



# Are multidisciplinary consultation meetings for prenatal diagnosis achievable in a low-income country? A descriptive cross-sectional survey in Benin

Monsoia Gildas Yassegounbe,<sup>1</sup> Beaudelaire Romulus Assan ,<sup>1</sup> Amoussou Sedjro Clotaire Romeo Houegban ,<sup>1</sup> Codjo Serge Metchihoungbe,<sup>2</sup> Jean-Francois Lecompte,<sup>3</sup> Christine Tschabu Aguemon,<sup>4</sup> Sidoine Bitho Gbetey,<sup>5</sup> Jean Breaud,<sup>3</sup> Antoine Seraphin Gbenou<sup>1</sup>

**To cite:** Yassegounbe MG, Assan BR, Houegban ASCR, et al. Are multidisciplinary consultation meetings for prenatal diagnosis achievable in a low-income country? A descriptive cross-sectional survey in Benin. *World J Pediatr Surg* 2023;6:e000576. doi:10.1136/wjps-2023-000576  
 ► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/wjps-2023-000576>).

Received 30 January 2023  
 Accepted 1 September 2023

## ABSTRACT

**Objective** The multidisciplinary antenatal diagnosis staff bring together practitioners who are involved in the management of the antenatal period at birth. This project was designed following the French experience to institute multidisciplinary consultation meetings for prenatal diagnosis (MCPMD) in Benin.

**Methods** This is a descriptive cross-sectional study examining the knowledge, attitudes, and practices of Beninese practitioners in the field of MCPMD to develop the pilot phase of the project.

**Results** We collected 108 participants from different specialties. Pediatricians and pediatric surgeons were in the majority at 23.9% and 16.5%, respectively. Sixty-seven percent of participants were from the public sector (n=75). One practitioner felt that it was not a good idea to implement these meetings. Almost all staff (96.2%) agreed that this meeting would have a positive impact on reducing neonatal mortality. Omphalocele (58.5%), spina bifida aperta (43.6%), and gastroschisis (34%) were the most commonly diagnosed antenatal conditions in Benin. No neonatal pathology required medical termination of the pregnancy according to 35.6% of the participants.

**Conclusions** The objective of reducing infant mortality due to medical and surgical pathologies is a noble one and deserves to be supported. This innovative project, developed through this study, the first of its kind in the subregion, will contribute inexorably to the achievement of the third Goal Sustainable Development.

## INTRODUCTION

With the development of antenatal diagnostic means, complex congenital anomalies are increasingly diagnosed, and the fetus has become a potential patient for pediatric surgeons. Obstetricians and pediatric surgeons thus progressively learned to work together for the sake of the expectant mother and her future child.<sup>1</sup> Management of the fetal patient requires the expertise of various clinicians, ranging from geneticists and genetic counselors to neonatologists,

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Multidisciplinary consultation meetings for prenatal diagnosis have proven their effectiveness in reducing neonatal morbidity and mortality in developed countries.

## WHAT THIS STUDY ADDS

⇒ As in several African countries, practitioners are still faced with major congenital malformations that could require medical termination.  
 ⇒ This study investigated the feasibility of multidisciplinary consultation meetings for prenatal diagnosis in a country with limited resources.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The results of this study were designed as a project that would significantly reduce neonatal morbidity and mortality due to congenital anomalies if implemented.

pediatric surgical and medical subspecialists and experts in medical imaging.<sup>2</sup> Prenatal diagnosis of structural anomalies provides the opportunity to influence perinatal management favorably by changing the site of delivery for immediate postnatal treatment, altering the mode of delivery to prevent hemorrhage or dystocia, and early delivery to prevent ongoing fetal organ damage.<sup>3</sup>

The multidisciplinary prenatal diagnosis staff bring together practitioners who are involved in the management of the antenatal period up to birth. Their task is to assist medical teams and couples in the analysis, decision-making and follow-up of the pregnancy when a malformation or a fetal anomaly is detected or suspected and when hereditary transmission of disease in a family leads to prenatal or pre-implantation diagnosis.<sup>4</sup>



© Author(s) (or their employer(s)) 2023. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

## Correspondence to

Dr Amoussou Sedjro Clotaire Romeo Houegban; [houegbanromeo@gmail.com](mailto:houegbanromeo@gmail.com)

In 2019, 2.4 million children worldwide died during their first month of life. There are approximately 6700 newborn deaths per day, which accounts for 47% of all deaths of children under 5 years of age. This number has increased from 40% in 1990.<sup>5</sup> The majority of neonatal deaths (75%) occur during the first week of life, and approximately 1 million newborns die within the first 24 hours.<sup>6</sup> Morbidity related to congenital anomalies is also very important, since most children born with major anomalies who survive 24 months present with complications with severe physical, psychological and social handicaps and social disabilities.<sup>7</sup> Thus, the impact of congenital anomalies on the health of populations is tremendous at all levels: mortality, morbidity, disability economic and emotional.<sup>8</sup>

In Benin, there are few data on mortality related to congenital anomalies. In 2010, Zoumenou *et al*<sup>9</sup> noted that surgery for gastroschisis and intestinal obstructions was complicated by cardiac arrest. More recently, a study showed that mortality from esophageal atresia was 74.07%.<sup>10</sup>

In Benin, neonatal mortality, which in 2014 according to the PNDS (Plan National de Développement Sanitaire) 2017–2022<sup>11</sup> was 38%, would seem to be increasing.<sup>11–13</sup> From what we retain from our daily practice, these deaths are largely attributable to congenital anomalies incompatible with life.<sup>10–14</sup> In Benin, there is neither a register of congenital malformations nor official figures, making it difficult to control them on a national scale.

Currently, Benin has approximately 250 gynecologists for 6.5 million women.<sup>14</sup> There are 21 pediatric surgeons, 2 pediatric anesthesiologists and 150 pediatricians for 4.8 million children. The focused prenatal consultation led by qualified personnel is the new prenatal consultation model recommended by the WHO and adopted in Benin. It is an updated approach that emphasizes the quality of prenatal consultations rather than the number of visits.<sup>5 15</sup> Prenatal visits were reduced to four for low-risk pregnancies (one visit in the first two trimesters and two visits in the last trimester). These prenatal consultations can lead to genetic counseling and genetic diagnosis. In our context, the techniques used are amniocentesis, fetal hemoglobin electrophoresis, and fetal karyotype. Molecular study is not feasible. Moreover, the ambition of this project to introduce multidisciplinary prenatal consultations is to make them an integral part of focused prenatal consultations, without any additional financial contribution from parents. This will ensure proper follow-up right up to the end of the treatment.

The literature<sup>16–18</sup> and our international experience have enabled us to discover that developed countries have achieved good results in the prenatal discussion of cases between the different specialties to organize and supervise prenatal and postnatal care as well as the delivery itself. At the end of the 1970s in France, multidisciplinary teams met regularly to discuss the management of the mother–child couple, marking the beginning of these meetings.<sup>19</sup> Supervised by the Agency of Biomedicine

and supported by the government, it has grown with very good results.<sup>20</sup> Currently, these meetings are held in person or by videoconference.

We aimed to implement these multidisciplinary consultation meetings in Benin in the University Hospital Centers and hospitals with pediatric surgeons and specific adapted equipment. Therefore, we have carried out an overview of the knowledge of Beninese practitioners on the issue to establish a multidisciplinary consultation meeting for prenatal diagnosis (MCMPD) in Benin.

## METHODS

This is a descriptive cross-sectional survey on the knowledge, attitudes and practices of Beninese practitioners in relation to MCMPD in order to institute one in Benin. It was carried out from 1 May to 31 May 2022. The survey was addressed to hospital and private practitioners practicing in Benin in pediatric surgery, neonatology, gynecobstetrics, pediatrics, genetics, anesthesia, medical imaging, pediatric oncology, general medicine, and others. All physicians whose activity focused on the mother–child couple were included in the study.

The variables investigated included participants' personal data (specialty, years of experience, gender, academic degree, sector of work, judgment on the MCMPD), participants' knowledge (knowledge of the MCMPD, the possibility of its implementation, the conditions of antenatal diagnosis in Benin and the ones that may require medical interruption of pregnancy, the level of maternity, the availability of resources necessary for the MCMPD standards), participants' opinions on the topic and the proposed guideline. This was a comprehensive recruitment of practitioners who agreed to participate in the study.

An anonymous questionnaire in Google Form format and a survey form were sent to the practitioners. Upon completion of the data collection, we established a data sheet based on the variables to be studied in Microsoft Excel V.2010 software. Then, the data were processed with SPSS V.20 software. After analysis of these results, a strategy of reproduction of these meetings, named MCMPD, was elaborated. Details of this project and its organizational chart are attached as online supplemental files.

## RESULTS

A total of 108 participants in the different specialties were enrolled. There was a male predominance with a sex ratio of 2.27:1. Participants had a mean work experience of 7.25 years (range: 6 months–36 years), and 47.2% were working in a level 2 maternity hospital. **Table 1** summarizes the practitioners who were enrolled in the survey and their academic degree.

Sixty-seven percent of the participants were from the public sector (n=75). Six out of 10 practitioners (n=70) had already heard of MCMPD, and 92.5% (n=100) wanted to promote it in their facility. When referring to

**Table 1** Practitioners and their academic degree

Participants (n=108)	Number	Percentage
<b>Specialty</b>		
Pediatrics	32	29.62
Pediatric surgery*	24	22.22
General medicine	13	12.03
Obstetrics and gynecology	11	10.18
General surgery	3	2.77
Medical imaging	4	3.70
Anesthesia and intensive care	3	2.77
Geneticist	3	2.77
Neonatology	2	1.85
Others	13	12.03
<b>Academic degree</b>		
Hospital practitioners	44	40.74
Interns	35	32.40
Private practitioners	20	18.51
Full professor	4	3.70
Senior lecturer	3	2.77
Associate professors	2	1.85

\*Physicians in their final semester of residency were considered pediatric surgeons and included in the survey.

the health context in Benin with difficult access to care, 8 participants (7.4%) out of 108 thought that this MCMPD would not be feasible in Benin, even though it is an excellent idea. Almost all participants (96.2%) agreed that these meetings will have a positive impact on neonatal mortality.

The most commonly diagnosed antenatal conditions are omphalocele (58.5%), spina bifida aperta (43.6%), and gastroschisis (34%) according to the participants (figure 1).

Prenatal ultrasounds at each trimester were not routinely performed in all facilities, as reported by 25 participants (23.8%). Of all participants, 33.33% were against medical termination of pregnancy. Three cases of cloacal exstrophies (figure 2A) and one case of agenesis of the caudal extremity (mermaid syndrome) (figure 2B), a rare pathology incompatible with life, were collected and subsequently died.

The resources available in the facilities involved in the MCMPD were subdivided into three groups: human resources, equipment and infrastructure.

► For human resources:

A total of 93.1% of participants (n=95) responded that they had a pediatrician in their center.

A total of 93.1% of the participants (n=95) answered that they had an obstetrician-gynecologist in their center.

A total of 67.6% of participants (n=69) responded that they had a radiologist in their center.

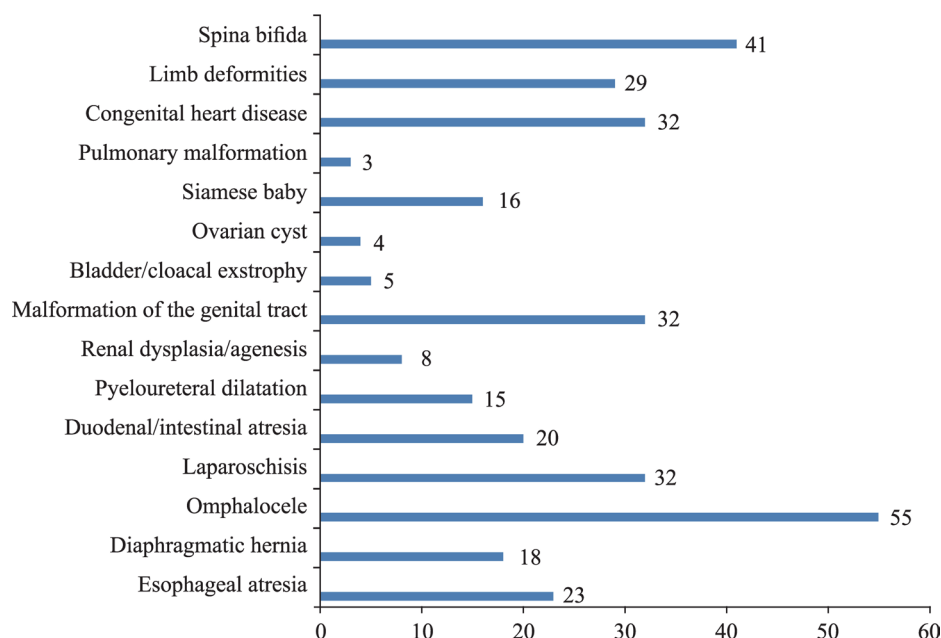
A total of 66.7% of participants (n=68) responded that they had a pediatric surgeon in their center.

A total of 60.8% of participants (n=62) responded that they had a neonatologist in their center.

A total of 36.3% of participants (n=37) responded that they had a pediatric anesthesiologist in their center.

A total of 24.5% of participants (n=37) responded that they had a geneticist in their center.

► For equipment, standard ultrasound was the most available equipment. Scintigraphy and genetic laboratories were available in only one center, and MRI was available in two centers.

**Figure 1** Diagnosable conditions in the antenatal period.



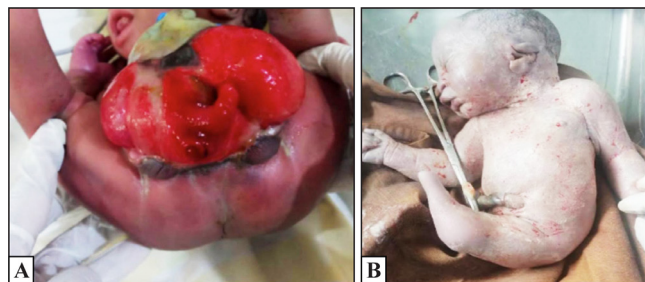
- Benin has three university neonatology departments and one pediatric intensive care unit but no neonatal intensive care unit.

The major problems mentioned were unavailability of the participants (82%), internet connection (80.9%) and financial means (65.2%). The insufficient number of files to be presented, the excess of files to be presented, the lack of technical support, the quality of ultrasound results, the lack of coordination, and the lack of will of the specialists were also reported.

## DISCUSSION

These findings suggest that the project to implement an MCMPD in Benin is possible and urgent to improve neonatal care in spite of issues reported by participants. These were few issues that could not compromise this project. In fact, this is a relevant and topical issue in regard to the law of 2021 in Benin, modifying and completing the law 2003-04 of 3 March 2003 on sexual health and reproduction, new article 17<sup>14</sup> 'the voluntary termination of pregnancy is authorized on the prescription of a physician when: the continuation of the pregnancy endangers the life and health of the pregnant woman; the pregnancy is the consequence of a rape or an incestuous relationship and the request is made by the pregnant woman if she is an adult, or by her legal representatives if she is a minor; the child to be born is suffering from a particularly serious condition at the time of diagnosis.' We then find a similarity with the bioethics law in France on the mortality related to the affections of particular gravity, the point of origin of the MCMPD. Its introduction in France has been slow and silent. The main driving forces were the total delegation of the government to geneticists and biologists and the financing by the French health system of the program even before the legislation on abortion had been adopted.<sup>16</sup>

Beninese physicians found the concept relevant by participating in the survey, where pediatricians were in the majority, followed by pediatric surgeons. This finding is explained by the fact that the latter are in the forefront in the care of these children. All grades of practitioners ranging from general practitioners to full professors, of different generations and from various places of practice have contributed, and their desire to see this project materialize.



**Figure 2** (A) Cloacal exstrophy and (B) mermaid syndrome.

The MCMPD was not known to many practitioners. It then became an original idea that could be implemented but that should be adapted to the context of developing countries. The conditions of antenatal diagnosis require a particular follow-up in the postnatal period and a birth in a level 3 maternity hospital in the majority of serious cases. In Benin, level 2 maternity hospitals are predominant. This makes it difficult to implement this project throughout the country. Thus, for the MCMPD, implementation will depend on the strategic zones that have at least one pediatric surgeon and one anesthesiologist trained in pediatrics who can manage these newborns as a team.

Quarterly prenatal ultrasounds, which are mandatory, and pregnancy monitoring are not systematically carried out. Communications and actions are conducted by the College and the Beninese Society of Obstetrics and Gynecology through the prenatal consultations instituted by the WHO, whose objective is to promote the health of pregnant women through pregnancy monitoring, prevention and management of complications.<sup>21</sup> It allows the pregnant woman to have at least four prenatal consultations for low-risk pregnancies. Therefore, many antenatal diagnoses are made in Benin during pregnancy monitoring by obstetrician-gynecologists. The MCMPD will allow for the review of these cases so that prenatal, perinatal and postnatal care is better and more efficient. The development of pediatric surgery worldwide, in Africa and particularly in Benin, has made it possible to develop neonatal surgery and to improve the management of newborns<sup>12 22-26</sup> even if more needs to be done. Its implementation would improve the neonatal management of certain conditions, such as gastroschisis, the mortality rate of which is still very high in our countries.<sup>27</sup>

The management of conditions of particular severity detected in the prenatal period remains a problem to be solved. The number of pediatric surgeons, pediatric anesthesiologists, and geneticists being very low for the current growing population constitutes a manpower problem that the MCMPD will be able to solve by periodically pooling the difficulties for a solution to this infant mortality. These serious malformations increase the neonatal mortality rate and increase the financial burden of the destitute parents who turn to ritual infanticide, as medical termination of pregnancy is culturally not accepted.<sup>28</sup> Collaboration between obstetrician-gynecologists, pediatric surgeons, pediatricians, geneticists, radiologists, anesthesiologists and other specialists depending on the malformation is necessary for these newborns.<sup>16</sup>

We wanted to gather the opinion of specialists on the need for termination of pregnancy in the case of certain serious pathologies encountered in our setting. Indeed, some of these pathologies were serious, with serious functional and vital consequences in our context, and could require medical termination of the pregnancy if diagnosed antenatally. However, it is clear that 33.33% of participants were against medical termination of the pregnancy, regardless of the type of antenatal malformation.

Since it was adopted in 2021,<sup>21</sup> the law on abortion has generated much sociocultural debate and religious considerations. It is still a myth in Benin. This shows that the role of the MCMPD will not stop at discussing medical records and proposing a termination of the pregnancy in case of serious malformation. It will also focus on raising awareness and educating the population about the seriousness of these conditions, the known risk factors and prevention. With the support of partners, technical documents such as prenatal diagnosis consultation guides and information sheets for parents will be developed. Likewise, this project for multidisciplinary consultations will be governed by ministerial decrees and validated by the ethics committee to ensure equitable and ethical meetings.

Benin's major health development orientations are based on the six pillars of the WHO health system (governance and leadership; human resources, health information and health research; health financing; medicine, vaccines and medical and blood products; infrastructure, equipment and maintenance; service delivery) to meet the challenges of reducing morbidity and mortality rates, particularly among women and children. The Beninese health system has a very dynamic and active public and private sector. Currently, in Benin, healthcare is entirely funded by patients, except for the treatment of malaria in children under 5 years of age, which is funded by the government through the malaria control program.<sup>28</sup>

The health insurance component of the Insurance for Human Capital Strengthening Project is in its pilot phase and is being extended to the 77 districts of Benin. This is a government project to ensure free care for the population. Its realization and the involvement of the MCMPD in this project will make this multidisciplinary meeting sustainable. The conditions of antenatal diagnosis require much investment from the parents, who are often destitute in this case to the cost of surgery,<sup>29 30</sup> despite a derisory technical platform with actors who are not necessarily very competent depending on the structure. The realization of this project is therefore a challenge and requires the support of legal authorities (parliamentary, institutional and/or academic), development partners with a contribution from the various learned societies (pediatricians, gynecologists, radiologists, etc) whose ambitions the project meets. It will allow us to concretize the registry of congenital malformations for better surveillance.

This proposed project would undoubtedly reduce neonatal and infant mortality and the financial and human costs related to the management of a child with a permanent disability and would contribute to the eradication of ritual infanticide, a social problem in Benin. In addition, the MCMPD will increase the capacity to practice pediatric surgery, encouraging young physicians to go into this specialization. This project could also be a good platform to develop teleconsultation across the country while strengthening the collaboration between mother-child specialists. Finally, this project could help achieve Sustainable Development Goal 3 on the reduction of

maternal and neonatal mortality, which is a major challenge for Benin and particularly for the health system.<sup>31</sup>

#### Author affiliations

<sup>1</sup>Pediatric Surgery Department, Mother and Child Teaching Hospital Lagune, University of Abomey-Calavi, Cotonou, Benin

<sup>2</sup>Pediatric Surgery Department, National Teaching Hospital Hubert Koutoukou Maga, University of Abomey-Calavi, Cotonou, Benin

<sup>3</sup>Pediatric Surgery Department, CHU-LENVAL Paediatric Hospitals of Nice, Nice, France

<sup>4</sup>University Clinic of Gynecological Obstetrics, National Teaching Hospital Hubert Koutoukou Maga, University of Abomey-Calavi, Cotonou, Benin

<sup>5</sup>Intellectual Production Department, Center of Expertise in Applied Social Sciences, Cotonou, Benin

**Contributors** MGY contributed to the conception, acquisition, analysis and interpretation of data, writing (original draft and review), and final approval. BRA contributed to the design of the work, acquisition, analysis and interpretation of data, writing (original draft and review), and final approval. ASCRH contributed to the design of the work, analysis and interpretation of data, writing (original draft and review), and final approval, guarantor. CSM contributed to the design of the work, analysis and interpretation of data, writing (original draft and review), and final approval. J-FL contributed to the conception, acquisition, analysis and interpretation of data, writing (original draft and review), and final approval. CTA contributed to the conception, acquisition, analysis and interpretation of data, writing (original draft and review), and final approval. SG contributed to the design of the work, analysis and interpretation of data, and final approval. JB contributed to the design of the work, analysis and interpretation of data, and final approval. ASG contributed to the design of the work, analysis and interpretation of data, and final approval.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient consent for publication** Informed consent was obtained from parents prior to the use of the children's photos.

**Ethics approval** The participants enrolled in this study were all consented. Data were analyzed and interpreted anonymously.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available upon reasonable request.

**Supplemental material** This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

#### ORCID iDs

Beaudelaire Romulus Assan <http://orcid.org/0000-0002-1302-6731>

Amoussou Sedjro Clotaire Romeo Houegban <http://orcid.org/0000-0002-1961-5668>

#### REFERENCES

- Benachi A, Sarnacki S. Prenatal counselling and the role of the paediatric surgeon. *Semin Pediatr Surg* 2014;23:240-3.
- Luks FI, Carr SR, Feit LR, et al. Experience with a multidisciplinary antenatal diagnosis and management model in fetal medicine. *J Matern Fetal Neonatal Med* 2003;14:333-7.

- 3 Adzick NS, Harrison MR. The unborn surgical patient. *Curr Probl Surg* 1994;31:1–68.
- 4 Code de la Santé Publique - article R. 2131-10 [en Ligne]. code de la Santé Publique. 2609; 5608 P. Disponible; Available: [https://www.legifrance.gouv.fr/codes/article\\_lc/LEGIARTI000028470129#:~:text=Seuls%20peuvent%20%C3%AAtre%20d%C3%A9nomm%C3%A9s%20centres,%20orientation%20de%20l'agence](https://www.legifrance.gouv.fr/codes/article_lc/LEGIARTI000028470129#:~:text=Seuls%20peuvent%20%C3%AAtre%20d%C3%A9nomm%C3%A9s%20centres,%20orientation%20de%20l'agence) [Accessed 15 Nov 2021].
- 5 WHO. Newborns: improving survival and well-being. 2020. Available: <https://www.who.int/fr/news-room/fact-sheets/detail/newborns-reducing-mortality> [Accessed 19 Sep 2020].
- 6 UNICEF. 7,000 newborns die every day, despite steady decrease in under-five mortality, new report says. 2017. Available: <https://www.unicef.org/press-releases/7000-newborns-die-every-day-despite-steady-decrease-under-five-mortality-new-report> [Accessed 19 Oct 2017].
- 7 EUROCAT Report 8. surveillance of congenital anomalies in Europe, 1980- 1999, in EUROCAT Esoca (Ed). Newtownabbey University of Ulster, Northern Ireland, EUROCAT, European surveillance of congenital anomalies; 2002.
- 8 Rosano A, Botto LD, Botting B, et al. Infant mortality and congenital anomalies from 1950 to 1994: an international perspective. *J Epidemiol Community Health* 2000;54:660–6.
- 9 Zoumenou E, Gbenou S, Assouto P, et al. Pediatric anesthesia in developing countries: experience in the two main University hospitals of Benin in West Africa. *Paediatr Anaesth* 2010;20:741–7.
- 10 Gogan MVLSB, Houegban ASCR, Metchioungbe CS, et al. Ten years of management of esophageal atresia in Benin: state of the art, experiences and needs for families of children with Stoma. *Int J Pediatr Child Health* 2023;11:1–9.
- 11 Bénin. Ministère de la Santé. PNDS 2017-2022; 2018. 72. Available: <https://www.prb.org/wp-content/uploads/2020/06/Benin-Plan-National-de-D%C3%A9veloppement-Sanitaire-2018-2022.pdf> [Accessed 24 Oct 2022].
- 12 Yassegoungbe MG, Assan BR, Houegban ASCR, et al. Gastrointestinal perforations in newborns with high mortality: a series of 18 cases. *J Neonatal Surg* 2020;9:32.
- 13 Ameh EA. Challenges of neonatal surgery in Sub-Saharan Africa. *Afr J Paediatr Surg* 2004;1:43–8.
- 14 Plan Opérationnel de Réduction de la Mortalité Maternelle et Néonatale au Bénin. PO-RMMN 2018 – 2022. Bénin Ministère de la santé; 2018. 66. Available: <https://www.prb.org/wp-content/uploads/2020/06/Benin-Plan-Operationnel-de-Reduction-de-la-Mortalite-Maternelle-et-Neonatale-au-Benin.pdf> [Accessed 12 Jun 2019].
- 15 Gerein N, Mayhew S, Lubben M. A framework for a new approach to antenatal care. *Int J Gynaecol Obstet* 2003;80:175–82.
- 16 Ville I. Prenatal diagnosis in France: between regulation of practices and professional autonomy. *Med Hist* 2019;63:209–29.
- 17 Global Initiative for Children's Surgery. Global initiative for children's surgery: a model of global collaboration to advance the surgical care of children. *World J Surg* 2019;43:1416–25.
- 18 Sarin YK. Improving neonatal surgical outcome: my vision. *J Neonatal Surg* 2022;11:1.
- 19 la Documentation française. *La Révision des Lois de Bioéthique: quelles options pour Demain? Etude Adoptée en Assemblée Générale, Conseil D'État section Du rapport et des Études, Disponible [en ligne]*. Paris, 2018: 262.
- 20 Biu Cujas. *Aspects Juridiques de la Bioéthique, Disponible*. 2014; 38. Available: <http://bcujas-cms.univ-paris1.fr/fr> [accessed 17 Nov 2021].
- 21 Bénin: Loi de 2021 Modifiant et Complétant La Loi N° 2003-04 Du 03 Mars 2003 relative À La Santé Sexuelle et À La reproduction, article 17; 2021. 3.
- 22 Saisonou J, Agueh DV, Agueh B, et al. Évaluation de la Qualité des services de consultation Prénatale Recentrée À L'Hôpital de district de Suru-Léré au Bénin. *Santé Publique* 2014;26:249–57.
- 23 Houegban A, Assan BR, Guedenon MA, et al. Spontaneous Enterocrotal Fistula following an incarcerated Inguinal hernia in a neonate: case report and literature review. *Int J Surg Case Rep* 2022;90:106656.
- 24 Gogan MVLSB, Guedenon MA, Yassegoungbe MG, et al. Neonatal occlusion by strangulation of the Caeco-Appendix in a type I Omphalocele of Aitken: rare case. *MOJ Clin Med Case Rep* 2021;11:113–4.
- 25 Metchioungbe CS, Sogbo DHO, Koco H, et al. Congenital retro-costo-xiphoid diaphragmatic hernia. *J Pediatr Surg Case Rep* 2021;72:101969.
- 26 Gbenou AS, Assan BR, Akodjenou J, et al. OEIS syndrome (Cloacal Exstrophy): about two cases treated at the mother and child teaching hospital in Cotonou (Benin). *Open J Pediatr* 2020;10:535–41.
- 27 Assouto CB, Houegban ASCR, Assan BR, et al. Dismal outcome of gastroschisis in a resource-limited country in West Africa: relevant issues and what to expect. *J Neonatal Surg* 2022;11:24.
- 28 Degla D, Faye S, Barry H, et al. *Analyse des politiques de gratuité et étude du coût de traitement du paludisme au Bénin*. Rockville, MD: Health Finance and Governance project, Abt associates Inc, 2018: 43.
- 29 Shrimpe MG, Dare AJ, Alkire BC, et al. Catastrophic expenditure to pay for surgery worldwide: a modeling study lancet glob health. *Lancet Glob Health* 2015;3 Suppl 2:S38–44.
- 30 Saxton AT, Poenaru D, Ozgediz D, et al. Economic analysis of children's surgical care in low- and middle-income countries: a systematic review and analysis. *PLoS One* 2016;11:e0165480.
- 31 United Nations. The sustainable development goals report. 2022. Available: <https://www.un.org/sustainabledevelopment/health/> [Accessed 28 Oct 2022].