary anemias which, without lifelong optimum care, may be lethal, often in early childhood. In high prevalence regions of the world, they constitute a serious medical and public health problem. In a zone ranging from the Mediterranean Basin to China, as well as Africa, these conditions are prevalent in the indigenous populations. However, migrations over the years have introduced them to many parts of the world, especially to the more prosperous western world [1]. Patients receive varying levels of care, according to national policies and priorities. Optimal care is defined as the application of clinical and laboratory approaches that are validated at a given period of time, and which may change as new practices are adopted.

Over the years, advances in clinical care have changed the prospect for survival and quality of life (QoL) [2,3]. The accumulation of experience and knowledge particularly of the Southern Mediterranean countries in the last 2–3
decades, have led to the publication, initially by the WHO (in 1993) and later by TIF (in 1996) and others, of guidelines for both management and prevention of thalassemia [4,5]. To date, guidelines for the prevention of thalassemia are encompassing the same elements as those identified in the 1970s, mainly by the countries of the Southern Mediterranean Region using the guidelines of the WHO and the expert Hb groups established by the WHO in the 1980s. In developing economies, however, where more than 75.0% of the patient population is born and lives, optimum care cannot be and is not provided. Only a very small percentage of patients (TIF estimates this is less than 10.0% of the global patient community) in these countries has access to what is today referred to as optimal care. Limiting care to ‘what is possible’ will only result in the development of medical complications, a variety of comorbidities and premature death of patients, in their teens or early adulthood, who have lived the life of a chronic invalid. Such a situation, in addition to being characterized as a strong violation of human rights, is an additional burden to the health economy, as all resources offered to the patients are lost/wasted before the patient can achieve any QoL and be able to work as an independent member of society.

**Historical aspects and general principles**

Historically, the steps toward better management dates back to the 1960s when blood transfusion became increasingly used [6], and iron chelation was recognized as an essential component of treatment [7]. Over the ensuing years, these basic modalities of care have been optimized and new oral iron-chelating agents have been introduced. Increased survival led to the recognition of multi-organ damage due to transfusional iron overload and toxicity and the need for a multi-disciplinary approach to clinical management. In addition, psychosocial aspects were recognized and community support was introduced. This increasing complexity of patient care required increasing resources and demands on health systems, especially felt in high prevalence countries. Reducing birth incidence as a means of reducing the public health impact and persuading health authorities to provide optimal care and saving resources, hopefully for the benefit of affected patients, became imperative. The willingness to invest in treatment was and still is, in many settings, limited by the lack of in-depth knowledge of the real needs of these conditions by the health authorities. In addition, perceived ‘other’ priorities, such as infectious diseases, have been put forward as a reason for avoiding effectively addressing the issue of congenital disorders. Over and above this, the lack of precise epidemiological data has continued to sustain the view that these are rare disorders, with a low health burden and public health significance.

The importance of comprehensive control programs was recognized as early as the 1950s when Silvestroni and Bianco [6] in Italy, recommended to the High Commission for Hygiene and Health in 1955 the provision of free medical care for patients and the establishment of large-scale screening and preventive counseling programs [8]. Lack of public and professional awareness was a limiting factor along with the fact that counseling for at-risk carrier couples was all that was available. However, the dreadful clinical picture experienced in those early years, the uncertain prognosis and the projection of an ever-increasing number of new cases as life expectancy was improving with better care, led health authorities and medical specialists to adopt and implement a program of prevention of new affected births in some high prevalence countries. This gave at-risk couples the option of avoiding an affected birth.

The first attempts at large scale and national prevention were adopted by Italian provinces, Greece and Cyprus from the 1970s [9–12]. These have served as an inspiration for other high prevalence countries, to formulate their own programs. Later, PND was introduced and became an additional choice for couples [13].

Support for these programs also came from the WHO, which formed a Working Group in the 1980s that, in one of its first meetings, stated: “a genetic control programme is an integral strategy combining the best possible patient care with prevention through carrier screening, genetic counseling and the availability of prenatal diagnosis” [14]. Further to this, through its resolution of May 2006, WHO urges member states to “design, implement, and reinforce in a systematic and effective manner, comprehensive national, integrated programmes for prevention and management of thalassemia, including information and screening. Such programmes being tailored to specific socioeconomic and cultural contexts aimed at reducing incidence, morbidity and mortality.” These programs were developed in accordance with fundamental principles of genetic counseling [15,16]: autonomy of the individual or couple, the right to full information and strict confidentiality. The aim was to allow involved couples to make ‘informed choices’ concerning marriage and reproduction, according to the information provided by the professional offering counseling. For all the above reasons, voluntary avoidance of new births affected by thalassemia has been gradually accepted by several national thalassemia policies.

The aim of this article is to discuss whether any changes in policy or particularly, public attitudes on thalassemia prevention have actually changed, in view of the improvement in patient outcomes that have been seen in recent years. Has the improved prognosis, due mainly to the increasing use of oral chelating agents, the improved monitoring [4], the multi-disciplinary care and the expectation of new, possibly curative therapies, such as gene therapy and new drugs to reduce blood transfusion requirements [17], influenced carrier couples to continue with affected pregnancies? The possibility of an increase in birth incidence of affected births in countries where optimal care is available is a question to be debated. Indeed, currently, because of the implementation of complex but comprehensive clinical management, which now includes early detection and effective management of complications, patients are surviving into their seventh decade [18–20]. These good outcomes hold true in high income settings but are variably achieved in several middle- and low-income countries, where governmental policies have
The free informed choice of ‘at-risk couples’ is the guiding principle in any programmed system of control presented to a population at risk, adequate and accurate information being provided. Community awareness and the quality of genetic counseling have a significant impact on parental choices. All at-risk couples are presented with the same choices in premarital and preconception screening and need the appropriate counseling in order to proceed to their own ‘informed’ decision (Table 1).

These are significant choices affecting both choice of partner, marriage and building a family. Thus, planning a service requires that these considerations are addressed. Where policies have been implemented, further to the key component of national approval, support and coordination, the main strategies adopted by national programs that have shown success and effectiveness include: (i) a national policy on prevention that indicates national approval, control and support; (ii) a public awareness program; (iii) a screening program to identify carriers; (iv) genetic counseling services; (v) PND as a choice for at-risk couples; (vi) preimplantation diagnosis (PGD); (vii) new emerging technologies, such as non-invasive PND.

The difficult choices faced by at-risk couples make the quality of information and counseling of utmost importance and this falls below expectation in many settings [21]. Cultural differences across the world have resulted in a variety of practices, which must be considered [22] and understood when ethical considerations are discussed. Consanguineous marriage is common in most countries of the Middle East, where the β-thalassemia (β-thal) carrier rate is also high. Termination of pregnancy has a variable acceptance across many cultures and individual couples may even differ between themselves. The acceptance of PGD over PND, and possible termination of pregnancy, has had limited utilization in many settings due to cost and complexity. If non-invasive PND becomes feasible, it may also have a poor uptake across the world because of the continuing need for pregnancy interruption. All these factors suggest the conclusion that a single policy on prevention cannot be universally accepted in view of the diversity of cultures, services offered and the patient clinical outcomes that are experienced in various settings.

The thalassemia-affected patient journey in each setting is a factor that influences public responses to prevention. To date, limited information exists on the quality of care across the world and even less on patient outcomes, including both morbidity and mortality, especially in developing economies. This requires the establishment of national patient registries [23], which in fact very few countries keep. If the aim is to encourage health authorities to review their policies, and address unmet needs within their communities, then reduction in birth incidence cannot be an isolated policy. It must, at the same time address the unmet needs of patients, who now, with good quality care, have the chance to return any investment in their care by becoming productive members of society.

When considering the reduction of new affected births as a policy, the element of autonomy of the couple is vital and is based on ‘informed choice’ that depends on accurate unbiased information [24]. The extent to which this is adhered to cannot be quantified when looking at an overview of national policies. The objective of such policies is not always clearly stated by health planners but ultimately, they offer the chance for reduction of affected births. How this is achieved, the contribution of carrier screening, the acceptability of pregnancy interruption and other measures, will vary from country to country and from culture to culture. The efficacy of the prevention programs is most often evaluated by the reduction of affected births and no doubt, a number of countries, mainly those with high incidence of β-thal, have already achieved a significant decrease of the birth of children with the disease. However, control of a disease is ultimately a reduction in suffering, so affected patients and family outcomes must be the ultimate aim.

Patient care leaves much to be desired in most of the world. Moreover, new therapies are emerging, which, due to cost, will only reach a minority of patients in the developing world. Thus, suffering and premature death are still a reality in the twenty-first century. Universal coverage has yet to reach most of the global population. In a picture of inequity in care, the reduction of affected births cannot be regarded as an outdated philosophy.

Public awareness

One aspect that is a major factor in any public health policy is adequate preparation of the public through an effective education/raising awareness policy [25]. The real impact of this is difficult to adequately assess, as there may be policies and actions in place, but whether they effectively reach the public can only be assessed through questionnaires. For example, in Oman [26], 36.0% of married participants in a survey, who reported that they did not volunteer for a premarital test, gave ignorance as the reason, while another 13.0% did not know where to go for the test; among other reasons, in 6.0% there was lack of knowledge of the partner’s status before marriage. Most of them believed that a premarital test is necessary but 30.0% were not in favor of taking it, even though 50.0% agreed to make the test compulsory. The situation in Oman is mirrored in other countries. In Malaysia [27], in 70.0% of families in which a thalassemic child was born, neither parent was aware of their carrier status until their child’s diagnosis; while in other cases, they did not receive accurate information or support for PND and the termination option. Of the 38 parents interviewed, 20 (52.6%) indicated that they would terminate an affected pregnancy. Notably, 52.2% of Muslims supported termination. Likewise, in Saudi Arabia [28], of 920 students, 445 (48.0%) had never heard of thalassemia and despite the
mandatory premarital testing for thalassemia, only 50.0% of married students stated having heard of the disease. These are failures in communication and in the policies adopted (or not adopted) to reach out to the communities, and constitute examples of the many situations across the world. One often hidden agenda in many cultures is the fear of stigmatization, reducing the chance of being a good choice in the marriage ‘market.’ This issue is ignored in health education campaigns and will take much time, even years to overcome, in some societies [29,30]. Lack of population awareness, cultural and religious factors, the element of stigmatization and marriage practices differing widely across the world, therefore, greatly influence the acceptance of genetic prevention. A dialogue with the public has been an essential component of programs, such as the one practiced in Cyprus and other countries [31].

Counseling

Information to the public must be supplemented by individually informing the at-risk couple in a counseling session, or even better, in a series of counseling sessions. To offer as many ‘choices’ as possible carrier detection should be before conception; the timing of screening is thus of great importance [30]. In areas where thalassemia is of low prevalence, reaching out to the at-risk population is difficult and screening in early pregnancy has been adopted, thus limiting the choices of the parents to either accepting an affected child or proceeding to PND and to possible termination of an affected pregnancy [32]. The difficulties of conveying correct, reliable, updated and understandable information to couples was recognized early, and not only in the case of hemoglobinopathy prevention [33]. “Learning during genetic counseling often falls below expectations as revealed by objective observations after counseling” [32].

One important question is the quality of counseling and who, with what qualification and/or prior training, is offering the service. Rowley et al. [21] compared the ‘efficiency’ of the program if the counseling was offered by ‘primary’ providers compared to ‘tertiary’ providers. They used indicators such as: (i) the proportion of β-thal births after counseling; (ii) the knowledge of both partners at-risk after counseling, and (iii) whether the individual counseled brought his/her partner to be tested. The two groups differed only in the case of bringing the partner to be tested. However, the similarity in the effectiveness may be because the study was preceded by a training session so that the primary group were made familiar with a ‘counseling protocol.’ In the real world, hemoglobinopathy counseling is not offered by trained tertiary professionals. Especially in large, high-risk populations, such counselors are scarce and usually concerned with rare hereditary conditions, while Hb disorders are left to clinic doctors, nurses and laboratory personnel who know the condition but are not trained in counseling. In some cultures, directive counseling is the norm.

The situation in the early days of screening in Cyprus, in an analysis of the causes of 55 children born with thalassemia despite an ongoing screening campaign, indicated that parents were not advised to go for testing (49.0%), or neglected to be screened (13.0%), or were given the wrong advice (13.0%) (usually by an obstetrician), or presented late in pregnancy (16.0%) and 9.0% were screening laboratory errors [8]. This is still the situation in many high prevalence countries across the world, where poor counseling, due to inexperience and/or lack of training, is added to the challenges.

In a recent publication [34], there were only 7000 professionals globally, and of these, only 350 were in the high prevalence countries of Asia; these countries include 1.6 billion population with countless genetic conditions and with an annual anticipated thalassemia and sickle cell disease births of around 25,000 and 20,000, respectively. Therefore, the possibility of having professional counselors for hemoglobinopathy prevention is very small. Counseling services that are based on internationally accepted principles are the basis of in-depth information for at-risk couples and lead to really informed choices. The global lack of trained counselors is a major obstacle to quality counseling, albeit this does not mean that genetic counselors should always be employed. The professionals (doctors, nurses), social workers and others who do counsel in real life should be trained before being permitted to assist people in understanding the implications of their risk and presenting them with choices.

Cultural influences

Most Islamic countries, particularly in the Arab world, practice mandatory premarital screening. To a great extent, this is due to the fact that termination of pregnancy is not allowed by civil law in some countries, even though according to religious law, expressed in various theological opinions (fatwa), termination is acceptable up to the first 100–120 days of pregnancy [35]. For these reasons,

Table 1. Choices available to at-risk couples for the prevention of thalassemia.

<table>
<thead>
<tr>
<th>Identified Risk</th>
<th>Choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before marriage or pregnancy</td>
<td>1. Avoid marrying another carrier</td>
</tr>
<tr>
<td></td>
<td>2. Separate from a relationship that puts their future children at risk</td>
</tr>
<tr>
<td></td>
<td>3. Marry the chosen partner despite knowing the risk</td>
</tr>
<tr>
<td>After marriage or cohabitation</td>
<td>1. Proceed with a pregnancy accepting the risk of an affected child</td>
</tr>
<tr>
<td></td>
<td>2. Avoid having children, e.g. choosing adoption</td>
</tr>
<tr>
<td></td>
<td>3. Accept going through PND, choosing to either accept an affected child or to terminate the pregnancy</td>
</tr>
<tr>
<td></td>
<td>4. Use PGD as an alternative to PND and so avoid termination of pregnancy</td>
</tr>
<tr>
<td>When already pregnant</td>
<td>1. Undergo PND (if in early pregnancy)</td>
</tr>
<tr>
<td></td>
<td>2. Accept any outcome with no further action</td>
</tr>
<tr>
<td></td>
<td>3. Terminate the current pregnancy with no further action</td>
</tr>
</tbody>
</table>

PND: prenatal diagnosis; PGD: preimplantation diagnosis.
premarital screening is conducted with the aim of limiting marriages between carriers. However, marriage restriction in these countries is not supported by the social norms, which include customary cousins and commonly arranged marriages. Moreover, mandatory premarital screening has been said to promote community awareness of hemoglobinopathies, which may in the long-term increase the efficacy of the program [36], although even where premarital screening is mandatory, marriage cancelation may not be acceptable to most [37].

Consanguineous marriage is associated with a higher risk of having offspring with an autosomal recessive condition if this is present in the family. The prevalence of congenital anomalies in the offspring of first-cousin marriages is estimated at 1.7–2.8% higher than the general population risk [38]. If evidence-based recommendations are to be the basis of community and individual counseling, then the social factors behind these traditions must also be considered and the benefits weighed against the risks. Culturally based advice in genetic prevention is a must and the contribution of other academic disciplines, such as sociology and anthropology, as well as legal and religious input, will help to provide a more sensitive approach to communication between the medical specialties and the people.

Health planners should also be aware of cultural change over time. One example is Cyprus, where premarital screening has been the choice of the services, the public and the church, which wanted to limit termination of affected pregnancies by timely detection of carrier couples. In the 21st century, civil weddings are increasing and many couples cohabit and marry after the first or even second pregnancy. Thus, there are new social issues that may make premarital testing of less importance and make preconception tests the focus of public education. Likewise, in the Arab world, cousin marriages are decreasing with recent urbanization [39–41].

**Availability and impact of prenatal diagnosis**

Prenatal diagnosis leading to selective abortion of affected fetuses is viewed with particular distaste not only on religious grounds but also by ‘at-risk’ couples and the families themselves, whatever the cultural background [16]. Factors that made termination of pregnancy acceptable in some settings included the specter of premature death of the child, the complexity, expense and risks of treatment, and the painful experience of a previously affected child. Modell et al. [42] showed that PND was introduced on the basis of the collective informed choices of couples at risk. In Cyprus, avoiding marriage to another carrier was rejected by 90.0% of the population as a means of prevention of thalassemia, while PND was immediately accepted [9]. A large majority also accepted PND in Sardinia [43] and in Greece [44]. The effect of prenatal testing and interruption of affected pregnancies has been a basic factor in reducing affected birth incidences in the Mediterranean countries and countries such as Iran, where all aspects of prevention including PND are implemented, with more than 80.0% reduction in birth incidences [45]. This is not always acceptable in other cultures, but it is noted that without this choice, avoiding carrier marriages may also not be acceptable.

**Current trends**

These complex steps and difficult choices have led couples to question the need to avoid the birth of affected children, particularly with improved patient prognoses. This trend is currently limited but visible. Taking the example of Cyprus, where since the 1980s, the birth of thalassemic children was reduced to 0–2 per year from an expected number of 50–70; in recent years up to eight new cases per year have been seen (Figure 1; data from the Cyprus Thalassemia Registry).

When asked by journalists, one Cypriot couple responded that a child with thalassemia can live to old age, so ‘we have chosen to have our baby.’ This confidence in outcomes has also been experienced in Italy; in Sicily, the residual cases ‘were because of a conscious choice by expectant parents in relation to improved life expectancy as well as improved Qol. of the affected patients’ [46]. Of course, other reasons for residual births exist, for example, the influx of migrant groups with cultural differences as well as with a lack of knowledge compared to the indigenous population, poor communication and counseling and laboratory errors [47]. In many countries, ignorance, poor communication and poor laboratory standards are expected to be the more prominent reasons.

**Summary conclusions**

Programs were initiated in high prevalence countries almost 50 years ago, mainly in the Mediterranean Basin, aiming to limit affected births, having very much in mind the need to reallocate resources and address more effectively the increasing needs for lifelong management of patients. Over the years, these needs were largely satisfied in these countries and this is reflected in the results related to patient outcomes. These may indeed not have been achieved if the thalassemia birth incidence remained unchecked.

At-risk populations made choices based on awareness programs and the poor clinical picture, including early mortality of affected children and the difficulties faced by the families. Social determinants such as having to find paid blood donors or replacement donations and to provide medications beyond family income capacity were, and still are, important factors in the acceptance of thalassemia prevention programs. Over the years, this situation began to change but only in some very limited parts of the world where patient outcomes indeed have shown dramatic improvements. However, in many of the high prevalence countries of the world, affecting the majority of the global thalassemia population, conditions related to significantly improved patient outcomes have not substantially changed. As long as families are not supported by healthcare systems to treat their thalassemic members, inequalities and poor outcomes will remain as the global picture of these conditions. The impact on the whole family in countries where
universal health coverage is not effective, must not be underestimated. In a social study from a developing country (in a confidential report from the country’s authorities), 42.0% of the surveyed families pay their own health expenses and nearly 80.0% are in debt. Such information on the plight of families is a daily occurrence in the work of TIF. This is without considering other psychosocial effects including isolation and stigmatization. The socioeconomic consequences of chronic illnesses must always be at the forefront when health planning is being considered.

Therefore, offering people the possibility to choose and even prevent the birth of affected children, remains a less painful alternative to experiencing multiple medical complications and early death. For such countries, limiting affected births remains a policy that may be regarded as justified. The concept of eugenics, often cited as a criticism of the prevention of any genetic disease, cannot be sustained when the overall picture of severe and lifelong suffering is understood. When Galton first used this term [48] he had in mind the ‘the improvement of the inborn qualities or stock of the human population.’ In medical genetics, the aim of hereditary disease programs is to offer improvement in the lives of patients and their families, along with measures to support those affected.[49]

In countries where the patient outcomes indicate the possibility of a long and good QoL, the perspective on prevention has changed or has begun to change. Couples are now seeing adult patients, often professionals, and are asking why should their child not have the same destiny? People are aware of new therapies, which may either cure or seriously reduce the need for blood transfusions and all the consequences that follow this dependency. Is the choice of ‘prevention’ still relevant in such settings? Another consideration to be taken into account, mainly by policy makers, is that increasing patient numbers will severely limit the competence and capacities for treatment options, as the increase in patient numbers goes hand in hand with increasing costs for treatment that even in the developed, high human development index (HDI) countries of the world may not be sustainable. We therefore believe risk information and genetic counseling must still be available for people to make fully informed choices.

Organizations such as the TIF, the WHO and professional, medical and scientific groups (such as hematology associations) with the welfare of patients as a primary concern, must continue to promote public awareness policies through which responses to policy changes can be more effective, while in many of the countries with no policies and/or sub-optimal services, awareness can help in advocacy and motivational actions. People at-risk of genetic diseases such as thalassemia, in whichever health care environment they may live, will always be faced with painful choices in their reproduction lives, and the effort of every government to provide all available tools to support their decision must continue.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

References


