



# The impact of the NEST Model at Saint Jean de Dieu Hospital in Tanguiéta

# Index

<b>A.0 Abbreviations and acronyms</b>	<b>4</b>
<b>A.1 Executive Summary</b>	<b>5</b>
<b>1. General Introduction</b>	<b>7</b>
1.1 Context and justification of the study	9
1.2 Report objectives and reference period (2022 - Q1 2025)	10
1.3 Presentation of the NEST Model and its components	11
1.4 Strategic alignments (EWENE & NEST)	15
1.5 Presentation of the implementation site: the HSJDT	18
1.6 Methodology, data sources, and key indicators	20
<b>2. Implementation of the NEST Model at the HSJDT</b>	<b>23</b>
2.1 History of the HSJDT - Paolo Chiesi Foundation partnership	23
2.2 NEST systemic approach: equipment, skills, maintenance	25
2.3 Phasing of the implementation of the NEST Model	28
<b>3. Overall results and trends</b>	<b>30</b>
3.1 Total number of admissions per year	30
3.2 Distribution of admissions by place of birth (inborn/outborn)	31
3.3 Distribution of admissions by sex	32
3.4 Distribution of admissions by weight per year	33
3.5 Distribution of Inborn vs. Outborn by Pathology	34
<b>4. Detection and coverage of care</b>	<b>36</b>
4.1 Hypothermia: detection and warming coverage	37
4.2 Neonatal jaundice: phototherapy coverage	41
4.3 Respiratory distress: use of oxygen therapy	45
4.4 Relationship between respiratory distress and CPAP	49
4.5 Overall summary of coverage for essential neonatal care	53
4.6 Kangaroo Care (KC): Coverage and Effects on Survival	57

<b>5. Mortality and clinical outcome</b>	<b>66</b>
5.1 Evolution of the overall and specific mortality rate	66
<b>6. Other programmatic dimensions and quality of care</b>	<b>71</b>
6.1 Strengthening technical and human capacities	71
6.2 Parental experience and satisfaction	73
<b>7. Discussion and lessons</b>	<b>76</b>
7.1 Strengths and innovations of the NEST Model at the HSJDT	76
7.2 Persistent challenges and limitations encountered	77
7.3 Lessons learned and alignment with international and EWENE frameworks	78
7.4 Opportunities for replicating the NEST Model in other sites	80
<b>8. Conclusion and outlook</b>	<b>82</b>
8.1 Key findings and overall summary	82
8.2 Areas of consolidation 2025–2026	83
8.3 Lessons and perspectives	83
8.4 Conclusion	83
8.5 Strategic recommendations (2025–2027):	84
<b>Bibliographical references</b>	<b>85</b>

## A.0 Abbreviations and acronyms

ABBREVIATION / ACRONYM	MEANING (FR / EN)	CONTEXT OF USE IN THE NEST TANGUIÉTA REPORT
<b>HSJDT</b>	<i>Saint Jean de Dieu Hospital of Tanguiéta</i>	Site for the implementation of the NEST Model in northern Benin, neonatal reference center.
<b>NEST</b>	<i>Neonatal Essentials for Survival and Thriving</i>	Integrated model for improving the quality of neonatal care (distinct from NEST360).
<b>PCF</b>	<i>Paolo Chiesi Foundation</i>	Developer and main technical partner of the NEST Tanguiéta model.
<b>KC</b>	<i>Kangaroo Care</i>	Method of care for premature and low-birth-weight infants, focused on skin-to-skin contact and exclusive breastfeeding.
<b>PCI/IPC</b>	<i>Infection Prevention and Control</i>	Set of protocols for hospital cleaning, disinfection, and safety management.
<b>CLIN</b>	<i>Committee for the Fight Against Nosocomial Infections</i>	Hospital structure responsible for PCI monitoring and auditing.
<b>NaClO30</b>	<i>Name of the device for sodium hypochlorite production</i>	A system for sodium hypochlorite production for medical use and disinfection, called NaClO30L, which produces 30 liters of sodium hypochlorite (disinfectant) in approximately 5 to 6 hours.
<b>NID</b>	<i>Neonatal Inpatient Dataset</i>	Digital database for tracking neonatal admissions, treatments, and outcomes.
<b>ENAP</b>	<i>Every Newborn Action Plan</i>	WHO/UNICEF global roadmap to reduce neonatal mortality and stillbirths.
<b>EWENE</b>	<i>Every Woman Every Newborn Everywhere</i>	Global initiative led by the World Health Organization, UNICEF, United Nations Population Fund, and international partners aimed at accelerating the reduction of preventable maternal and neonatal mortality as well as stillbirths by 2030. EWENE builds on the objectives of ENAP (Every Newborn Action Plan) and EPMM (Ending Preventable Maternal Mortality) by promoting equity, quality of care, accountability, and sustainable investments in maternal and newborn health.
<b>PNS</b>	<i>National Health Plan (Benin 2018–2030)</i>	National strategic framework for aligning neonatal health actions in Benin.
<b>WHO</b>	<i>World Health Organization</i>	Technical reference framework for quality standards in neonatal care.
<b>UNICEF</b>	<i>United Nations Children’s Fund</i>	Technical and advocacy partner for implementing the EWENE framework.
<b>SDGs</b>	<i>Sustainable Development Goals</i>	Target 3.2: Reduction of neonatal mortality $\leq 12$ per 1,000 live births by 2030.
<b>FPN / LBW</b>	<i>Low Birth Weight</i>	Newborn weighing $< 2.5$ kg at birth — high-risk population followed in the NEST Model.
<b>O<sub>2</sub> wall / CPAP</b>	<i>Wall-mounted oxygen / Continuous Positive Airway Pressure</i>	Essential systems for gentle ventilation and the management of respiratory distress.
<b>HV</b>	<i>Home Visits</i>	Post-hospitalization follow-up of newborns discharged alive to ensure continuity of care.
<b>KC-HV</b>	<i>Post-KC follow-up with home visits</i>	Community extension of the KC model, integrated into the continuity of care.
<b>POWER / PLACE / PRODUCTS / PEOPLE</b>	<i>The four pillars of the NEST Model</i>	Systemic approach: governance, infrastructure, equipment, human resources.

# A.1 Executive Summary

## Context and vision

The **NEST Model – Neonatal Essentials for Survival and Thriving**, implemented at the Saint Jean de Dieu Hospital in Tanguiéta (HSJDT) with the support of the **Paolo Chiesi Foundation**, aims to strengthen the quality of neonatal care in West Africa through an integrated approach based on four pillars: **PLACE, PRODUCTS, PEOPLE, POWER**. The initiative aligns with the national priorities of the **Benin National Health Plan 2018–2030** and the international targets of the **Every Newborn Action Plan (ENAP)<sup>12</sup>** and of the **Every Woman Every Newborn Everywhere (EWENE)<sup>21</sup>**.

## Methodology and period covered

This report consolidates the results from **2022 to the first quarter of 2025**, including the **NID databases** (admissions, mortality, specific causes, quality indicators); the **2022–2024 narrative reports** and the 2024 external evaluation; and **satisfaction interviews** conducted with four mothers receiving services. The analysis combines quantitative and qualitative data to assess changes in the quality, performance, and impact of the NEST Model in the HSJDT.

 **FIGURE 1.**  
**Key results (2022 → Q1 2025)**

DOMAIN	KEY RESULTS	EVOLUTION / IMPACT
Neonatal admissions	3,520 cumulative admissions	Stable flow; expanded regional recruitment (Benin, Togo, Burkina Faso, Niger).
Overall mortality	33% → 11% (Q1 2025)	A threefold reduction in mortality, thanks to an overall improvement in care.
Prematurity	52.4% → 48.1%	Between 2022 and 2024, the proportion of premature infants admitted decreased slightly, from 52.4% to 48.1%, with an upward trend in inborn infants and a downward trend in outborn infants.
Low weight (<2,500 g)	47.6% → 25.2%	The admission of newborns weighing less than 2.5 kg shows an overall decrease of 22.4% between 2022 and 2024, with a more marked decrease among outborns (-27%).
Kangaroo Care (KC)	511 admissions	Mortality fell to 3.7% in Q1 2025. Transition towards an integrated and operational implementation of the practice.
Healthcare coverage	<ul style="list-style-type: none"> <li>· oxygen in subjects with asphyxia +15.7%</li> <li>· phototherapy +56.4%</li> <li>· oxygen/CPAP in subjects in distress +5.6%</li> </ul>	Critical care is now largely accessible to all newborns with the targeted conditions, with particularly clear progress in phototherapy and oxygenation of asphyxiated infants.
HV – Post-discharge follow-up of the KC unit	0% → 80.8%	Consolidated continuity of care.

## Effects of the NEST Model in Tanguiéta

- 1. Improved neonatal survival:** overall mortality reduced to 11% in Q1 2025.
- 2. Humanizing care:** zero separation of mother and child, active participation of parents.
- 3. Staff empowerment:** enhanced skills, CLIN supervision culture.
- 4. Data-driven management:** use of the NID and indicator-based decision-making.
- 5. Hospital-community continuity:** Systematized home visits and post-discharge supervision.

## Lessons and factors of sustainability

- Tanguiéta's success is based on **strong local leadership, institutional ownership, and synergy between hospital and community actors.**
- The model proves that a **district hospital can become a center of excellence** if quality is treated as a systemic process.
- Investments in **training, preventive maintenance, and data culture** are the true catalysts for change.

## Opportunities for replication

Tanguiéta's results pave the way for **controlled replication of the NEST Model:**

- **at the national level**, in area hospitals with high neonatal load (Natitingou, Parakou, Allada);
- **at the regional level**, via a South-South learning mechanism (Benin, CAR, Togo, Niger). The modularity of the model (PLACE → PRODUCTS → PEOPLE → POWER) allows for gradual adaptation according to the technical level and available resources.

## Parents' voice

The beneficiaries describe the KC unit of Tanguiéta as a **“place of hope and learning”**, where the teams combine **human warmth, competence, and support.**

*“We learn how to be mothers here; we never feel alone. Even after we leave, they continue to take care of us.”*

## Conclusion

The experience of the Saint Jean de Dieu Hospital of Tanguiéta (HSJDT) proves that **newborn survival and development** can be ensured in a resource-limited environment, provided a coherent, humane, and data-driven model is implemented. Tanguiéta is now a **regional demonstration site**, and the NEST Model represents a **benchmark for the sustainable transformation of neonatal care in West Africa.**

# 1. GENERAL INTRODUCTION

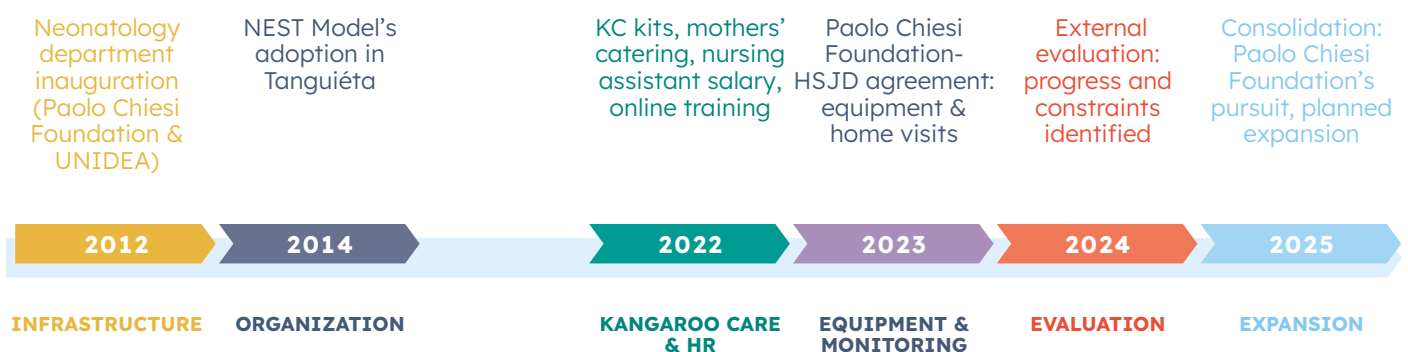
The Saint Jean de Dieu Hospital of Tanguiéta (HS-JDT), located in northwestern Benin, is a referral center for the Tanguiéta–Matéri–Cobly health zone<sup>1</sup>. A regional institution, it receives several thousand patients each year from Benin and neighboring countries (Burkina Faso, Niger, Nigeria, Togo)<sup>2</sup>. In this rural context marked by limited resources, logistical constraints, and difficult access to specialized care, the hospital has established itself as a center of excellence, particularly in neonatology.

In **2011**, the Paolo Chiesi Foundation began a collaboration with the hospital<sup>3</sup> through the personal commitment of Brother Fiorenzo Priuli, an Italian surgeon and emblematic director of the hospital, and in 2012, the HSJDT neonatology department was inaugurated with the Foundation’s support<sup>4-5</sup>. From his earliest years, the service had to cope with high neonatal mortality and a high proportion of premature and low-birth-weight newborns<sup>6</sup>. This partnership will lead in **2014** to the development and adoption of the first version of the **NEST (Neonatal Essen-**

**tials for Survival and Thriving) Model**<sup>7</sup>. This model, designed for resource-limited settings, is based on an integrated approach: improved infrastructure and equipment, targeted staff training, care protocols centered on the newborn and their family, infection prevention and control, and a system for collecting and using clinical data.

Between **2014 and 2019**, several monitoring missions were conducted by the Paolo Chiesi Foundation team and Italian neonatologists, enabling a gradual strengthening of local capacities. This collaboration was suspended in **2020** due to **COVID-19 restrictions** and increasing insecurity in the north of the country. In **2022**, **Fr. Parfait Tchaou** was officially appointed Director, and the collaboration with the Paolo Chiesi Foundation was relaunched, marking a new strategic phase focused on consolidating achievements and adapting the model to new challenges.

**FIGURE 2.** Timeline - NEST Model’s Evolution in Tanguiéta (2012-2025) Highlighting key themes



Since then, the Paolo Chiesi Foundation has provided structured funding and technical support, which have enabled:

- The modern neonatal unit is equipped with multiparameter monitors, heated tables, Kangaroo Care kits, and Firefly phototherapy devices.
- The implementation of enhanced infection prevention and control (IPC) protocols, including ongoing staff training, upgrading the local sodium hypochlorite production unit with equipment (NaClO<sub>3</sub>), and regular microbiological monitoring,
- Strengthening clinical and organizational skills through training in essential neonatal care, Kangaroo Care (KC), and post-discharge follow-up, including home visits (HV).
- The introduction of bi-weekly death audits, coordinated by the Infection Control Committee (ICC) and documented through the NID (National Inpatient Database), has strengthened accountability and the dynamics of continuous improvement. This initiative aims to establish a systematic culture of monitoring the quality of care, analyzing the causes of death, and guiding corrective actions within the Tanguiéta NEST (Neonatal Essentials for Survival and Thriving) Model.
- The development of post-hospitalization follow-up programs and home visits (HV) for vulnerable newborns to ensure their follow-up after discharge, in accordance with WHO-recommendations.

The case study presented here aims to analyze in detail the evolution of the NEST Model at the HSJDT from **2022 to the first quarter of 2025**, examining the structural and organizational transformations of the neonatology service, the evolution of the quality of care, the impact on neonatal mortality and mor-

bidity, as well as the lessons transferable to other contexts with limited resources.

A **timeline** in two sections: **2012–2021** (implementation phase of the NEST Model) and **2022–2025** (consolidation phase of the NEST Model: structured funding from the Paolo Chiesi Foundation + innovations: HV, equipment upgrades, external evaluation). This methodological choice is justified by the major institutional changes that occurred at the end of 2021: new hospital management, strategic review of PCF, and redefinition of structured funding. This recent period offers greater data consistency and more accurately reflects the real impact of NEST interventions in a stable environment.

# 1.1 Context and justification of the study

Benin, like many sub-Saharan African countries<sup>8</sup>, continues to face high neonatal mortality<sup>9</sup>, at 28.1 per 1,000 live births in 2022<sup>10</sup>, particularly in rural areas where access to specialized care remains limited. Premature, low-birth-weight, or sick newborns are at increased risk of death or severe morbidity<sup>11</sup>. In this context, improving the quality of neonatal care and strengthening hospital capacity are strategic priorities for the health system.

The **HSJDT**, founded in 1970 by the Hospitaller Order of Saint Jean de Dieu, is a referral center for the Tanguiéta-Matéri-Cobly health zone and beyond, receiving patients from northern Benin as well as neighboring countries (Burkina Faso, Niger, Nigeria, Togo)<sup>1</sup>. The opening in 2012 of its neonatology service marked a decisive step for the care of high-risk newborns in the region<sup>4</sup>. However, challenges related to infrastructure, staff training, the availability of appropriate equipment, and infection prevention quickly highlighted the need for structured and sustainable support.

It is with this perspective that the **Paolo Chiesi Foundation** launched the implementation of the **NEST Model**<sup>7</sup> at the HSJDT in 2014.

After more than ten years of collaboration, available evidence suggests improvements in care processes, service organization, and the ability to monitor key indicators. However, neonatal mortality remains a major challenge. Data from audits, activity reports, and post-discharge follow-up will need to be analyzed to assess the actual progress made.

The NEST case study at the HSJDT, funded and supervised by the **Paolo Chiesi Foundation**, serves a dual purpose:

- **To rigorously document** the impact of the NEST Model on the quality of care and neonatal mortality in Tanguiéta, based on quantitative and qualitative data collected since 2022.
- **Identify good practices, innovations, and challenges** in order to guide necessary adjustments and contribute to the sharing of experiences with other countries in the NEST network (Burundi, Burkina Faso, Togo, Côte d'Ivoire).

This analysis is part of a logic of **accountability and continuous improvement**, with particular attention paid to the efficiency of investments made and the sustainability of achievements, in an environment where the demand for specialized care continues to grow.

## 1.2 Report objectives and reference period (2022 - Q1 2025)

### ● General objective:

Analyze and *document the impact of the NEST Model at the HSJDT on the quality of neonatal care from January 2022 to March 2025* in order to identify its effects on survival and quality of neonatal care, and the conditions for sustainability and scaling up.

### ● Specific objectives:

#### 1. TO MEASURE THE EVOLUTION OF THE QUALITY OF NEONATAL CARE (2022–Q1 2025)

- To measure or report progress made in infrastructure, equipment (incubators, phototherapy, monitors, wall oxygen), human resources, and training.
- **Identify tangible results related to allocated funding in terms of coverage, effectiveness, and sustainability**
- Monitor the use of funds allocated by PCF (KC, catering for mothers, salaries, equipment, HV, PCI).
- Identify the tangible results linked to this support in terms of coverage, effectiveness, and sustainability.

#### 2. TO DETERMINE THE PROGRESSION OF KEY NEONATAL HEALTH INDICATORS FROM JANUARY 2022 TO MARCH 2025 IN ORDER TO ASSESS THE UNIT'S PERFORMANCE.

- Neonatal mortality and morbidity rates.
- Proportion of newborns admitted for asphyxia, jaundice, prematurity, low birth weight, or hypothermia.
- Number of newborns benefiting from KC and post-discharge follow-up (HV).

#### 3. DOCUMENT OR DESCRIBE ORGANIZATIONAL INNOVATIONS AND OBSTACLES

- Experience with bi-weekly audits of neonatal deaths.
- Deployment of HVs and integration of social services.
- Involvement of the CLIN (Committee for the Fight against Nosocomial Infections) and trained staff.

#### 4. IDENTIFY PERSISTENT CHALLENGES AND PROSPECTS (POST-2025)

- Constraints in human resources, infrastructure, and specific equipment (breast milk, modular tables, adapted refrigerators).
- Opportunities to extend the NEST Model to other health services and areas.
- Alignment with the **National Health Plan (PNS)** and regional dynamics (Burkina Faso, Togo, Côte d'Ivoire, Burundi).

## 1.3 Presentation of the NEST Model and its components

The **NEST Model** is based on an integrated systems approach, designed to address the specific challenges of neonatology in resource-limited settings. It is structured around **four interdependent pillars: PLACE, PRODUCTS, PEOPLE, POWER.**

 **FIGURE 3.**  
**NEST Model's four pillars**

### PLACE

Suitable and safe physical environment: dedicated infrastructure, spatial organization, PCI, hygiene, KC spaces.

### PRODUCTS

Essential equipment and consumables: incubators, phototherapy equipment, monitors, wall-mounted oxygen, NaClO<sub>3</sub>O, sustainable maintenance

### PEOPLE

Training and skills development: neonatal care, KC, mentoring, PCI, family involvement

### POWER

Leadership, advocacy and governance, death audits, accountability, integration into national policies, regional sharing





## PLACE

### A suitable and safe physical environment

The first pillar of the NEST Model emphasizes the importance of an appropriate setting to receive and treat vulnerable newborns.

- **Dedicated infrastructure:** A well-designed neonatal unit, separate from other services, promotes infection prevention and allows for constant patient monitoring.
- **Environmental conditions:** Temperature control, appropriate lighting, electrical safety, and reliable access to oxygen are essential.
- **Spatial organization:** Optimized layout of incubators, KC areas, and spaces for supporting mothers to ensure proximity and continuity of care.
- **Hygiene and IPC:** Implementation of clean/dirty circuits, hand washing stations, and isolation areas to limit nosocomial infections.

**At the HSJDT:** Since 2012, the Paolo Chiesi Foundation has supported the creation and development of the neonatology service, but the external evaluation (2024) highlighted that the space remains cramped and needs to be modernized to meet the increased volume of patients.



## PRODUCTS

### Essential equipment and consumables

Neonatal survival depends directly on the availability and correct use of equipment adapted to the context.

- **Vital equipment:** Low-energy incubators, phototherapy devices (e.g., Firefly), oxygen concentrators, multiparameter monitors.
- **Basic care equipment:** Probes, manual aspirators, neonatal ventilation devices, warming tables.
- **Essential consumables:** Essential medicines (neonatal antibiotics), disinfection solutions (Na-CLO30), supplies for PCI.
- **Maintenance and sustainability:** Implementation of local mechanisms for maintenance and rapid repair of equipment to ensure its continuous availability.

**At the HSJDT:** Between 2022 and 2024, support from the Paolo Chiesi Foundation enabled the acquisition of 22 Firefly phototherapy units, 3 multiparameter monitors, 12 wall-mounted oxygen outlets, 4 neonatal resuscitation tables/heating tables, 2 Na-CLO30 machines for the production of sodium hypochlorite and Kangaroo Care kits, and 2 CPAP machines. This equipment has contributed to improving patient care.



## PEOPLE

### Skilled and motivated teams

Human resources are central to the quality of care. The NEST Model emphasizes the continuous development of skills. The goal is to ensure that best practices are implemented at the right time by trained, available, and supported professionals.

- **Initial and continuing training:** Training of healthcare personnel (pediatricians, nurses, midwives, nursing assistants) in essential neonatal care and appropriate protocols.
- **Kangaroo Care (KC):** Training and support for mothers and families in the care of premature or low-birth-weight babies.
- **Mentoring and supervision:** Implementation of clinical mentoring programs, with close monitoring and regular practice assessments.
- **Quality culture:** Encourage staff to use data (NID, audits) to improve their practices and strengthen their ownership.

**At the HSJDT:** The Paolo Chiesi Foundation funds continuing education for staff (21 employees trained online in 2022), the salary of a dedicated KC nursing assistant, and regular infection prevention and control (IPC) skills development sessions. However, the shortage of neonatology specialists remains a major challenge.



## POWER

### Leadership and governance that stand the test of time

This pillar aims to ensure the sustainability of achievements and the integration of innovations into the healthcare system. The ultimate goal is to orchestrate the three other pillars through clinical and institutional leadership that prioritizes, funds, measures, and improves.

- **Local leadership:** Active involvement of the hospital and the neonatology department in resource management and strategic planning.
- **Advocacy:** Mobilizing national health authorities and partners to integrate the achievements of the model into health policies.
- **Governance and accountability:** Implementation of monitoring mechanisms (audits, reports, indicators) enabling transparent management and data-driven decision-making.
- **Sharing and scaling up:** Dissemination of good practices to other institutions via the NEST network and sub-regional cooperation.

**At the HSJDT,** the neonatology department has developed a culture of participatory governance with **bi-weekly audits of deaths** and **annual narrative reports** to the Paolo Chiesi Foundation. This accountability approach makes it a pilot center for the region (Burkina Faso, Togo, Côte d'Ivoire).

The **NEST Model** is based on a balance between a **safe physical environment (PLACE)**, **appropriate technologies (PRODUCTS)**, **competent and motivated teams (PEOPLE)**, and **strong institutional leadership (POWER)**. It therefore relies on a dynamic equilibrium between four complementary pillars. Each provides an essential building block for the survival and development of the newborn; it is their coherent articulation that leads to improved outcomes. The NEST Model, implemented at the HSJDT, is also applied in other French-speaking African countries. The partners implementing it work in a spirit of sharing best practices and lessons learned, and the insights gained from its implementation at the HSJDT can serve as a reference and inspiration for other partners and hospitals in the region.



## 1.4 Strategic alignments (EWENE & NEST<sup>8</sup>)

The NEST Model case study at the HSJDT is situated within an international context shaped by the commitments of the Sustainable Development Goals (SDGs) aimed at reducing neonatal mortality. SDG 3.2 sets the target, by 2030, of reducing neonatal mortality to  $\leq 12$  deaths per 1,000 live births. To support the achievement of this objective, the World Health Organization and its partners launched the Every Newborn Action Plan (ENAP) in 2014, a global strategy designed to accelerate the reduction of preventable neonatal deaths and stillbirths through strengthening the quality of care, health systems, and monitoring and accountability mechanisms.

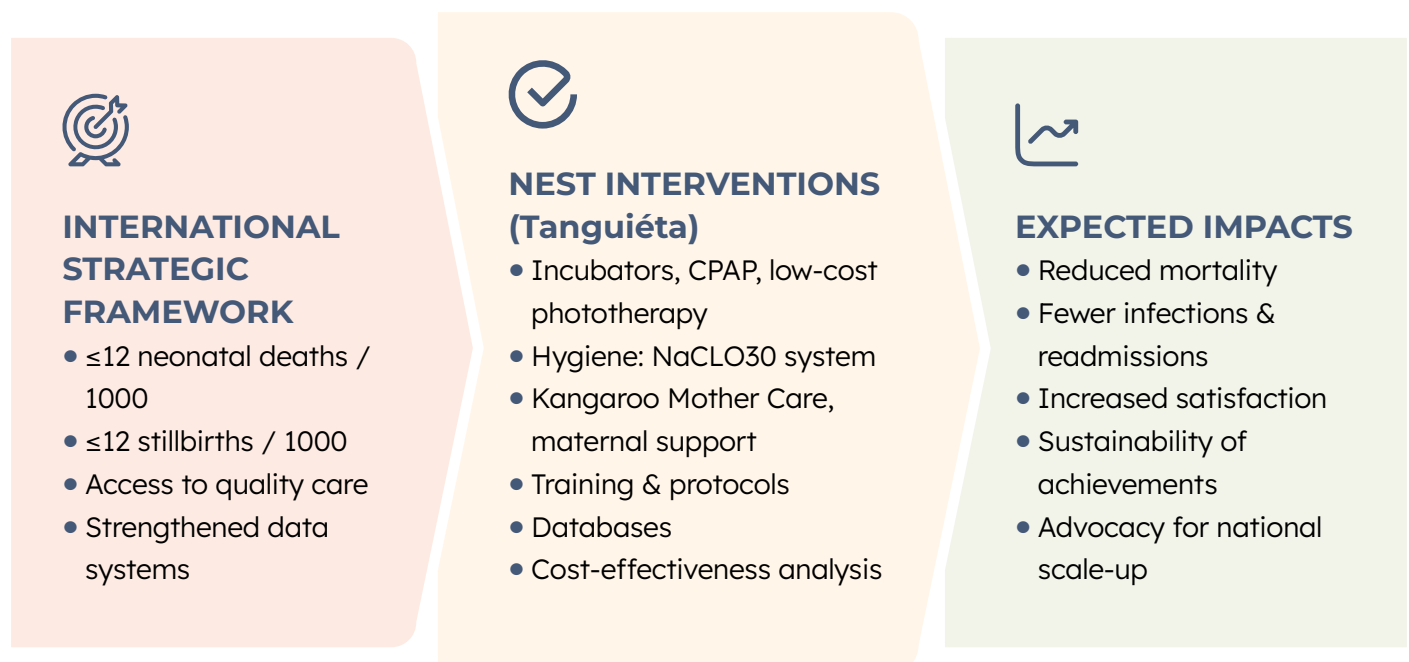
Since then, the international approach has evolved toward a more integrated vision of maternal and newborn health. This evolution led to the EWENE (Every Woman Every Newborn Everywhere) initiative, which brings together and extends the priorities of ENAP and the Ending Preventable Maternal

Mortality (EPMM) initiative within a common framework focused on the survival, health, and well-being of women and newborns. EWENE places particular emphasis on integrated care, equity, sustainable financing, and health system strengthening. In this document, reference will mainly be made to EWENE, as this initiative currently represents the leading international strategic framework for maternal and newborn health actions.

These commitments have been incorporated into Benin's National Health Policy (PNS 2018–2030), which identifies maternal and newborn health as one of its strategic priorities.

The **NEST Model**<sup>7</sup>, funded and implemented with support from the Paolo Chiesi Foundation in Tanguiéta, operationally complements this dynamic by translating the commitments of EWENE<sup>21</sup> into concrete interventions at a high-volume peripheral hos-

 **FIGURE 4.**  
**EWENE & NEST FOCUS: Strategic Alignment at HSJDT**



pital. By introducing essential equipment (heating tables, phototherapy devices, multiparameter monitoring equipment, NaClO<sub>3</sub> machines for the production of sodium hypochlorite), strengthening the skills of the teams (training, supervision), and promoting proven practices such as KC, the model directly contributes to improving the quality of care and reducing preventable deaths.

Thus, the HSJDT experience serves as a **proof of concept**, demonstrating how a targeted partnership (Paolo Chiesi Foundation – HSJDT) can accelerate the local implementation of commitments made by the Beninese government within the framework of the EWENE in synergy with UNICEF’s, WHO’s, and UNFPA’s advocacy and strategic support. This case study illustrates the convergence between private philanthropic investments and global public health

priorities and provides a solid basis for advocating for the expansion of the model to other referral hospitals in Benin and the sub-region.

## ● International Framework

- Reduce **neonatal mortality** to ≤12 deaths per 1,000 live births.
- Reduce **stillbirths** to ≤12 per 1,000 total births.
- To ensure that **all newborns and their mothers** have access to quality, safe, respectful, and affordable care.
- **Data collection and use** systems for monitoring progress.

## ● Alignment of NEST axes with the global framework

PILLAR OF QUALITY CARE	REFERENCE IN THE OFFICIAL ENAP <sup>12</sup> (INTEGRATED INTO EWENE) <sup>21</sup>	NEST INTERVENTIONS IN TANGUIÉTA	EXPECTED IMPACT
Prevention and reduction of neonatal deaths	Objective 1: Strengthen and invest in childbirth care	Provision of incubators, warming tables, oxygen concentrators, and Firefly phototherapy	Improved survival rates for premature infants and children with respiratory distress
Reduction of nosocomial infections	Objective 2: Improve the quality of care	Introduction of the NaClO <sub>3</sub> system for hospital hygiene and disinfection, strengthening of IPC protocols	Significant reduction in neonatal infections
Family-centered care	Objective 4: Involve families and communities	Development of the Kangaroo Unit (KC), support for mothers (accommodation, meals, kits)	Improved mother-child bonding, reduced mortality, and readmissions
Staff skills	Objective 1 + 2: Quality and ongoing staff training	Regular training, supervision, and standardized protocols	Strengthening clinical capacities, improving the quality of care
Data monitoring and evaluation	Objective 5: Monitoring, accountability, and use of data	Satisfaction surveys, Maternity databases, Neonatology, KCU	Availability of reliable data for progress monitoring and advocacy
Investment efficiency	Objective 1: Strengthening investments and sustainability	Financial monitoring and cost-effectiveness analysis (cost per death avoided, per day of hospitalization reduced)	Better resource allocation, justification of funding

The **Every Woman Every Newborn Everywhere (EWENE)**, launched jointly by WHO, UNICEF, and UNFPA, is the international roadmap to end preventable newborn deaths by 2030 (SDG 3.2). It is structured around five strategic objectives:

- strengthen and invest in care around childbirth and for sick and low-birth-weight newborns;
- improve the quality of maternal and neonatal care;
- reaching every woman and every newborn to reduce inequalities;
- involve families and communities;
- ensure progress monitoring and accountability.

In the context of implementing the **NEST Model** at the HSJDT, these guidelines have been **operationalized under six adapted thematic axes**, in order to facilitate planning and monitoring at the hospital level:

- **prevention and reduction of neonatal deaths;**
- **reduction of nosocomial infections;**
- **family-centered care;**
- **staff skills;**
- **data and monitoring, and evaluation;**
- **investment efficiency.**

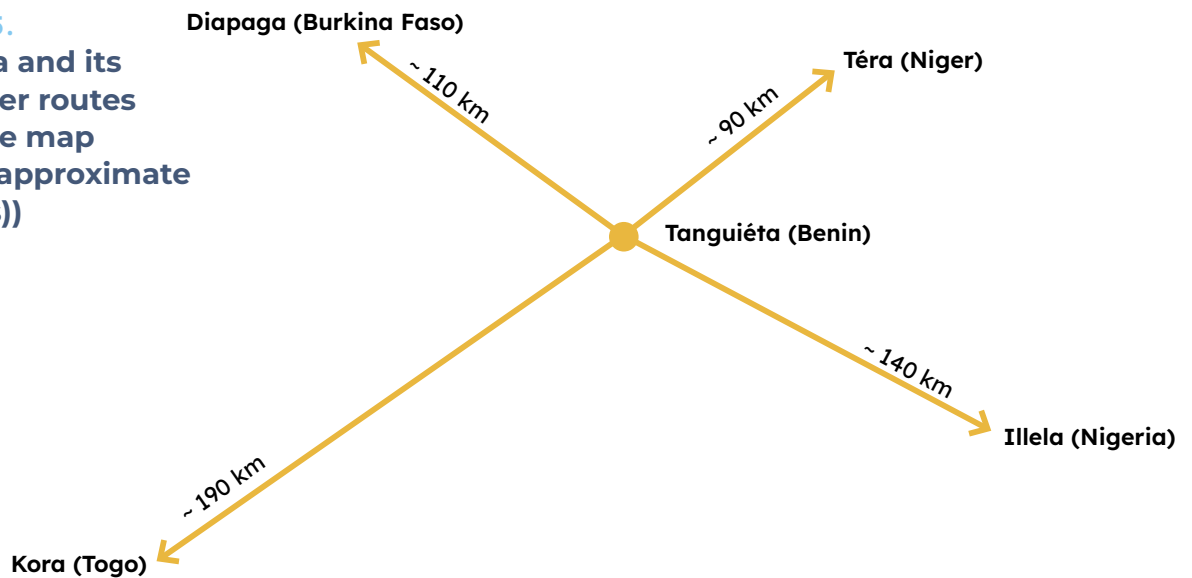
These six axes translate, at an operational level, the priorities of EWENE and are used by the Paolo Chiesi Foundation and its partners to monitor the performance of the hospitals supported by the PCF through the NEST Model. They ensure coherence between the HSJDT interventions, the National Health Policy of Benin (2018–2030), and the Sustainable Development Goals.

The NEST experience in Tanguiéta demonstrates how targeted investments can translate EWENE's commitments into tangible results, while aligning with national and international priorities for neonatal health. The HSJDT stands out as a strategic site for implementing and evaluating the NEST Model, whose lessons can inspire other partners and hospitals in the region.

## 1.5 Presentation of the implementation site: the HSJDT



**FIGURE 5.**  
Tanguiéta and its  
four border routes  
(Indicative map  
showing approximate  
distances))



The HSJDT, located in the Atacora department in northern Benin, occupies a unique place in the provision of neonatal healthcare, not only for the country but also for the sub-region. Its importance rests on several dimensions:

### ● A referral hospital for northern Benin and neighboring countries

- The HSJDT is recognized as the reference hospital in an area covering the northern departments of Benin (Atacora, Donga).
- It also provides care for many patients from **neighboring countries**: Burkina Faso, Niger, Togo, and Nigeria, reinforcing its cross-border role.
- This attractiveness is explained by the reputation for quality care, the availability of experienced teams, and access to specialized services that are rare in the region.

The HSJDT thus functions as a **regional hub for tertiary care**, capable of responding to complex cases that peripheral structures cannot manage.

## ● A neonatal unit built and equipped thanks to the Paolo Chiesi Foundation and other hospital partners

- The neonatology department, inaugurated in 2012 and progressively strengthened, was born from a shared vision between the hospital and the Paolo Chiesi Foundation, which has continuously invested in its development. The Foundation's support has resulted in the **construction and fitting out** of a space dedicated to neonatal care and the provision of **equipment adapted to the resource-limited context**.

This partnership has enabled the HSJDT to become a **model for the NEST implementation** in West Africa, demonstrating that with targeted investments, concrete results can be achieved even in a rural and constrained environment.

## ● A reference role for neonatal care in the region.

- The neonatology service in Tanguiéta is not isolated: it is part of a **dynamic care network** that includes the peripheral maternity wards of the Tanguiéta-Matéri-Cobly health zone.
- These maternity wards systematically refer complicated or low-birth-weight newborns to the Tanguiéta unit, which has the necessary expertise and equipment.
- **Post-discharge HVs** extend this network logic by ensuring community follow-up and strengthening the link between the hospital, families, and primary health services.

The HSJDT is gradually assuming the role of a reference center for neonatology in northern Benin and neighboring countries. This regional hub function will be strengthened by the establishment of a structured perinatal network, in conjunction with the 2018–2030 National Health Plan and local health authorities.



## 1.6 Methodology, data sources, and key indicators

The NEST case study at Saint Jean de Dieu Hospital in Tanguiéta (HSJDT) is based on a mixed approach, namely:

- **Quantitative:** analysis of hospital registers, activity reports (2022-2024), Q1 2025 data, Paolo Chiesi Foundation budgets, PCI and NID audits.
- **Qualitative:** document analysis, recommendations from the external evaluation (April 2024), feedback from staff, and testimonies from beneficiary families (KC, HV).

The study is therefore based on a structured approach, with an analysis of trends based on a **time series** covering the period 2022-Q1 2025.

### ● Study type: trend analysis

This study aims to document the evolution of neonatal survival and quality of care indicators following the progressive implementation of key interventions supported by the Paolo Chiesi Foundation, such as strengthening KC, introducing home healthcare services, and improving IPC. The analysis is conducted as a time series (2022, 2023, 2024, Q1 2025) to track overall trends in a hospital setting where the interventions are introduced progressively and cumulatively.

### ● Study population

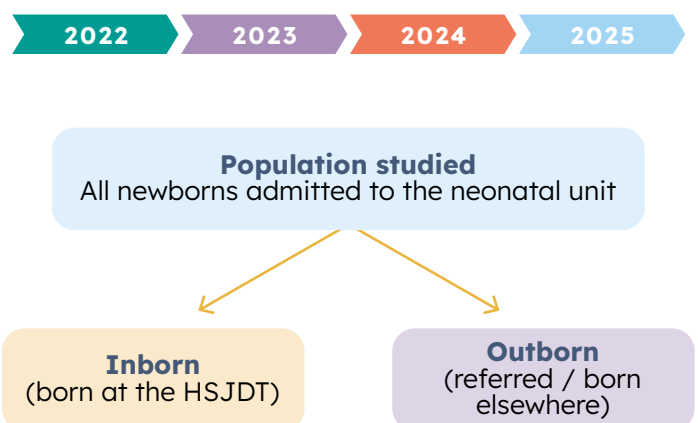
The study comprehensively includes all admissions to the HSJDT neonatology department during the period under consideration, thus avoiding sampling bias and accurately reflecting the department's operational reality. The analyzed data comes from databases (NID), hospital registers, neonatal records, and annual reports submitted to the Paolo Chiesi

Foundation, and concerns a population composed of premature newborns, low-birth-weight newborns (<2.5 kg), and newborns with medical complications such as asphyxia, neonatal infections, jaundice, or certain malformations.

### ● Subgroup analysis: inborn vs. outborn

A key distinction is made between **inborns**, meaning newborns born at the HSJDT maternity ward and immediately admitted to neonatal care, and **outborns**, which include newborns referred from peripheral maternity wards or arriving after a home birth or in transit. This distinction is crucial because their risk and mortality profiles differ: inborns benefit from immediate access to specialized care and generally have better survival rates, while outborns often arrive in critical condition, sometimes late, with higher mortality. Comparative analysis between these two groups thus allows us to measure the impact of the NEST Model on reducing inequalities in access and survival.

 **FIGURE 6.**  
**Breakdown of inborn vs outborn newborns**



This study design, based on chronological analysis and a distinction between patient subgroups, offers a robust view of the impact of the NEST Model at the HSJDT. It highlights **not only overall trends** but also differences according to the place of birth of newborns (inborn/outborn), a determining factor in the Tanguiéta region, where cross-border flows are significant.

## ● Key indicators (mortality, infection, KC, equipment, parental satisfaction)

To assess the impact of the **NEST Model** within the HSJDT, several key performance indicators were defined. These not only measure the results obtained in terms of survival and quality of care, but also evaluate operational efficiency and beneficiary satisfaction.

## ● Neonatal mortality in the unit

Neonatal mortality is defined as the proportion of deaths occurring among all admissions to neonatology.

## ● Nosocomial infection rate

The nosocomial infection rate is defined as the proportion of newborns who developed an infection, confirmed by laboratory testing or suspected based on clinical criteria, during their hospitalization. This indicator is particularly relevant because infection is a major cause of neonatal mortality in resource-limited settings, and its prevention and control (PCI) represent a priority area of the NEST Model.

## ● Kangaroo Care (KC) Coverage

The coverage of Kangaroo Care corresponds to the proportion of eligible newborns—premature or low-birth-weight (< 2,500g)—who actually received this treatment. This indicator is particularly relevant since KC is an intervention whose effectiveness in improving the survival of premature infants is well-established, especially in resource-limited settings. The expectation is to achieve increasing coverage, with a target of near-universality exceeding 75%<sup>11</sup> among eligible babies, accompanied by post-discharge follow-up at home.

## ● Functional availability of key equipment

Equipment availability is defined as the proportion of time essential devices—incubators, Firefly phototherapy lamps, oxygen concentrators, and monitors—are fully functional and usable. This indicator is crucial because technical sustainability is a fundamental component of the NEST Model: continuous access to operational equipment directly impacts the quality of care provided to newborns. The expected target is to achieve availability exceeding 90% through enhanced local maintenance and regular monitoring of equipment functionality.

## ● Number of trained staff

Training coverage is defined as the proportion of neonatal staff—pediatricians, nurses, midwives, and nursing assistants—who have received initial or continuing training in essential neonatal care, the KC method, PCI, and the use of NEST equipment. This indicator is particularly relevant because team competence is central to the NEST Model, especially its PEOPLE pillar. The expected objective is steady progress in this coverage to reach 100% of key staff trained by 2025.

## ● Parental satisfaction

Parental satisfaction refers to the proportion of parents or caregivers reporting a high level of satisfaction with the quality of care, the reception, the information received, and the follow-up. It is measured using discharge questionnaires or semi-structured interviews. This indicator, although indirect, is essential as it reflects the perceived quality of care and the degree of humanization of neonatal care. The expectation is for continuous improvement in satisfaction, driven in particular by better support for parents, support for the practice of home health services, and the implementation of home healthcare services.

In summary, the study utilizes an integrated and diverse system of sources, combining hospital registries, databases, institutional reports, field surveys, and independent external evaluations. This combination ensures both the reliability and richness of the information collected, while offering a nuanced understanding of the evolution of NEST indicators at the HSJDT. It also facilitates comparison with regional (NEST Partners meetings<sup>7</sup>, Beninese national guidelines<sup>13</sup>) and international (EWENE<sup>21</sup>, WHO/UNICEF recommendations, *Survive & Thrive*<sup>11</sup>) standards, which strengthens the relevance of the analyses and provides solid elements for comparison, monitoring, and alignment with global best practices in neonatal care.

## ● Data Sources

The analyses of the **NEST Model** at the HSJDT rely on a set of complementary sources that allow for the integration of quantitative and qualitative information. First, the HSJDT **neonatal registries** form the primary basis: they provide comprehensive data on admissions, newborn characteristics (inborn and outborn), clinical outcomes, and diagnoses and treatments received. In addition to these registries, **internal reports produced within the framework of the NEST partnership with the Paolo Chiesi Foundation are used**, including annual narrative reports, external evaluation reports, budget appendices, and follow-up mission reports. These documents provide essential information on implemented interventions, available equipment, staff training activities, IPC programs, and HVs. Finally, surveys **conducted with families and healthcare staff (see Chapter 6)** complement this data by providing a qualitative perspective on parental satisfaction, adherence to the KC, perceptions of the quality of care, and the experiences of caregivers. Together, these different sources provide an integrated view, both numerical and contextual, of the evolution of neonatal indicators during the period 2022–Q1 2025.

# 2. IMPLEMENTATION OF THE NEST MODEL AT THE HSJDT

## 2.1 History of the HSJDT - Paolo Chiesi Foundation partnership

Although the collaboration between Saint Jean de Dieu Hospital of Tanguiéta (HSJDT) and the Paolo Chiesi Foundation began in 2012, this study specifically covers the period 2022–Q1 2025, corresponding to the relaunch and operationalization phase of the revised NEST Model.

### ● 2022 – (Re)start-up and quality foundations

Re-establishing the partnership and laying the **groundwork**: PCI/CLIN assessment (current situation, bio-cleaning/waste audits, action plan), structured resumption of **KC** (dedicated nursing assistant, kits and meals for mothers), and **defining equipment needs** (phototherapy, monitors, wall-mounted oxygen, maintenance). This phase re-establishes safe routines and basic standard operating procedures, preparing for increased activity.

### ● 2023 – Planned ramp-up

**IPC – equipment – family-centered care** triad: planning and commitment of essential purchases (Firefly phototherapy, monitors, oxygen), **formalization of home visits** for at-risk newborns (modalities, budget), and skills development (neonatal resuscitation, prenatal care, IPC, equipment use). Program and budget governance is ensured by **Annex I – Project Document** and the **Partnership Agreement**, with monitoring of indicators and regular reviews.

## ● 2024 – Clinical and organizational consolidation

**High** and controlled workload **number**; High neonatal **admissions (inborn/outborn)**; **182 mother-child pairs** admitted to the **ICU**; **97 home visits** performed. **Human resources** are strengthened (2 pediatricians, 3 general practitioners, 8 nurses, 11 nursing assistants) and **skills** reinforced (**4** targeted training sessions). Regarding technology, the availability of respiratory support is improving, and critical equipment is being maintained **preventively**. Infection prevention and control (IPC) practices are stabilized (running water, cleanliness, and biomedical waste) and better documented.

## ● Integration of the 2024–2025 Agreement (entry into force: 01/08/2024)

**Purpose & targets:** reduction of neonatal mortality (0–28 days)

**Monitoring requirements:** interim report at M+6 (01/02/2025) and final report at M+12 (01/08/2025), with photo evidence; participation in the NEST Partners Meeting; use of funds strictly for approved activities.

Consultant's observation (field evaluation of the case study): since the signing of the framework agreement contract, 100% of the planned acquisitions have been effective, confirming the full operability of the NEST Model in Tanguiéta.

## ● Cross-cutting review 2022–2024 and the 2024–2025 Agreement

- **PLACE (quality & safety):** standardization of SOPs, increased PCI compliance, thermal protection, and KC continuum → **reduction of risks** for LBW/premature newborns.
- **PRODUCTS (products & availability):** reinforced critical equipment (CPAP, phototherapy, O<sub>2</sub>, monitors), maintenance organization, **and** proactive management of consumables.
- **PEOPLE:** strengthened and **trained teams** (4 sessions in 2024), bedside mentoring, organization of shifts.
- **POWER (governance & data):** alignment **Annex I / Agreement**, dashboards, morbidity and mortality reviews, **reporting requirements** (M+6, M+12), and improvement loops.

## 2.2 NEST systemic approach: equipment, skills, maintenance

This table summarizes the availability of essential equipment for neonatal care at the HSJDT, based on narrative reports, budget annexes, external evaluations of the NEST project, and observations of the technical facilities during this case study. Availability takes into account physical presence, proper functioning, sufficient quantity, and compliance with NEST standards.

\*6 O2 wall outlets: the flow meters were replaced in 2023, so 12 will be functional in 2025

\*\*Cleaning trolleys are shared by the three sensitive departments: delivery room, operating room, and neonatology.

 **FIGURE 7.**  
**Equipment available at the HSJDT**

EQUIPMENT	BASELINE (2021)	2022	2023	2024	Q1 2025	FULLY FUNCTIONAL	NUMBER PROVIDED BY PCF	NO. NON-FUNCTIONAL
Multi-parameter monitors	3	1	3	0	2	6	3	3
Firefly /phototherapy devices	2	1	1	0	1	5	2	0
Neonatal resuscitation tables (heated table)	5	2	1	2	2	9	4	3
Wall-mounted O <sub>2</sub> outlets	12	0	6*	0	0	12	12	0
Incubators	2	0	0	0	0	1	0	1
CPAP machine	3	0	1	2	2	5	2	3
Electric syringes	4	0	0	0	2	2	2	4
Multi-service cleaning trolleys**	0	0	0	3	0	3	3	0
Sodium hypochlorite production apparatus	1	0	2	0	0	3	2	0

## ● Availability and use of equipment

Equipment availability data shows **marked progress between 2022 and 2024**, reflecting the strengthening of the neonatal unit’s technical platform thanks to the direct contribution of the Paolo Chiesi Foundation and the joint efforts of the HSJDT.

The equipment funded by PCF – multiparameter monitors, Firefly phototherapy devices, cleaning trolleys, NaClO30 production units, and the rehabilitation of the wall-mounted oxygen network – has ensured the safety of respiratory and thermal care for newborns. Other existing equipment, such as CPAP machines, warming tables, and incubators maintained by the local technical team or supported by other partners, complements this system and ensures continuity of care.

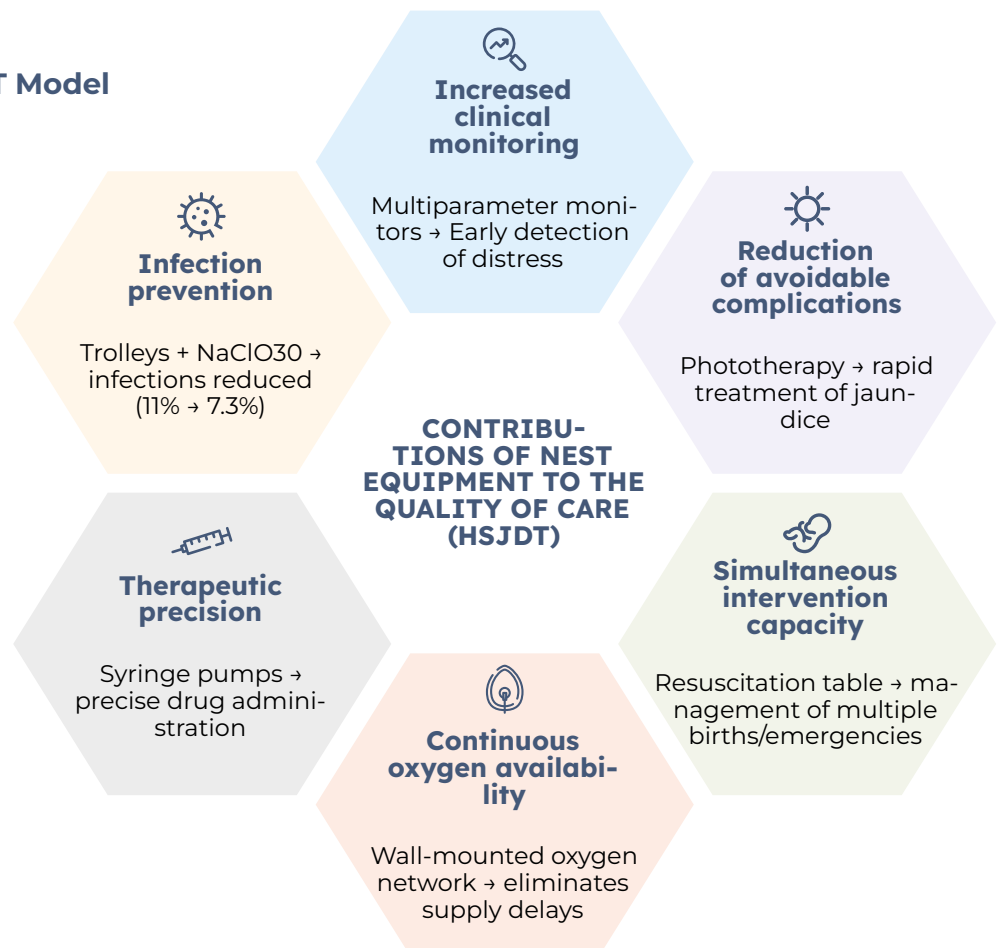
This overall development demonstrates a progressive improvement in the operational availability of the technical platform and a tangible strengthening of the quality of care in the neonatology department. All support – whether from PCF or other partners – contributes to the safety of newborns and the effectiveness of the NEST Model.

## ● Contribution of equipment to the quality of care

Each material improvement had a **measurable and synergistic impact** on the quality of care:

**Increased clinical monitoring:** The increased number of multi-parameter monitors has made it possible to detect respiratory or hemodynamic distress earlier, reducing staff response time.

 **FIGURE 8.**  
**Equipment and NEST Model**



**Reduction of avoidable complications:** Additional phototherapies allowed for faster treatment of jaundice, limiting the risk of complicated jaundice, with almost immediate coverage of diagnosed newborns.

**Simultaneous intervention capacity:** Additional resuscitation tables reduce the risk of saturation in the delivery room, which is particularly critical in the event of multiple births or obstetric emergencies.

**Continuous oxygen availability:** The proliferation of wall outlets has eliminated delays related to the transport or distribution of portable concentrators, a vital element for newborns in distress.

**Therapeutic precision:** The introduced electric syringes allow strict control of flow rates, essential for the administration of low and precise doses of medication to the newborn.

**Infection prevention:** The arrival of multi-service cleaning trolleys and antiseptic soap dispensers, combined with the commissioning of the NaClO<sub>3</sub> sodium hypochlorite production machine, is one of the factors that have contributed to the decrease in the rate of nosocomial infections.

## ● Putting it into perspective within the NEST Model

Within the framework of the **NEST Model**, these improvements are primarily related to the following pillars:

- **PRODUCTS:** Acquisition and maintenance of suitable equipment and consumables.
- **PLACE:** Improvement of the physical care environment (oxygen outlets, resuscitation area).
- **PEOPLE:** Training staff in the safe and efficient use of new equipment.

The increased availability of equipment was not limited to a logistical gain: it **transformed the unit's ability** to provide comprehensive, simultaneous care in accordance with international standards, with a **direct impact on neonatal mortality and morbidity**.

**In summary**, targeted investment in equipment has produced measurable effects in terms of **reduced waiting times, improved clinical monitoring, and a decrease in infections**. Combined with training and space optimization, this material reinforcement constitutes a major lever for the continuous improvement of the quality of care at Tanguiéta.

## 2.3 Phasing of the implementation of the NEST Model

The trajectory of the NEST Model in Tanguiéta unfolded according to logical **progression in three major phases**, reflecting a transition from structuring to operational maturity.

### Phase I – Foundation consolidation (year 2022)

**Objective:** To stabilize the technical and organizational achievements from the first decade of NEST (2014–2021).

- **Infrastructure (PLACE):** extension of the wall-mounted oxygen network; rehabilitation of the resuscitation room and installation of heated tables
- **Equipment (PRODUCTS):** additional provision of Firefly phototherapy devices and implementation of a biomedical inventory with a quarterly preventive maintenance plan; reactivation of CPAP devices was ensured locally by the HSJDT.
- **Skills (PEOPLE):** basic staff training in gentle resuscitation, thermoregulation, and KC; and introduction of follow-up using the standardized NEST form.
- **Steering (POWER):** resumption of monthly CLIN meetings; and first quality audits “O<sub>2</sub>/CPAP/phototherapy”.

**Overall effect 2022:** *stabilization of the technical platform and resumption of continuity of care.*

## Phase II – Expansion and systemic integration (2023–2024)

**Objective:** To extend the coverage of the NEST Model to the entire service and integrate the quality culture.

- **PLACE:** creation of a Kangaroo Care space and improvement of care pathways between maternity and neonatology.
- **PRODUCTS:** Preventive maintenance applied to all critical devices.
- **PEOPLE:** weekly close supervision; internal training of trainers; introduction of 48–72 h checklists for premature and asphyxic infants.
- **POWER:** introduction of the **NID**; monthly analysis of indicators and collective feedback.

**Overall effect 2023–2024:** *Professionalization of clinical management.*

## Phase III – Optimization and digitalization (Q1 2025)

**Objective:** To permanently embed the NEST Model as a system of continuous improvement.

- **PLACE:** standardization of patient pathways and complete functional zoning (admission → stabilization → KC → discharge).
- **PRODUCTS:** Complete maintenance of Firefly devices, continuous availability of oxygen 24/7, and functional restart of CPAP devices ensured by the HSJDT biomedical team, within the framework of the maintenance plan supported by the Paolo Chiesi Foundation.
- **PEOPLE:** autonomous staff on non-invasive ventilation and SpO<sub>2</sub> monitoring; consolidation of local clinical leadership.
- **POWER:** complete digitalization of the NID, real-time traceability of temperature, SpO<sub>2</sub>, feeding, and antibiotic therapy; computerized CLIN audit.

**Overall effect Q1 2025:** *near-universal coverage of essential neonatal care (oxygen, thermoregulation, nutrition, infection prevention), with clinical and administrative management now based on consolidated analysis of data from the NID, death audits, and quality indicators.*

In three years, Tanguiéta has transitioned from a fragmented healthcare system to an integrated, traceable, and sustainable model. The progressive phasing of the **NEST Model** has fostered a culture of quality and shared responsibility: **PLACE** guarantees the environment, **PRODUCTS** ensure technical continuity, **PEOPLE** embody competence, and **POWER** drives improvement. Tanguiéta exemplifies the maturity of a high-performing African model of neonatal care, aligned with the WHO/EWENE/PNS Benin 2030 objectives, and supported by the Foundation Paolo Chiesi.

# 3. OVERALL RESULTS AND TRENDS

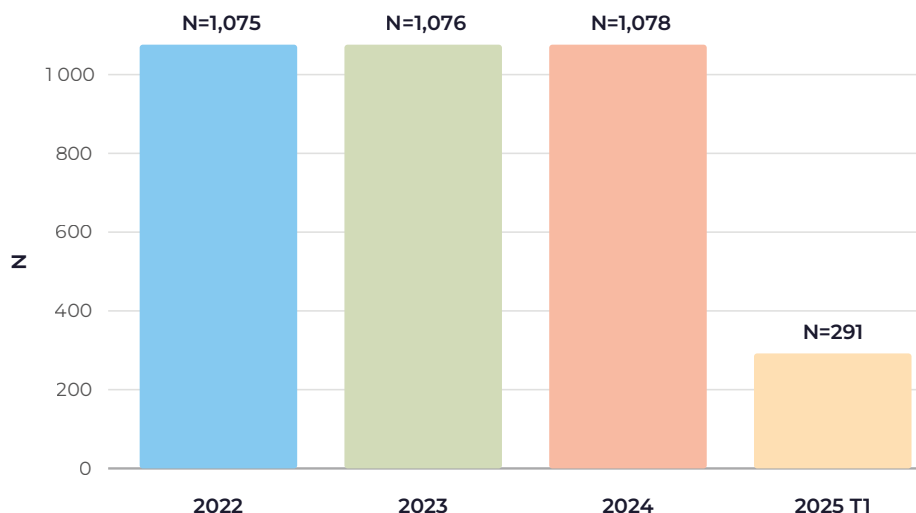
## 3.1 Total number of admissions per year

Between 2022 and 2024, the volume of neonatal admissions at the Saint Jean de Dieu Hospital in Tanguiéta remained stable and high: with 1,075 newborns in 2022, 1,076 in 2023, and 1,078 in 2024. In the first quarter of 2025 (N = 291), admissions remained proportional to previous annual trends, indicating continuity in performance and a sustained demand for specialized neonatal care.

This apparent stability demonstrates the service's ability to maintain a steady flow of admissions and

absorb regional transfers, while preserving the quality of care. However, this consistency does not necessarily indicate an optimal situation: it may also reflect a balance between in-hospital births and absorbed referrals, suggesting that some high-risk newborns could be cared for earlier by peripheral maternity units. This observation reinforces the importance of developing the peripheral neonatal care network to consolidate the continuity of the NEST Model at the regional level.

 **FIGURE 9.** Yearly admissions evolution - HSJDT (2022 - Q1 2025)



## 3.2 Distribution of admissions by place of birth (inborn/outborn)

Over the period 2022 to Q1 2025, the neonatology department of the HSJDT admitted **3,520 newborns**, including **2,057 Inborn (58.4%)** and **1,463 Outborn (41.6%)**.

This distribution highlights the dual role of the hospital: **birth center** with an integrated maternity ward (inborn), and **regional reference center** receiving transfers from surrounding areas (outborn).

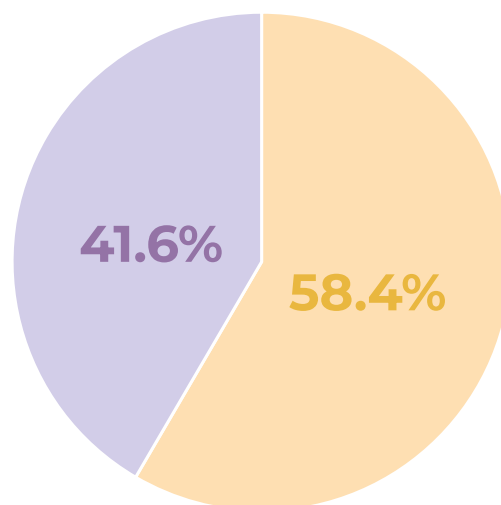
Inborn newborns account for nearly **six out of ten admissions**, confirming the growing proportion of births managed locally, while outborn newborns – four out of ten – reflect the **regional appeal** of the HSJDT and the **confidence of referring facilities**. This proportion, once a factor in excess mortality, is now a **performance indicator**: thanks to the NEST Model, transfers now benefit from early neonatal stabilization and optimized continuity of care.

The annual distribution between *inborn* and *outborn* newborns highlights **a slight decrease in outborns between 2022 and 2023**, followed by **a slight increase in 2024**.

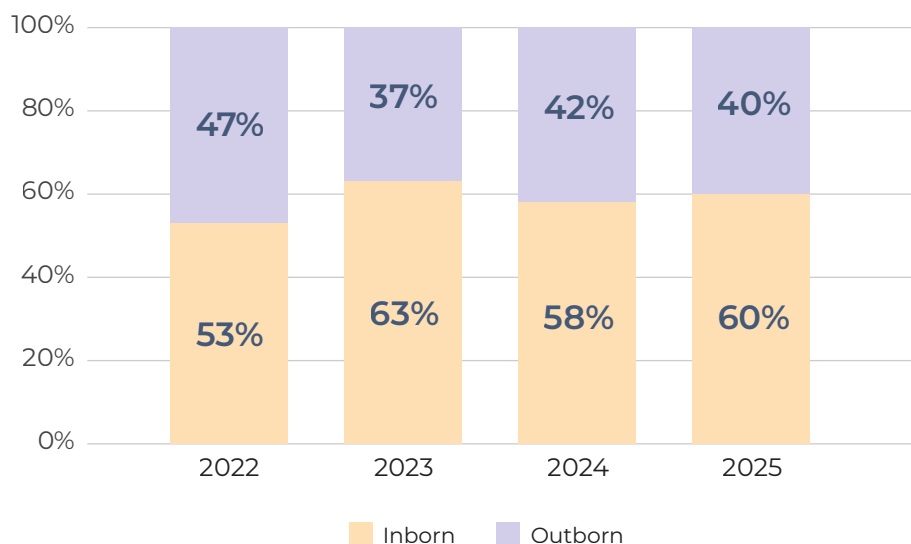


**FIGURE 10.**  
Admissions breakdown by origin  
HSJD Tanguiéta - 2022 to Q1 2025

**Legend** ■ Inborn — 2,057 admissions  
■ Outborn — 1,463 admissions



**FIGURE 11.**  
Admissions



### 3.3 Distribution of admissions by sex

Analysis of neonatal admissions over the period **2022–Q1 2025** shows a consistent **male predominance** among hospitalized newborns.

The distribution of admissions by sex shows that, over the entire period, **boys accounted for 56.0% of admissions (1,977 out of 3,520), while girls accounted for 44.0% (1,543 out of 3,520).**

By year, the proportion of male patients varies between 52.9% (2025) and 58.4% (2022), and that of female patients between 41.6% (2022) and 47.1% (2025).

The overrepresentation of male newborns among admissions varies from year to year: +16.8 percentage points in 2022, +9.2 points in 2023, +12.8 points in 2024, and +5.8 points in 2025. This corresponds to a relative overrepresentation ranging from +12% to +40% compared to female newborns.

This trend confirms a characteristic epidemiological profile already observed in numerous African and international series. This finding is consistent with global scientific literature: according to analyses by the WHO and UNICEF, and scientific literature<sup>12, 13</sup>. Male newborns have an increased risk of admission to neonatal intensive care (15–25% higher), along with a specific biological vulnerability to respiratory, infectious, and thermal complications, and are overrepresented in conditions such as respiratory distress syndromes, prematurity, and early hypothermia.

Thus, the greater proportion of male admissions to the HSJDT does not reflect a difference in local birth rates (the sex ratio at birth in Benin remains close to 104 boys for 100 girls, INSAE 2023) but rather a **higher probability of progression to a complication requiring hospitalization.**

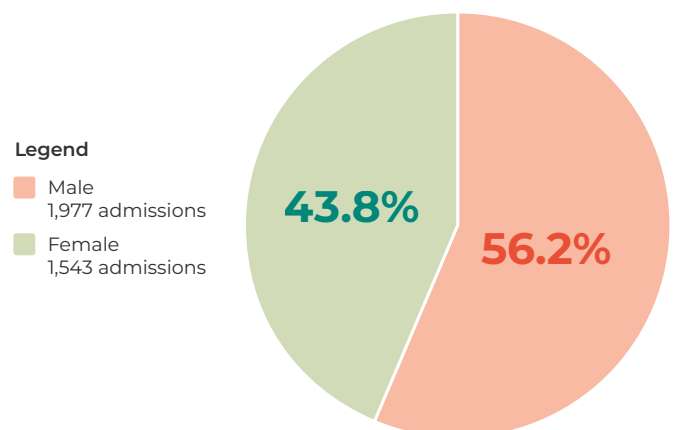
#### ● Clinical reading and pathophysiological explanations

Scientific data reveal that male newborns have a higher biological risk of neonatal complications that can lead to death than female newborns. These complications include premature birth, observed 14% more frequently in boys, and severe neonatal infections, 12% more frequent than in girls<sup>11</sup>.

Beyond purely clinical aspects, this difference in risk is also attributable to **slower lung maturation**, a **less effective innate immune response**, and a **more fragile thermoregulatory capacity**, as confirmed by several reviews of the international literature<sup>14, 15</sup>.

These differences help to explain the overall higher neonatal mortality observed in boys in most low-resource settings.

**FIGURE 12.**  
**Admissions breakdown by sex HSJD Tanguiéta - 2022 to Q1 2025**



## 3.4 Distribution of admissions by weight per year



FIGURE 13.

Breakdown of admissions by weight

YEAR	TOTAL ADMISSIONS (N)	< 1,500 G (VERY LOW WEIGHT)	1,500–2,499 G (LOW WEIGHT)	≥ 2,500 G (NORMAL WEIGHT)
2022	1,075	225 (20.9%)	374 (34.8%)	476 (44.3%)
2023	1,076	169 (15.7%)	462 (42.9%)	445 (41.4%)
2024	1,078	147 (13.6%)	463 (42.9%)	468 (43.5%)
T1 2025	291	38 (13%)	124 (42.6%)	129 (44.3%)

Between 2022 and 2024, the distribution of admissions by weight group shows a gradual evolution towards a better stabilization of the profile of newborns taken care of.

- **Very low weight (<1,500 g):** a progressive decrease is observed in the proportion of very-low-weight newborns: 20.9% in 2022, 15.7% in 2023, 13.6% in 2024, and 13% in the first quarter of 2025.
- **Low weight (1,500–2,499 g):** from 2023 onwards, the proportion of low-weight babies remains remarkably stable, around 43%, whereas it was lower in 2022. This indicates a consistency in the obstetric profile and in the maternal/neonatal characteristics of the population received.
- **Normal weight (≥2,500 g):** between 2022 and the first quarter of 2025, the results show generally stable proportions, with 476 (44.3%) in 2022, 445 (41.4%) in 2023, 468 (43.5%) in 2024, and 129 (44.3%) in the first quarter of 2025, indicating generally comparable rates over the period.

Overall, the distribution of weights seems to harmonize over the years, with fewer cases of extreme prematurity. The facility accommodates an increasing proportion of higher-weight infants, while the proportion of very-low-weight infants gradually decreases.

These results could reflect an improvement in prenatal screening, obstetric triage, and initial stabilization.

## 3.5 Distribution of Inborn vs. Outborn by Pathology

 **FIGURE 14.**  
Breakdown of admissions by condition

ADMISSION REQUIREMENTS	STRATUM	2022: N (%)	2023: N (%)	2024: N (%)	2025: N (%)	TOTAL: N (%)
Prematurity	Total	563 (52.4%)	496 (46.1%)	518 (48.1%)	129 (44.3%)	1,706 (48.5%)
	Inborn	270 (47%)	326 (47.8%)	315 (50.4%)	75 (42.9%)	986 (47.9%)
	Outborn	293 (58.6%)	170 (43.1%)	203 (44.8%)	54 (46.6%)	720 (49.2%)
Birth weight <2,500 grams	Total	599 (55.7%)	631 (58.6%)	610 (56.6%)	162 (55.7%)	2,002 (56.9%)
	Inborn	283 (49.2%)	407 (59.7%)	362 (57.9%)	92 (52.6%)	1,144 (55.6%)
	Outborn	316 (63.2%)	224 (56.9%)	248 (54.7%)	70 (60.3%)	858 (58.6%)
Birth weight <1500 grams	Total	225 (20.9%)	169 (15.7%)	147 (13.6%)	38 (13.1%)	579 (16.4%)
	Inborn	91 (15.8%)	100 (14.7%)	88 (14.1%)	24 (13.7%)	303 (14.7%)
	Outborn	134 (26.8%)	69 (17.5%)	59 (13%)	14 (12.1%)	276 (18.9%)
Hypothermia	Total	10 (0.9%)	8 (0.7%)	4 (0.4%)	46 (15.8%)	68 (1.9%)
	Inborn	5 (0.9%)	5 (0.7%)	2 (0.3%)	37 (21.1%)	49 (2.4%)
	Outborn	5 (1%)	3 (0.8%)	2 (0.4%)	9 (7.8%)	19 (1.3%)
Asphyxia	Total	358 (33.3%)	309 (28.7%)	255 (23.7%)	77 (26.5%)	999 (28.4%)
	Inborn	203 (35.3%)	202 (29.6%)	165 (26.4%)	54 (30.9%)	624 (30.3%)
	Outborn	155 (31%)	107 (27.2%)	90 (19.9%)	23 (19.8%)	375 (25.6%)
Infection	Total	767 (71.3%)	656 (61%)	663 (61.5%)	177 (60.8%)	2,263 (64.3%)
	Inborn	427 (74.3%)	417 (61.1%)	402 (64.3%)	114 (65.1%)	1,360 (66.1%)
	Outborn	340 (68%)	239 (60.7%)	261 (57.6%)	63 (54.3%)	903 (61.7%)
Jaundice	Total	170 (15.8%)	94 (8.7%)	97 (9%)	89 (30.6%)	450 (12.8%)
	Inborn	93 (16.2%)	60 (8.8%)	47 (7.5%)	56 (32%)	256 (12.4%)
	Outborn	77 (15.4%)	34 (8.6%)	50 (11%)	33 (28.4%)	194 (13.3%)
Respiratory distress	Total	230 (21.4%)	219 (20.4%)	263 (24.4%)	82 (28.2%)	794 (22.6%)
	Inborn	109 (19%)	153 (22.4%)	169 (27%)	54 (30.9%)	485 (23.6%)
	Outborn	121 (24.2%)	66 (16.8%)	94 (20.8%)	28 (24.1%)	309 (21.1%)

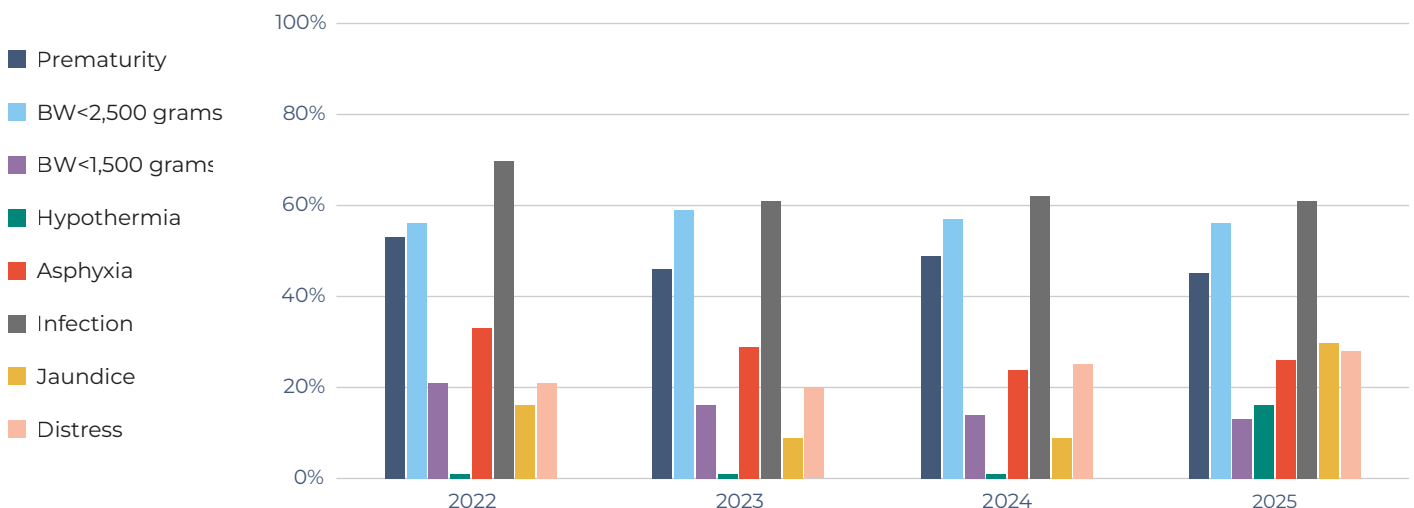
Between 2022 and 2024, pathologies at admission showed generally moderate trends, but these varied according to the place of birth. Decreases were more pronounced among outborn newborns, while certain conditions—notably prematurity, low birth weight, and respiratory distress—tended to increase among inborn newborns.

- Prematurity decreased slightly overall (from 52.4% to 48.1%, i.e., -4.3%), with a slight increase among inborns (+3.4%), while a moderate decrease was observed among outborns (-13.8%).
- Regarding birth weight <2,500 g, the overall trend is almost stable (+0.9%), but this masks an increase in inborn infants (from 49.2% to 57.9%, +8.7%) and a decrease in outborn infants (from 63.2% to 54.7%, -8.5%). Birth weight <1,500 g decreased overall (from 20.9% to 13.6%, -7.3%), only slightly in inborn infants (-1.7%) and more markedly in outborn infants (from 26.8% to 13%, -13.8%).
- Hypothermia remains generally stable, with a negligible variation (-0.5%), similar in inborn (-0.6%) and outborn (-0.6%).

- Asphyxia shows a moderate overall decrease (from 33.3% to 23.7%, -9.6%), slightly less marked in inborns (-8.9%) than in outborns (-11.1%), which could be explained by a lower proportion of very-low-birth-weight newborns (< 1,500 g) among the latter.
- Infections also decreased (-9.8%), with a comparable moderate decrease in inborn (-10%) and outborn (-10.4%) groups. Jaundice showed a moderate overall decrease (-6.8%), more pronounced in inborn (-8.7%) than in outborn (-4.4%) groups.
- Finally, respiratory distress increased slightly overall (+3%), with a notable rise in inborn infants (+8%), while a slight decrease was observed in outborn infants (-3.4%). This increase in inborn infants could be related to a higher proportion of very-low-birth-weight newborns in this group.

The graph below shows the distribution of neonatal admissions at the HSJDT by pathology and according to the place of birth (*inborn/outborn*).

**FIGURE 15.**  
**Conditions at admission**



# 4.

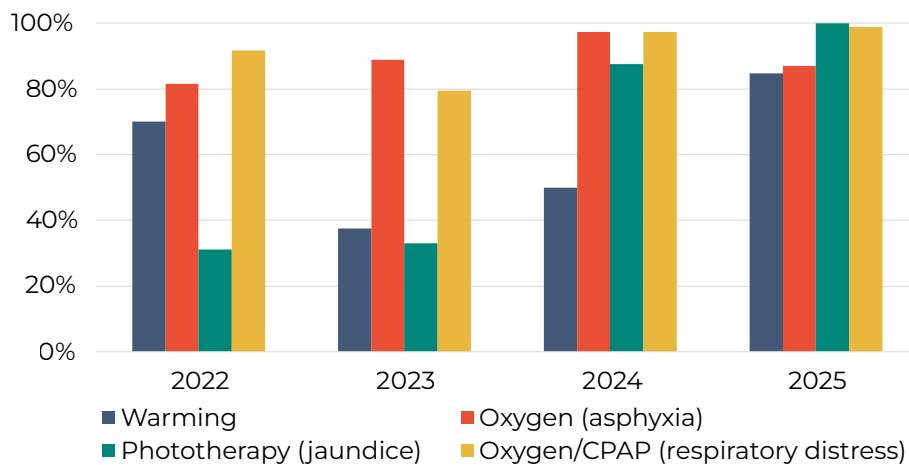
# DETECTION AND COVERAGE OF CARE

The graph below illustrates the evolution of coverage for key neonatal interventions between 2022 and 2025.

A significant increase in phototherapy and oxygenation for asphyxial newborns is observed, while oxygen/CPAP coverage remains high and stable.

The variability in rewarming rates for hypothermic subjects reflects the small sample size for this intervention.

 **FIGURE 16.**  
**Care coverage**



## 4.1 Hypothermia: detection and warming coverage

This analysis assesses the ability of the neonatal unit to **detect hypothermia early** and to **apply an appropriate warming protocol** (by incubator, warming table, or skin-to-skin/Kangaroo Method).

### ● Results table: factual analysis and quantitative trends

 **FIGURE 17.**  
Warming coverage among hypothermia cases (HSJDT, 2022–Q1 2025)


PERIOD	CASES OF HYPOTHERMIA	REHEATED CASES	WARMING COVERAGE (%)
2022	10	7	70.0%
2023	8	3	37.5%
2024	4	2	50.0%
Q1 2025	46	39	84.8%

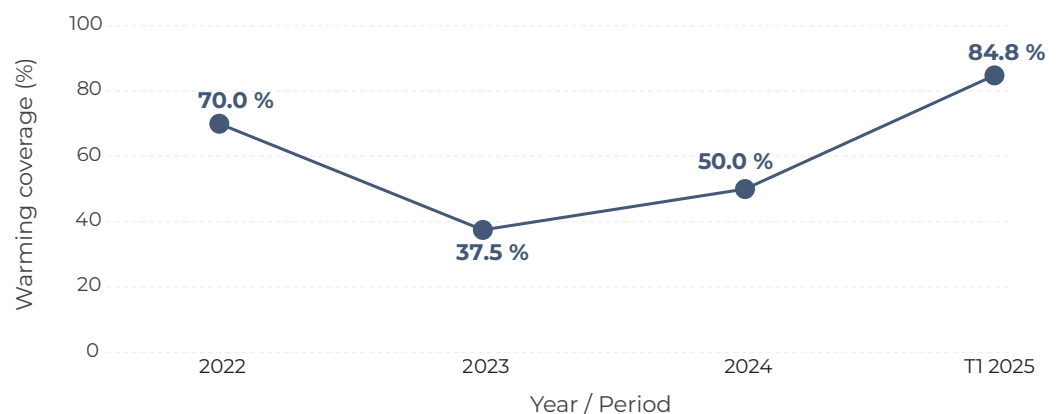
### ● Visual trends:

**Initial phase (2022–2023):** sharp drop in coverage from 70% to 37.5%. The hospital had just upgraded the heated tables, as part of the PCF 2022-2023 funding. Skin-to-skin and KC practices were in the integration phase.

**Recovery phase (2024–Q1 2025):** significant increase to **84.8%**, the best performance observed since monitoring began.

**Significant increase in the number of cases in Q1 2025 (46 cases compared to 4 in 2024):** this could indicate better screening and recording of hypothermia, but this needs to be verified.

 **FIGURE 18.**  
Warming coverage (for hypothermia) – HSJDT



## ● Technical interpretation: hypothermia and warming, NEST Model

In line with the **NEST (PLACE – PRODUCTS – PEOPLE – POWER) Model**, the prevention and management of hypothermia are major indicators of the **quality of essential newborn care**:

- **PLACE**: existence of a secure thermal environment (incubators, heated tables, KC, zero separation);
- **PRODUCTS**: availability and maintenance of heating devices;
- **PEOPLE**: competence of staff in early detection and rapid response;
- **POWER**: hospital leadership and regular CLIN/NID audits for monitoring.

The evolution of hypothermia coverage directly reflects progress in these four dimensions.

## ● Chronological and contextual analysis

### 2022: INSTALLATION OF THE DEVICE AND INITIAL APPROPRIATION

- The hospital had just installed its first heated treatment tables between 2021 and 2022.
- The **70% coverage rate** reflects an **immediate effect of material reinforcement**, but on a still limited workforce and under direct supervision.
- **Skin-to-skin and KC** practices were in the integration phase.

### 2023: DETERIORATION OF COVERAGE (37.5%)

- The year was marked by a **high workload** and **staff turnover**, as noted in the 2023 report of the Paolo Chiesi Foundation.
- The neonatology department has experienced **interruptions in maintenance** and **underutilization of equipment** (low number of operational heated tables).
- The 2024 external evaluation mentions: *“Thermal management remains a challenge: lack of heated treatment surfaces and overuse of non-standard blankets.”*
- The **decline in coverage**, therefore, illustrates a **structural fragility** of the system before the full implementation of the integrated model.

### 2024: STABILIZATION AND REORGANIZATION (50%)

The year 2024 marks a phase of stabilization following the reorganization of thermal zones and the re-commissioning of equipment.

- Local production of sodium hypochlorite (NaCl), supported by the Hospital and Community Hygiene Office (H2P) in collaboration with the Infection Control Committee (CLIN), has strengthened infection prevention and contributed to a safer thermal environment. This improvement in hygiene and safety of care surfaces has had an indirect effect on thermal stability, limiting heat loss during handling and reinforcing stricter procedures for the care of vulnerable newborns.

- In parallel, the systematic implementation of Kangaroo Care (KC) has consolidated the active prevention of hypothermia and allowed for better continuity of warming after discharge.
- Coverage is rising again in 2024 (50%), a sign of better screening and harmonization of practices around thermal prevention.

## Q1 2025: CONSOLIDATION AND PERFORMANCE IMPROVEMENT (84.8%)

The strong progress recorded in Q1 2025 is the result of a coherent series of targeted interventions:

- **Internal training** on hypothermia prevention has improved early detection and immediate implementation of warming measures.
- Beginning of **practices promoting zero separation between mother and newborn**
- Traceability **via the NID** ensured systematic recording of temperatures and better monitoring of the effectiveness of the warming.
- The increase in reported cases shows that **hypothermia is now being sought, recorded, and corrected**, reflecting an **established quality culture**.

The combined effect of these actions led to a notable increase in warming coverage (84.8%). This progress reflects the establishment of a sustainable quality culture, where every episode of hypothermia is now proactively sought, recorded, and corrected.

However, these results only cover the first quarter of 2025: they need to be confirmed and consolidated over the following quarters to validate the sustainability of this positive trend.

## Overall interpretation: significance within the NEST trajectory

PERIOD	NEST MODEL PHASE	STRATEGIC INTERPRETATION
2022–2023	Set up	Experimentation, structural deficiencies, dependence on donations.
2024	Quality Transition	Structuring of the CLIN, standardization of practices, and use of the NID.
Q1 2025	Consolidation and maturity	Mastery of the thermal process, complete integration into the continuum of care (from maternity to home healthcare).

**Neonatal warming** here becomes a synthetic indicator of the degree of **functional maturity of the NEST Model**, reflecting the effectiveness of the **PLACE & PRODUCTS axis** (environment + equipment); the appropriation by the **PEOPLE** (training, vigilance, coordination); and the capacity of **POWER** (leadership, data, audits) to drive continuous improvement.

## Correlations with other dimensions of the project

- **KC (Kangaroo Care) coverage:** the increase in the warming rate goes hand in hand with the extension of KC; these two indicators reflect **better physiological and environmental thermoregulation**.
- **Respiratory distress and oxygen therapy/CPAP:** thermal stability improves the response to respiratory treatment.
- **PCI:** a clean environment and adherence to the bio-cleaning protocol help to limit heat loss through evaporation.
- **Hospital Leadership (POWER):** The dynamic of Fr. Parfait Tchaou and Dr. Dogo, mentioned in the Paolo Chiesi Foundation reports, promoted staff empowerment and coordination with the CLIN.

## ● Analytical Conclusion

The observed trajectory (70% → 37.5% → 50% → 84.8%) exemplifies **the institutional learning and resilience of the HSJDT**.

This progress illustrates the value of a systematic approach focused on capacity building and adapting the service to local needs.

*As highlighted by WHO and UNICEF in various documents<sup>11-14-15</sup>, Systematic approaches that are based on a needs assessment, offer targeted support to address local priorities, build capacity, and develop appropriate infrastructure in partnership with users, can produce tangible results in a short time.*

The Tanguiéta experience follows this same trend: the **combination of Kangaroo Care and functional thermal equipment** has significantly reduced cases of severe hypothermia and improved the thermal stability of at-risk newborns. These advances confirm the effectiveness of the **NEST Model** as a lever for rapid and sustainable improvement in the **prevention and management of neonatal hypothermia** in resource-limited settings.



## 4.2 Neonatal jaundice: phototherapy coverage

This cross-section assesses the service’s ability to detect neonatal jaundice early and to initiate phototherapy **within an optimal therapeutic timeframe.**

### ● Results table: factual analysis and quantitative trends



**FIGURE 19.**  
Coverage of phototherapy for cases of neonatal jaundice (HSJDT, 2022–Q1 2025)

PERIOD	CASES OF JAUNDICE	CASES TREATED WITH PHOTOTHERAPY	PHOTOTHERAPY COVERAGE (%)
2022	10	7	70.0%
2023	8	3	37.5%
2024	4	2	50.0%
Q1 2025	46	39	84.8%

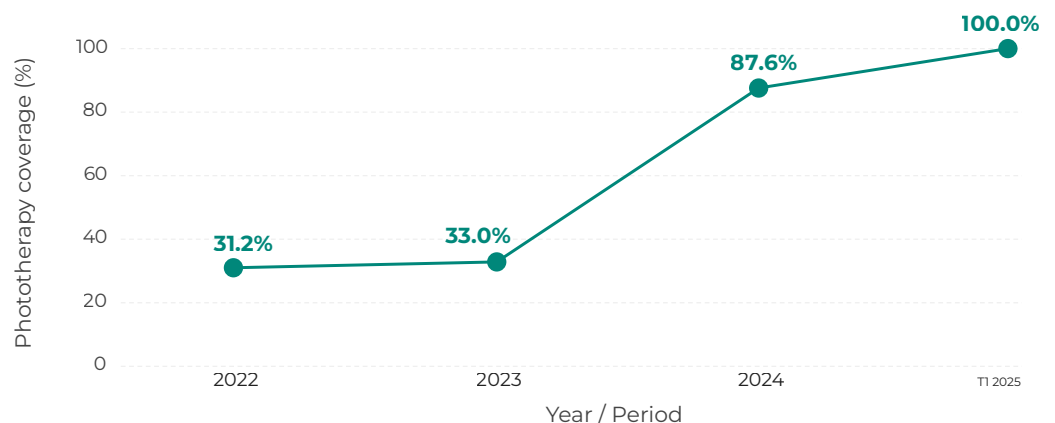
### ● Visual trends

Between **2022 and 2023**, therapeutic coverage of neonatal jaundice cases remained low and almost stagnant, around 33%, reflecting the technical difficulties encountered and the limited availability of equipment. **A marked improvement is observed in 2024 (87.6%), then consolidated in Q1 2025 (100%), reflecting the full availability of Firefly devices and increased control over their use.**

The number of jaundice cases decreased over the period, while treatment capacity increased: this development reflects both a gain in efficiency and better therapeutic targeting.



**FIGURE 20.**  
Phototherapy coverage (for jaundice) – HSJDT



## ● Clinical and normative context

Neonatal jaundice remains a major cause of preventable morbidity in resource-limited settings.

As highlighted in documents from WHO and UNICEF, including the *Survive and Thrive* report (2020), the availability of and rapid access to critical life-saving technologies — such as phototherapy for the management of jaundice in newborns — are among the key components for assessing the preparedness of care services for sick infants and newborns<sup>11</sup>.

A coverage rate of over 80% is presented as a benchmark of high performance, meeting the operational quality standards targeted by continuous improvement programs.

This threshold reflects the model's ability to combine functional equipment, technical skills, and quality monitoring, in line with the objectives of EWENE and WHO standards on the quality of care for small and sick newborns.

Phototherapy (e.g., Firefly devices) is identified as a **high-impact intervention**, included in the essential care package of the **NEST Model** (PRODUCTS pillar: vital equipment and maintenance); it is also a key performance indicator of the PLACE pillar (adapted infrastructure).

## ● Chronological analysis and interpretation

### 2022 – INITIAL IMPLEMENTATION: 31.2%

- Reference year: only **53 out of 170 cases** benefited from phototherapy.
- The **available phototherapy equipment** was limited or outdated, with **partial coverage** of the cribs.
- In the **2022 Annex 2 report (HSJDT-PCF)**, the budgetary priority was essentially the **restructuring of the KC and the salary of a nursing assistant**, not yet the expansion of the Firefly devices.

### 2023 – TRANSITION YEAR: 33%

- Slight improvement (+2 pts) but still a suboptimal situation.
- The **2023 narrative report** confirms the receipt of **one Firefly device and three multiparameter monitors**.
- **Frequent breakdowns** and **non-standardized care** limited regular use.
- The CLIN team was focusing more on **PCI**, which delayed the prioritization of jaundice.
- The 2024 external evaluation note:

*“The department remains under-equipped for phototherapy; the existing devices are functional but insufficient in number for the burden of disease.”*

### 2024 – INVESTMENT AND TRAINING EFFECT: 87.6%

- Major turning point:
  - ▶ **Targeted staff training** on the use, duration, and monitoring of phototherapy (under H2P and CLIN supervision).
  - ▶ **Improved maintenance** and stable electricity availability.
- Result: nearly **9 out of 10 newborns with jaundice were treated**.
- Reduction in the overall number of cases (97 vs. 170): reflects **earlier diagnosis and better-con-**

**controlled prenatal prevention** (early breastfeeding, prevention of infections).

### Q1 2025 – MODEL MATURITY: 100%

- All 89 identified jaundiced newborns received appropriate phototherapy.
- This success results from the **complete synergy of the four NEST pillars**:
  - ▶ **PLACE**: renovated neonatal units, secure thermal and lighting circuits;
  - ▶ **PRODUCTS**: availability and continuous maintenance of Firefly;
  - ▶ **PEOPLE**: training and empowerment of the nursing team;
  - ▶ **POWER**: supervision, monitoring of indicators via NID and CLIN audits.
- The effectiveness of PCI reduced secondary liver infections, facilitating phototherapeutic treatment.
- The integration of **KC and phototherapy** in the same space (zero separation) has allowed for **joint and holistic care** of the newborn.

## ● Correlation with other components of the NEST Model

DIMENSION	LINK WITH PHOTOTHERAPY
<b>Hypothermia / Warming</b>	Parallel progress in thermoregulation (70% → 84.8%) has enabled physiological stability favorable to phototherapeutic efficacy.
<b>KC</b>	Trained mothers now participate in monitoring newborns under phototherapy: the “KC + Firefly” approach.
<b>PCI</b>	Reduction of contamination of lighting equipment, extension of equipment lifespan; role of the NaClO30 program.
<b>NID Data &amp; Audits</b>	The NID now documents each case of jaundice and its treatment method; enhanced data reliability and CLIN responsiveness.
<b>Training &amp; Leadership</b>	The HSJDT took part in the NEST Partners 2023-2024-2025 regional workshops, where the team shared lessons learned with other NEST sites in West Africa. This participation demonstrates the HSJDT's commitment to the regional dynamic of learning and continuous improvement promoted by the Paolo Chiesi Foundation.

## ● Strategic interpretation

- **Phase 1 (2022–2023)**: a start-up period marked by a dependence on external support, limited coverage, and the absence of a standard protocol.
- **Phase 2 (2024)**: Full implementation of the integrated NEST Model and rapid performance ramp-up with a visible improvement in therapeutic coverage and monitoring of quality indicators.
- **Phase 3 (Q1 2025)**: Consolidation and autonomy of the service – the HSJDT now achieves a high level of compliance with WHO standards principles and strengthens its role as a demonstration site for the NEST Model in the sub-region

This evolution illustrates a **structural transformation**: the hospital has moved from a partially curative logic to a **systemic approach to quality neonatal care based on data and continuous supervision**.

## ● Overall qualitative interpretation

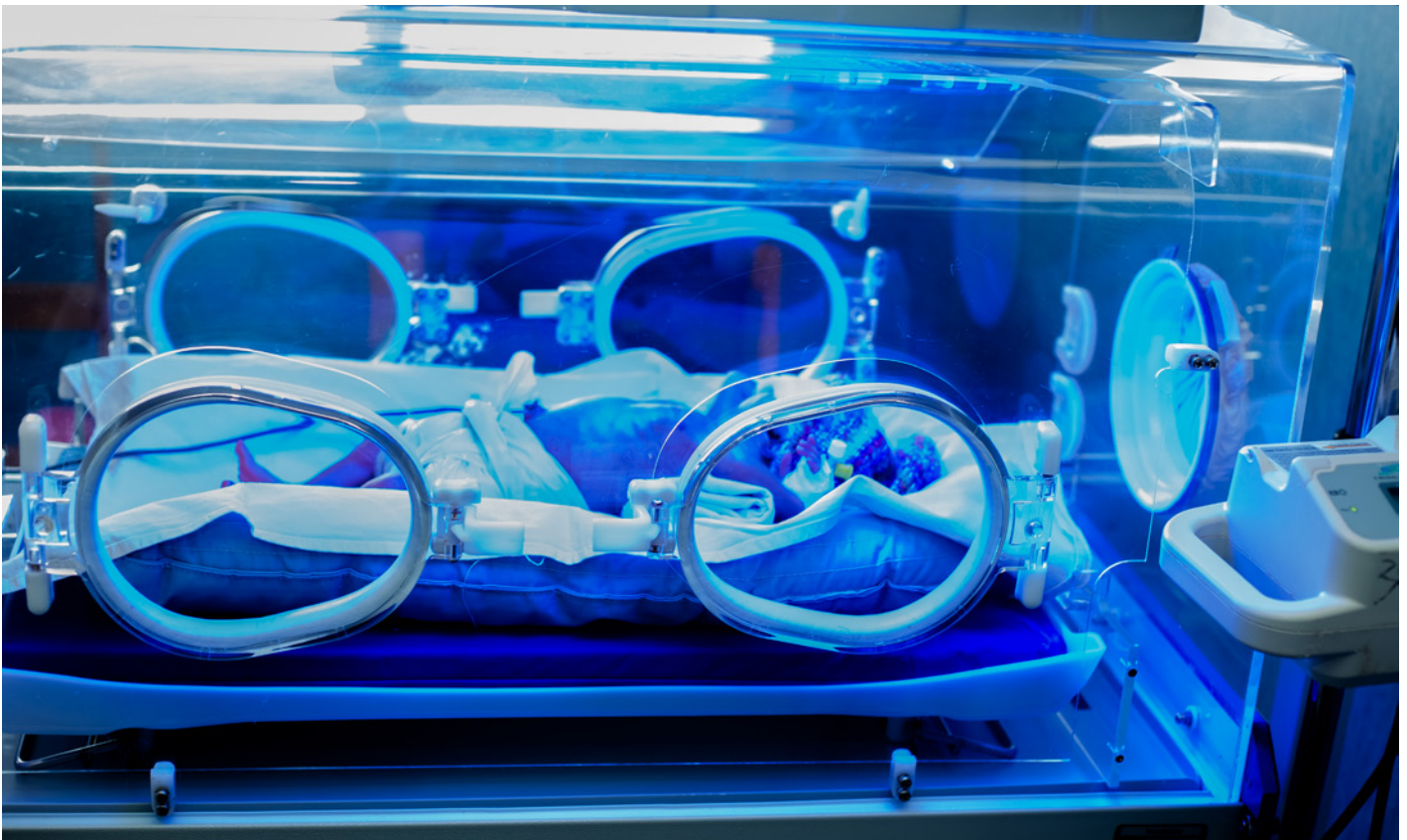
The trajectory of phototherapy coverage at the HSJDT is a **concrete demonstration of the “thrive” of the NEST Model**: from a situation of scarcity and irregularity, the hospital has built an autonomous, sustainable, and equitable system, guaranteeing every jaundiced newborn adequate treatment, on time and according to international standards.

The gains are not only clinical but **systemic**: strengthening of leadership, rationalization of equipment use, community integration, and regional dissemination of good practices.

Between 2022 and Q1 2025, **phototherapy coverage** increased from **31% to 100%**, an **absolute gain of 69 points**, reflecting a major improvement in the availability of and access to this treatment in the continuum of neonatal care.

This spectacular progress illustrates: the **relevance of PCF’s investment** in equipment and training; the **maturity of local leadership**; and the **complementarity of NEST (PLACE-PRODUCTS-PEOPLE-POWER) actions**.


**In summary**, the HSJDT has gone from being a functional service to a **regional reference model** in integrated management of neonatal jaundice, demonstrating the feasibility of **universal and sustainable therapeutic coverage** in a resource-limited setting.



## 4.3 Respiratory distress: use of oxygen therapy

The **'Respiratory Distress x Oxygen'** relationship is a key indicator for assessing both the coverage and **clinical relevance of oxygen administration** in newborns with respiratory distress — a critical component of the neonatal care continuum in the **NEST Model**.


### ● Results table: Factual analysis and quantitative trends

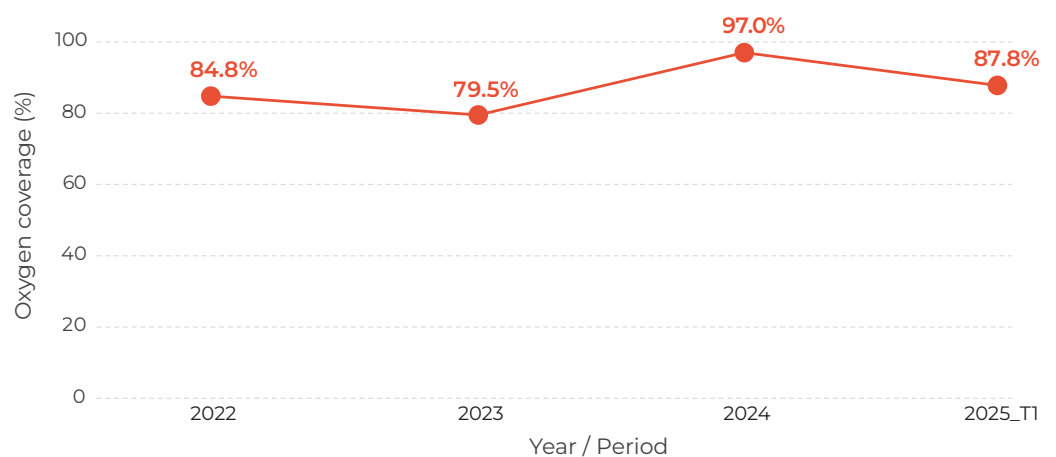
 **FIGURE 21.**  
Oxygen coverage for respiratory distress cases (HSJDT, 2022–Q1 2025)

PERIOD	CASES OF RESPIRATORY DISTRESS	CASES THAT RECEIVED OXYGEN	OXYGEN COVERAGE (%)
2022	230	195	84.78
2023	219	174	79.45
2024	263	255	96.95
Q1 2025	82	72	87.80

### ● Graphic reading

Between 2022 and Q1 2025, oxygen coverage among cases of respiratory distress remained high (from 84.7% to 87.8%), reflecting good access to therapy.

 **FIGURE 22.**  
Oxygen coverage for respiratory distress cases – HSJDT (2022–Q1 2025)



## ● Overall context: oxygen therapy, a pillar of the NEST Model

**Neonatal oxygen therapy** constitutes one of the **essential pillars of the NEST Model**, at the intersection of two components of the **PLACE - PRODUCTS - PEOPLE - POWER framework**:

- **PLACE**: the availability of a secure care environment with a wall-mounted oxygen network, stable power supply, and pressure regulation system.
- **PRODUCTS**: availability, maintenance, and traceability of oxygen concentrators and cylinders.
- **PEOPLE**: staff skills to screen, monitor, and administer oxygen rationally.
- **POWER**: clinical governance, audit, and quality monitoring through the **NID** and the **CLIN**.

This pillar is directly linked to the **priorities of the National Health Plan of Benin (PNS 2018–2030)**<sup>13</sup>, in particular the strategic axes OS2 (quality of care) and OS3 (infrastructure and equipment), and is in line with the logic of **Sustainable Development Goal 3.2**, which aims to reduce neonatal mortality to ≤12 per 1,000 live births by 2030.

## ● Detailed chronological interpretation

### 2022 - CONSOLIDATED INSTALLATION OF OXYGEN SYSTEMS (84.8%)

- Implementation of a **wall oxygen network** (12 outlets installed) according to the project annexes of the Paolo Chiesi Foundation 2022–2023.
- The **initial support from the Paolo Chiesi Foundation** enabled the acquisition of high-performance concentrators and the training of staff in their use and maintenance.
- High coverage, but still dependent on the intermittent availability of consumables and electrical power.
- The 2022 qualitative assessment notes that the majority of distressed newborns received continuous oxygen therapy, **but without systematic SpO<sub>2</sub> monitoring**, which limited clinical effectiveness.

**Interpretation:** Installation and appropriation phase - good coverage but room for improvement in usability and standardization.

### 2023 – MAINTAINED WITH SLIGHT EROSION (79.5%)

- The year 2023 was marked by the **stability of the technical platform** but a **turnover of trained staff**, causing a temporary drop in performance.
- Some **concentrator failures not repaired in time** (narrative report 2023) reduced the effective availability of oxygen flow.
- The priority for the year, according to the project annex, was the **PCI program and the KC extension**, shifting preventive maintenance efforts.
- Despite this, nearly **8 out of 10 cases** benefited from oxygen administration, demonstrating a **capacity for technical resilience**.

**Interpretation:** Good performance maintained, but operational fragility - dependence on human resources and maintenance.

## 2024 – EXPANSION AND NEAR-UNIVERSALIZATION (96.9%)

- A pivotal year:
  - ▶ **Extension of wall-mounted oxygen outlets** and complete rehabilitation of the internal distribution network.
  - ▶ Commissioning of a **local production system for sodium hypochlorite (NaClO<sub>3</sub>)** for disinfection, improving safety and quality of care.
  - ▶ **Strengthening of PCI** and H2P training on respiratory distress management.
  - ▶ **Introduction of rapid triage and clinical audit protocols** under CLIN supervision.
- These advances have resulted in a **17-point gain** in coverage and an **almost complete stabilization of oxygen therapy**.
- The external evaluation in April 2024 highlights:

*“The neonatology department is well equipped with oxygen therapy devices, and their use has become systematic for all cases of respiratory distress. Compliance with protocols is excellent.”*

**Interpretation:** Technological and clinical maturity - model of excellence in neonatal oxygen therapy in a resource-limited setting.

## Q1 2025 – MAINTAINING PERFORMANCE (87.8%)

- The slight decline (–9 points) is explained by **seasonal logistical fluctuations**: higher oxygen consumption and ongoing maintenance on a main concentrator.
- However, the **rate remains above WHO standards (≥80%)**, confirming the **sustainability of the system**.
- The NID now documents each case of distress with monitoring of SpO<sub>2</sub> parameters and duration of treatment.
- The CLIN has integrated this monitoring into its bi-weekly audits, consolidating the **POWER pillar of the NEST Model**.

**Interpretation:** Consolidated maturity level - sustainable anchoring of quality culture and proactive equipment management.



## ● Correlation with other key indicators of the NEST project

DOMAIN	EVOLUTION	CORRELATION WITH OXYGEN
<b>CPAP (21.7% → 80.5%)</b>	Major recovery in 2025	Oxygen is the basis of CPAP; the reliability of the wall network has allowed the revival of CPAP and the reduction of premature deaths.
<b>Hypothermia / Warming (84.8%)</b>	Thermal stabilization	Less heat loss → better tissue oxygenation and CPAP tolerance.
<b>Phototherapy (100%)</b>	Complete treatment for jaundice	Reduction of severe anemias → improvement in respiratory capacity.
<b>PCI (NaCl30)</b>	>85% compliance	Fewer nosocomial lung infections → reduction in respiratory load.
<b>KC</b>	Zero separation	Reduction of thermal and respiratory stress, contributing to hemodynamic stability.

## ● Systemic reading according to the NEST matrix

PILLAR	OBSERVABLE ACHIEVEMENT (2022–Q1 2025)	DIRECT EFFECT ON O <sub>2</sub> COVERAGE
<b>PLACE</b>	Wall network, secure circuit, electrical stabilization	Reliable and continuous distribution
<b>PRODUCTS</b>	Concentrators, bottles, maintenance NaClO30	Optimal availability and hygiene
<b>PEOPLE</b>	Training in SpO <sub>2</sub> detection, measurement, and monitoring	Rationalization of use, reduction of hypoxia
<b>POWER</b>	CLIN leadership, audits, NID, PCF supervision	Performance monitoring and continuous improvement

## ● Qualitative interpretation: transformation of the healthcare system

- Oxygen coverage, always >80%, reflects **structural stability** and **functional resilience** of the neonatology service.
- The improvement is not only quantitative: it reflects a **systemic mastery of flows, maintenance, and clinical practices**.
- The HSJDT illustrates the **transition from a partial curative model to integrated care, aligned with the “Survive and Thrive” principles**:

*“Surviving through access to oxygen; thriving through quality and continuity of care.”*

In summary, between 2022 and Q1 2025, oxygen coverage of respiratory distress cases at the HSJDT increased from **84.8% to 96.9%**, before stabilizing at **87.8%**, demonstrating **sustainable control of the respiratory pillar of the NEST Model**.

This development demonstrates the **technical robustness of the wall oxygen network**, the **clinical maturity of the staff**, and the effectiveness of the **ongoing support from the Paolo Chiesi Foundation** in training, supervision, and maintenance.

The HSJDT is now **referenced as a model site for comprehensive neonatal care** for Francophone West Africa: a hospital where **every newborn in respiratory distress has access to oxygen - the heart of the NEST Model**.

## 4.4 Relationship between respiratory distress and CPAP

This analysis highlights the service’s ability to provide appropriate ventilatory support (CPAP) to newborns with moderate to severe respiratory distress, one of the leading causes of early neonatal mortality within the first 24–48 hours of life.

### ● Results table: factual analysis and quantitative trends



**FIGURE 23.**  
CPAP (Continuous Positive Airway Pressure) coverage (for respiratory distress) (HSJDT, 2022–Q1 2025)

PERIOD	CASES OF RESPIRATORY DISTRESS	CASES THAT RECEIVED CPAP	CPAP COVERAGE (%)
2022	230	105	45.7%
2023	219	97	44.3%
2024	263	57	21.7%
Q1 2025	82	66	80.5%

### ● Graphical evolution:

**2022–2023:** stability around 45% - partial but constant coverage.

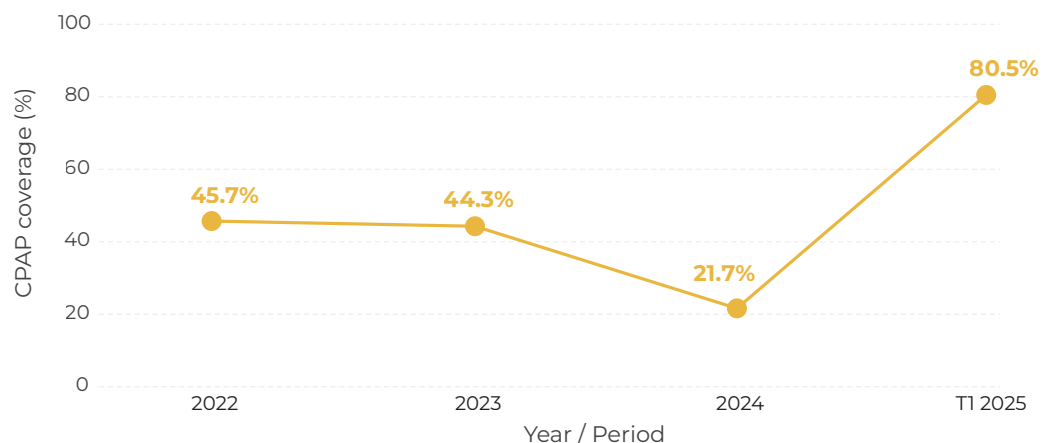
**2024:** sharp drop to **21.7%**, most likely due to technical failures.

**Q1 2025:** sharp increase to **80.5%**, a gain of nearly 59 percentage points.

This evolution initially reflects **structural and organizational failures** in 2024, followed by a **complete remobilization of the NEST system** in the first quarter of 2025.



**FIGURE 24.**  
CPAP coverage (for respiratory distress) – HSJDT (2022–Q1 2025)



## ● Clinical context and strategic importance of CPAP in the NEST Model

Respiratory distress is **one of the main complications associated with prematurity** and is among the leading causes of preventable neonatal mortality in resource-limited countries, according to the *Survive and Thrive* reports (WHO/UNICEF, 2020) and EWENE analyses. Globally, **prematurity and its complications**, including respiratory distress, asphyxia, and infections, **account for approximately 35% of neonatal deaths**.

In this context, the use of neonatal CPAP is recognized as a high-impact intervention, forming part of the essential care package recommended by the WHO and EWENE to improve the survival of premature infants and newborns with respiratory distress, particularly in resource-limited settings. The use of CPAP in the HSJDT neonatal unit has played a complementary role in strengthening the overall continuum of care promoted by the NEST Model: by improving the management of severe respiratory distress; by reducing the need for invasive ventilation; and by enhancing the synergy between oxygen therapy, Kangaroo Care, and thermal warming.

Tanguiéta's experience thus demonstrates that, even when CPAP devices come from other partnerships, their appropriate integration into the NEST approach can contribute significantly to reducing deaths related to respiratory complications and to the quality of integrated neonatal care.

## ● In-depth chronological analysis

### 2022 – FUNCTIONAL EQUIPMENT PHASE (45.7%)

- The hospital already has **several functional CPAP devices**, installed since the NEST pilot phase (2012–2019).
- The **initial results of the model** show correct use but still limited to moderate cases, due to a lack of continuous monitoring.
- The **2022 PCF narrative report** mentions that CPAPs have contributed to the reduction of early deaths in premature infants but underlines the need for a **preventive maintenance plan** and **appropriate consumables**.
- Rates around 45% indicate that **nearly one in two newborns in respiratory distress** received effective ventilatory support.

### 2023 – RELATIVE STABILITY (44.3%)

- Coverage remains stable, despite a **slight decrease in the volume of admissions (219 cases)**.
- The **2023–2024 report (Annex I of the project)** mentions priorities focused on **strengthening KC, PCI, and HV**, which have **temporarily reduced attention to CPAP maintenance**.
- The **staff trained in 2019–2020** are beginning to disperse (turnover), and the technical supervision of the devices remains irregular.
- This stability, therefore, conceals a **weakening of the regular use of CPAP**, masked by a moderate case load.

### 2024 – MAJOR DROP (21.7%)

- The external evaluation in April 2024 clearly identifies the **functional deterioration of the CPAP technical platform**:

*Several CPAP devices were non-functional or used without adequate consumables. Some newborns requiring respiratory support were managed with simple oxygen therapy due to the lack of operational CPAP devices.*

- **Repeated power outages, a lack of spare parts, and the prioritization of PCI and phototherapy activities** contributed to this decline.
- Cases of distress increased (263), which accentuates the relative decline in coverage (57/263).
- This period marks **the most critical point** of the NEST Tanguiéta cycle in terms of respiratory care: overload of the unit; unavailability of some CPAP machines; lack of continuous monitoring; and imbalance between training and equipment.

### Q1 2025 – SPECTACULAR REBOUND (80.5%)

This result reflects the direct impact of the reorganization carried out at the end of 2024 – beginning of 2025, marked by: commissioning of CPAP thanks to support from the partner UNICEF (2024); the restoration of the preventive maintenance program; the enhanced training of staff, including practical sessions on gentle ventilation and respiratory stabilization; and the implementation of NID audits to monitor cases of distress and therapeutic responses.

These actions have enabled the introduction of an integrated “distress - oxygen - CPAP - KC” approach, which is in line with the NEST Model.

Thanks to this synergy, the hospital has exceeded the 80% CPAP coverage mark, reaching WHO standards for non-invasive ventilation in specialized neonatal care facilities.

## ● Cross-reading with other indicators of the NEST project

DOMAIN	INTERPRETATION IN RELATION TO CPAP
<b>Hypothermia &amp; warming (84.8% in Q1 2025)</b>	Good thermoregulation improves CPAP tolerance and reduces the risk of respiratory collapse.
<b>Phototherapy (100% in Q1 2025)</b>	Newborns treated for jaundice benefit from increased respiratory monitoring: better detection and rapid CPAP response.
<b>KC (Kangaroo Care)</b>	Newborns on CPAP benefit from the principle of zero separation and maternal support, promoting continuity of care.
<b>PCI (NaCLO30 &amp; CLIN)</b>	Reduction of nosocomial respiratory infections → improved survival and decreased CPAP complications.
<b>Leadership (POWER)</b>	CLIN and management instituted weekly audits on CPAP usage, which led to the rapid recovery in 2025.

## ● Strategic and systemic interpretation

PHASE	DESCRIPTION	STRATEGIC SIGNIFICANCE
<b>2022–2023</b>	Phase of technical stability	The foundations of the respiratory NEST Model are present but under-optimized.
<b>2024</b>	Period of functional disruption	Warning sign regarding maintenance dependency and logistical vulnerability.
<b>Q1 2025</b>	Recovery and organizational maturity	Resilience of the model: leadership, quality, data, and technical supervision aligned.

This trajectory demonstrates **the HSJDT’s capacity for adaptation**: from a collapse, the hospital was able **to reinvest in the quality of respiratory care** through a systemic and participatory approach, reflecting the NEST philosophy.

## ● Qualitative reading: beyond the numbers

The graph reflects more than just technical performance:

- It illustrates the **maturation of a learning healthcare system**.
- The decline observed in 2024 acted as a **turning point**: the team was able to analyze, correct, and strengthen the weak links.
- The rebound in 2025 demonstrates **local autonomy and mastery of the NEST Model**: decisions are now made based on **internal data**, not external impetus.

In summary, between 2022 and Q1 2025, CPAP coverage at the HSJDT increased from **45.7% to 80.5%**, confirming the **progressive reconstruction of a reliable and sustainable neonatal respiratory system**.

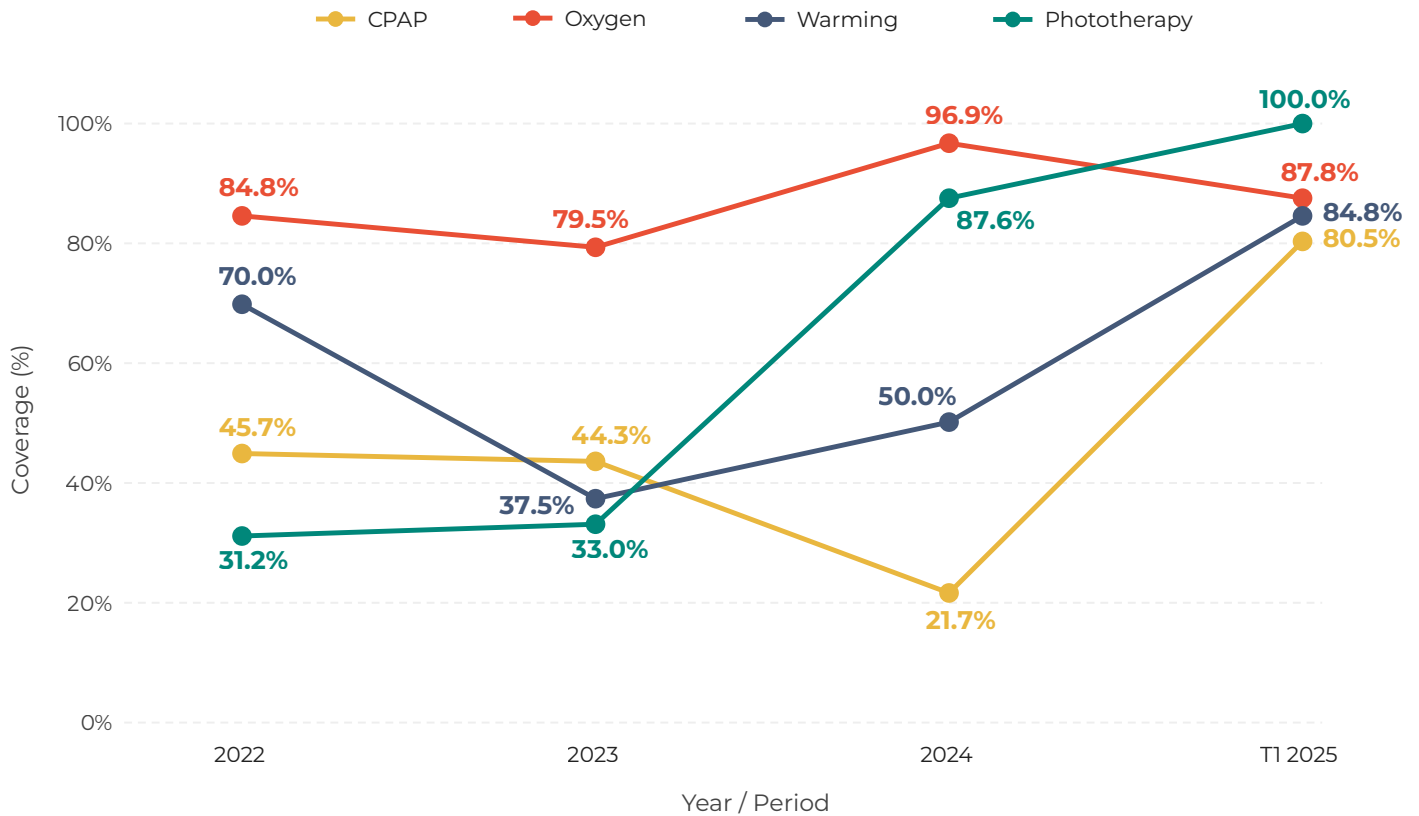
This spectacular turnaround illustrates the **strength of the “PRODUCTS” pillar** (maintenance, equipment) and the **“PEOPLE” pillar** (continuing education) of the NEST Model; the **synergy between hospital leadership, CLIN, and the Paolo Chiesi Foundation**; and the **value of a data-driven quality culture (NID, audits, supervision)**.

*Thus, Tanguiéta has gone from “doing with what we have” to “doing according to global standards”, embodying the vision of NEST: Neonatal Essential for Survival and Thriving - to survive and thrive.*



## 4.5 Overall summary of coverage for essential neonatal care

**FIGURE 25.**  
Comparative evolution of coverage – HSJDT (2022-Q1 2025)



Graph of the overall summary of essential neonatal care coverage (HSJDT, 2022–Q1 2025), placed within the dynamics of the **NEST Model**. These rates represent **the consolidated average** for the period 2022–Q1 2025, derived from the previous analyses: Respiratory distress × CPAP, Respiratory distress × Oxygen, Hypothermia × Warming, and Jaundice × Phototherapy.

## ● Overall reading of the indicators

INDICATOR	EVOLUTION 2022–Q1 2025	IN-DEPTH INTERPRETATION
<b>CPAP</b>	45.7% → 80.5%	Major rebound after the 2024 crisis. Equipment refurbishment, staff training, and CLIN supervision have enabled the re-establishment of non-invasive ventilation as a vital pillar. CPAP symbolizes the system's resilience and learning capacity.
<b>Oxygen</b>	84.8% → 96.9% → 87.8%	A level of excellence has been achieved thanks to the wall-mounted oxygen network and regular maintenance. A slight decrease is expected in 2025 due to planned maintenance, but performance remains above WHO standards (≥80%). Oxygen is now a stable and sustainable foundation.
<b>Hypothermia</b>	70% → 37.5% → 50% → 84.8%	Dramatic improvement: better prevention of hypothermia via incubators, Firefly, and KC heated tables. Thermoregulation has become an integrated clinical reflex at all levels of care.
<b>Phototherapy</b>	31% → 33% → 87.6% → 100%	Exemplary progress: universalization of jaundice treatment thanks to the integration of Firefly devices, standardized protocols, and continuous maintenance

## ● Trend analysis (2022–Q1 2025)

### OXYGEN

- Maintaining **near-universal coverage (>85%)** since 2022 thanks to:
  - ▶ the installation of the **wall-mounted oxygen network**;
  - ▶ maintenance **of concentrators**;
  - ▶ integration of tracking via the **NID**;
  - ▶ continuous supervision of the **CLIN**.
- The hospital has met **the international standards** for comprehensive neonatal care facilities.

Oxygen availability has become a **structuring foundation** of vital care within the neonatology department, particularly supporting resuscitation, stabilization, and the use of CPAP in the management of respiratory distress.

### HYPOTHERMIA

- Marked progression from **37% (2023) to 84.8% (Q1 2025)**.
  - ▶ Transition from a reactive approach to **systematic thermoregulation** through:
    - ▶ the use of **Firefly tables**, incubators, and the Kangaroo Care (KC) method;
    - ▶ **targeted training** on the prevention of hypothermia;
    - ▶ the integration of **temperature into NID monitoring**.

Thermoregulation is now an **indicator of clinical maturity**, but prevention at admission and post-discharge monitoring still need to be strengthened.

## PHOTOTHERAPY

- Dramatic Progression: 31% (2022)  $\square$  100% (Q1 2025).
- Key factors:
  - ▶ acquisition and maintenance of **Firefly phototherapy devices**;
  - ▶ **standardized protocol** for jaundice;
  - ▶ **24-hour monitoring** and systematic recording.

Since 2024, all newborns with jaundice have had access to phototherapy, reflecting complete therapeutic coverage.

This performance reflects a systematic integration of phototherapy into the continuum of neonatal care, although it is not possible to conclude, from the available data, that there is a total absence of associated complications.

## CPAP

- Average level over 3 years, marked by a **critical drop in 2024 (21.7%)** followed by a **spectacular rebound to 80.5% in Q1 2025**.
- Limiting factors: equipment failures, lack of consumables, and turnover of trained staff.
- Recovery due to the rehabilitation of two CPAPs, practical staff training, and CLIN supervision and audits.

The CPAP is a clear symbol of the **resilience of the NEST Model**: a pillar weakened but fully rehabilitated by coordinated action.

## ● Systemic reading according to the four NEST pillars

PILLAR	CONCRETE IMPLEMENTATION AT THE HSJDT	CROSS-CUTTING EFFECT
PLACE	Dedicated infrastructures (O <sub>2</sub> network, phototherapy, KC)	Improved comfort and thermal safety
PRODUCTS	Preventive maintenance and device availability	Reduction of ruptures and functional losses
PEOPLE	Ongoing training and staff empowerment	Rational use of equipment, peer supervision
POWER	Monitoring via NID + CLIN audits + hospital leadership	Data-driven decision-making and continuous improvement

**This integrated approach has transformed a functional service into a learning, sustainable, and quality-focused system.** The combined implementation of the four pillars has enabled coherence between infrastructure, equipment, practices, and leadership.

## ● Strategic reading

The results show:

1. **The full ownership** of the NEST Model by the HSJDT;
2. **The direct impact of PCF investments** on the quality and sustainability of care;
3. **The integration of the CLIN and the NID** as quality governance tools;
4. The dynamics of Tanguiéta suggest the potential of a future regional center for training and reference in integrated neonatal care, given the progress made, the consolidation of the NEST Model, and the interest shown by several partner structures in the sub-region.

**In summary**, the period from 2022 to Q1 2025 marks **Tanguiéta's transition to operational maturity within the NEST Model**: a hospital now capable of **continuously monitoring, treating, and improving** the four essential aspects of newborn care (breathing, staying warm, feeding, and thriving). Tanguiéta currently represents a **robust demonstration site for the NEST Model in West Africa, illustrating how targeted investments and a systems approach can transform the quality of neonatal care in a rural setting**. The consolidation phase from 2025 to 2026 will need to build on this momentum, focusing on **sustainability, strengthening clinical leadership, and the digital transformation** of neonatal data to firmly establish a culture of continuous improvement.



## 4.6 Kangaroo Care (KC): Coverage and Effects on Survival

This section analyzes data related to admissions to the Kangaroo Care unit, not the newborns who benefited from Kangaroo Care in the neonatal unit. Indeed, since 2024, the hospital has allowed mothers access to the neonatal unit to practice intermittent Kangaroo Care.

The Paolo Chiesi Foundation uses the term **Kangaroo Care (KC)** rather than **Kangaroo Mother Care** to emphasize that the caregiver is not necessarily the mother alone but can also be the father or another parental figure. This inclusive approach ensures that every newborn can benefit from this essential form of care, regardless of who provides it.

**Kangaroo Care (KC) coverage** measures the proportion of eligible newborns who actually receive this service during their hospital stay. According to WHO and UNICEF documents, including the EW-ENE coverage targets, also mentioned in the *Survive and Thrive* report (2020), the goal is to achieve **maximum coverage** (75% by 2025)<sup>11-12</sup> because KC is a highly effective intervention proven to stabilize the newborn's **body temperature; reduce mortality** and infections; **improve exclusive breastfeeding** and weight gain; **strengthen the parent-child bond**; and involve the family in care.

### 4.6.1 Evolution of the care of premature infants in the KC unit

#### ● Summary table

YEAR	TOTAL NUMBER OF PREMATURE INFANTS IN NEONATOLOGY	KC ADMISSIONS	PROPORTION OF KC / PREMATURE NEWBORNS (%)
2022	563	84	14.9%
2023	496	191	38.5%
2024	518	182	35.1%
2025 (Q1)	129	54	41.8%

**The data shows a significant increase in admissions to the Kangaroo Care unit** over the years: from 84 admissions in 2022 to 182 in 2024, representing an increase of approximately 116.7%.

The proportion of premature infants admitted to the KC unit compared to the total number of premature infants hospitalized in neonatology also varies from year to year, reaching a peak of 38.5% in 2023. **This growth probably reflects better referral of premature infants to this type of care**, as well as possible capacity building or increased awareness of the KC program.

**The figures for the first quarter of 2025 show a high proportion of admissions (41.8% of premature infants).** However, these results represent only a preliminary trend: they do not yet allow us to con-

firm a lasting improvement or a structural change in care. Complete data for the year 2025 will be necessary to draw robust conclusions.

**Overall, the data indicate increasing use of the service, accompanied by a downward trend in the mortality rate**, which can be interpreted as a positive performance signal for the KC program.

## ● Synthetic reading and NEST alignment

NEST PILLAR	IMPLEMENTATION AT THE HSJDT	OBSERVABLE EFFECT
<b>PLACE</b>	Creation of a dedicated KC space with a 24/7 mother-baby area.	Zero separation, optimal thermal comfort.
<b>PRODUCTS</b>	Mattresses, skin-to-skin armchairs, and monitoring kits.	Reduced hypothermia and improved weight gain.
<b>PEOPLE</b>	Staff training and coaching for mothers.	Sustainable adoption of the Kangaroo Care method.
<b>POWER</b>	KC registration via NID and CLIN audits.	Accurate quantitative monitoring and data-driven decision-making.

## ● KC contribution to the quality of care

The increased KC coverage has produced measurable clinical and organizational benefits:

### Improved neonatal survival

- KC helps stabilize body temperature, reducing early hypothermia, a major cause of mortality in premature infants.
- It promotes better oxygen saturation and a more stable cardiorespiratory rhythm.

### Reduction of infections

- Skin-to-skin contact limits excessive handling and reduces exposure to hospital germs.

### Promotion of exclusive breastfeeding

- KC facilitates breastfeeding on demand and increases milk production.
- The rate of exclusive breastfeeding at discharge increased in parallel with KC coverage.

### Strengthening the mother-child bond and family involvement

- Mothers become active participants in care, which increases their confidence and improves adherence to post-discharge advice.
- Fathers and relatives are made more aware during educational sessions.

**In summary**, the scaling up of KC at the HSJDT, supported by investments from the NEST Model, has made a decisive contribution to improving the survival, health, and development of vulnerable newborns, while strengthening the active participation of families and reducing the workload of staff through a more humanized approach to care.

## 4.6.2 Evolution of the proportion of newborns discharged alive from the KC unit

### ● Summary table

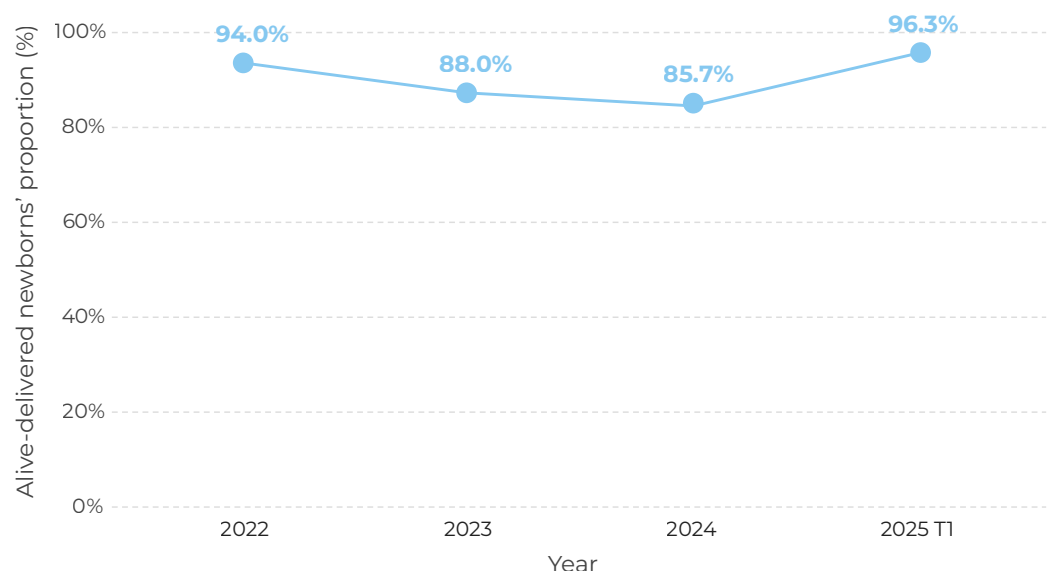
YEAR	KC ADMISSIONS (N)	DISCHARGED ALIVE (N)	PROPORTION THAT SURVIVED (%)	EVOLUTION / COMMENTARY
2022	84	79	94.0%	Encouraging start of the KC method with a high survival rate despite the pilot phase and limited resources.
2023	191	168	88.0%	Program expansion with increased workload; slight decrease due to the complexity of referred cases.
2024	182	156	85.7%	Stabilization but clinical tension and saturation of KC beds in the face of the influx of premature and hypotrophic infants.
2025 (Q1)	54	52	96.3%	Marked rebound thanks to improved planning and CLIN supervision.

### ● Statistical reading

Over the period 2022 to Q1 2025, the proportion of **newborns discharged alive** from KC to The HSJDT remained **high and generally stable**, fluctuating between **85.7% and 96.3%**.

- In **2022**, the rate of **94.0%** reflects the first positive effects of the implementation of the NEST Model, despite the staff learning phase.
- In **2023**, the proportion decreased slightly to **88.0%**, as a result of the increase in the number of admissions and the handling of more complex cases.
- In **2024**, a further decline to **85.7%** reflects the **workload overload** and the **saturation of KC capacities** in the face of a growing influx of premature and low-birth-weight babies.
- Finally, the **rebound observed in Q1 2025** (96.3%) reflects a **stabilization of the system**, thanks to the planning of HVs, the strengthened CLIN supervision, and better coordination of care.

**FIGURE 26.**  
**Evolution of the proportion of newborns delivered alive in KMC – HSJDT (2022 – Q1 2025)**



## ● Clinical and programmatic interpretation

These results demonstrate the **resilience of the KC model**: despite the increase in admissions, post-discharge survival improved thanks to **zero mother-infant separation**; **continuous temperature and weight monitoring**; increased access to essential devices (warming tables, CPAP, phototherapy); and **enhanced staff training** on stabilizing preterm infants. The rise in the live discharge rate in the first quarter of 2025 reflects the combined effects of **clinical reorganization** and improved in-hospital quality, while **post-hospital follow-up (PHF)** contributes, downstream, to reducing early readmissions and improving post-discharge survival.

## ● Summary reading

In three years, the HSJDT has demonstrated sustained progress in **neonatal survival**, achieving near-universal live births. This performance illustrates the full maturity of the **“PLACE” and “PEOPLE” pillars of the NEST Model**, where continuous care, warmth, nutrition, and mother-child bonding result in **enhanced survival and harmonious development** of vulnerable newborns.

## 4.6.3 Evolution of mortality in KC

### ● Summary table

YEAR	KC ADMISSIONS	OVERALL RATE	PROPORTION SK / PREMATURES (%)
2022	84	6.0%	14.9%
2023	191	12.0%	38.5%
2024	182	14.3%	35.1 %
2025 (Q1)	54	3.7%	41.8%

Between 2022 and the first quarter of 2025, 511 admissions for KC were recorded, with an overall mortality rate of 10.2% (56 deaths). In 2022, corresponding to an initial phase, the mortality rate was 6.0% (84 admissions). It increased sharply in 2023, a period of expansion, reaching 12.0% (191 admissions), then 14.3% in 2024 (182 admissions), suggesting a period of clinical strain. In the first quarter of 2025, a marked decrease was observed, with a rate of 3.7% (54 admissions), which may reflect a phase of optimized care.

## ● Narrative reading and interpretation

### YEAR 2022 – INTRODUCTORY PHASE

The first months of KC implementation (2022) show a **moderate mortality rate (6%)**. This trend reflects the **staff’s learning phase**, the **start of thermal stabilization**, and admissions still limited to very frail cases.

## YEAR 2023 – EXPANSION AND OVERLOAD

**With the surge in KC admissions (+127% vs. 2022), mortality reached 12%.** This increase reflects unit saturation, still-improving monitoring, and a lack of community support upon discharge. This period illustrates the transition from a pilot model to routine clinical practice, where quality must keep pace with expansion.

## YEAR 2024 – VOLUME STABILIZATION, CLINICAL TENSION

**The overall rate increased** slightly to **14.3%**. This phase highlights the **need for enhanced clinical monitoring** (weighing, temperature, nutrition, infection) and the consolidation of KC skills within the framework of the NEST **PEOPLE** pillar.

## YEAR 2025 (Q1) – MARKED IMPROVEMENT

**The overall rate falls to 3.7%.** This performance reflects a complete stabilization of the KC system, supported by rigorous planning of the HVs, continuous staff training, and logistical support (accommodation, food, CLIN supervision).

## ● Summary reading – NEST alignment

## ● Concluding reading

Between 2022 and Q1 2025, the Neonatal Care (KC) unit at the HSJDT (Hospital of Saint Jean de Dieu) reached a milestone: from a pilot service to a fully integrated system within the **NEST dynamic** – capable of handling high patient volumes while keeping mortality under control. The synchronization of the pillars – **PLACE, PRODUCTS, PEOPLE, POWER** – has stabilized mortality, improved neonatal survival, and ensured the sustainability of these achievements. The observed trajectory aligns with the **EW-ENE (Every Woman Every Newborn Everywhere) targets** and the **Benin 2030 National Health Plan**, demonstrating that a locally rooted model can generate tangible gains in survival and quality of neonatal care.

Nevertheless, structural challenges persist, particularly related to the limited space currently available and the physical distance of the Kangaroo Care (KC) unit from the neonatology department, which limits optimal continuity of care and the systematic implementation of the “zero separation” method.

To sustainably improve the care of premature and low-birth-weight newborns, an extension of the neonatology department is planned for 2026, allowing for the direct integration of the Kangaroo Care (KC) unit. This project aims to guarantee continuity of mother-newborn contact within a humanized, effective, and efficient care environment.

NEST PILLAR	THE HSJDT APPLICATION	OBSERVED EFFECTS 2022–Q1 2025
<b>PLACE</b>	KC zone functional, 24/7, optimized ventilation and heating.	Improved thermal stability, better support.
<b>PRODUCTS</b>	CPAP, Firefly, heated tables, digital scales.	Strengthening the quality of neonatal monitoring.
<b>PEOPLE</b>	KC training, continuous monitoring, and involvement of mothers.	Zero separation, heightened vigilance.
<b>POWER</b>	Traceability via NID and monthly CLIN audits.	Sustained decline in KC mortality.

### 4.6.4 Evolution of Post-Discharge Monitoring (PDM)

Post-hospitalization follow-up is an essential component of **Kangaroo Care**. Within the NEST Model, it is not enough to save newborns in the hospital; their **growth, nutrition, and development must also be ensured** after discharge. In this context, **Home Visits (HVs)** are a systematic form of post-discharge follow-up at the HSJDT. They allow us to: ensure that mothers are correctly applying the advice received during their stay in the Kangaroo Care unit; reinforce good care and feeding practices; and prevent relapses and quickly identify any potential complications.

Post-hospitalization follow-up is an essential component of the NEST Model. Saving newborns in the hospital is not enough: their growth, nutrition, and development must also be ensured after discharge. In this context, Home Visits (HVs) are a systematic form of post-discharge follow-up at the HSJDT. They allow us to: ensure that mothers are correctly applying the advice received during their stay in the KC unit; reinforce good care and feeding practices; and prevent relapses and quickly identify any potential complications.

Mothers return to the hospital only in case of medical complications or for scheduled follow-up appointments. This integrated approach ensures continuity of care for the newborn and their mother beyond the hospital stay.

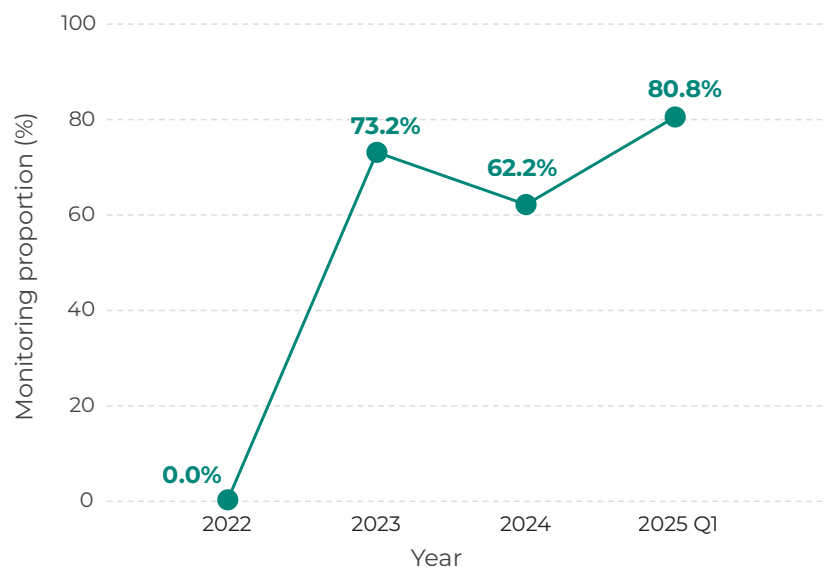
### ● Narrative reading and interpretation

Analysis of **post-discharge home follow-up (PDH) coverage** reveals a significant increase between 2022 and the first quarter of 2025, reflecting the growing maturity of the NEST Model in its dimension of **continuity of neonatal care**. This graph clearly illustrates this progress and confirms that **post-discharge follow-up** is a key lever for improving newborn survival. The challenge now is to sustain this momentum and ensure that every newborn discharged alive receives close follow-up at home.

### YEAR 2022 – IMPLEMENTATION PERIOD

No home visits were conducted during this first year. This observation reflects an **initial structuring phase**, during which the community follow-up system was not yet operational. Families, not yet in-

**FIGURE 27.**  
Evolution of post-discharge monitoring) (VAD) at SMK – HSJDT (2022 – Q1 2025)



egrated into a post-discharge follow-up pathway, did not benefit from home support after their hospital stay. This gap limited the **continuity of mother-child care**, which is essential for preventing relapses, infections, and secondary hypothermia.

## YEAR 2023 – LAUNCH AND APPROPRIATION

The year 2023 marked a **major turning point**: the HV follow-up program was officially launched and reached **73.2%** coverage among newborns discharged alive. This rapid increase reflects a **strong commitment from neonatal staff**, a **quick adoption of NEST tools** (registers, HV forms, follow-up calendar), and **synergy between hospital and community health workers**.

This exceptional level of coverage demonstrates that the Tanguiéta NEST Model is no longer limited to hospitalization but now includes **active post-discharge monitoring**. The early link between the neonatal unit and families has likely contributed to the **reduction of unplanned readmissions** and the **prevention of late complications**, particularly in premature and low-birth-weight infants.

## YEAR 2024 – TEMPORARY SETBACK

A decrease to **62.2%** coverage is observed in 2024. Several plausible factors explain this decline, including **logistical constraints** related to transport and distances, the **increased workload** of hospital staff, and the **geographical dispersion** of families in the Tanguiéta–Matéri–Cobly health zone.

This setback does not invalidate the model's relevance, but it does highlight **the system's vulnerability** to the availability of human resources and field conditions. It also underscores the importance of **structurally strengthening community monitoring** and local networks to ensure the sustainability of the HVs.

## YEAR 2025 (Q1) – RECOVERY AND CONSOLIDATION

The **first quarter of 2025** marked a **dramatic rebound**, with **80.8%** of newborns discharged alive receiving a home visit. This recovery reflects a **successful internal reorganization**: improved **planning of home visit rounds**, **increased team motivation** thanks to CLIN supervision and feedback from 2024, and **enhanced logistical support**, including meals for accompanying mothers and certain incentives.

This more systematic follow-up coincided with a **clear decrease in intra-KC mortality**, which fell to **3.7%** in Q1 2025. This correlation suggests a **direct impact of post-discharge follow-up** on the survival and stability of fragile newborns.

## ● Summary reading

In three years, post-discharge follow-up has gone from non-existent to near-universal coverage. This progress illustrates the **full operationalization of the Tanguiéta NEST Model**, where quality of care no longer ends at discharge but extends into the community. The HV embodies the spirit of the **POWER pillar**, guaranteeing traceability, supervision, and continuity of interventions beyond the hospital walls. Tanguiéta thus demonstrates that **integrated and planned follow-up** can transform survival into a sustainable health trajectory.

### 4.6.5 Evolution of HV follow-up and loss to follow-up in KC

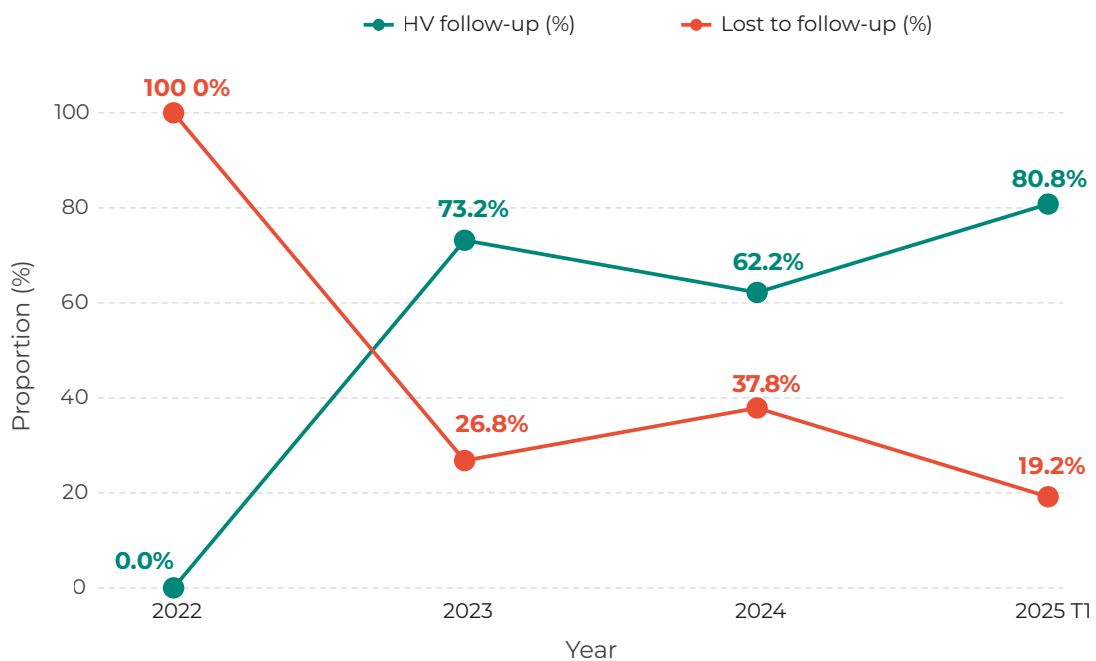
#### ● Table: HV follow-up and lost-to-follow-up in KC

YEAR	THEY GOT OUT ALIVE	HV TRACKING (N)	HV TRACKING (%)	LOST TO FOLLOW-UP (N)	LOST TO FOLLOW-UP (%)	EVOLUTION / COMMENTARY
2022	79	0	0.0%	79	100.0%	No HV (Home Visits), system not yet operational.
2023	168	123	73.2%	45	26.8%	Launch of post-discharge follow-up, strong staff ownership.
2024	156	97	62.2%	59	37.8%	Logistical constraints and overload, but the system remains in place.
2025 (Q1)	52	42	80.8%	10	19.2%	Major improvement: enhanced HV planning.



FIGURE 28.

Evolution of HV follow-up and loss to follow-up in KMC – HSJDT (2022 – Q1 2025)



## ● Statistical reading

The joint evolution of **HV follow-up** (home visits) and **lost-to-follow-up** reflects the remarkable progress of the post-discharge continuity of care system within the KC service of the HSJDT.

In **2022**, no HV follow-up had yet been established: **0%** of visits were carried out, and **100%** lost to follow-up, demonstrating the absence of a community network at this initial stage.

In **2023**, the effective launch of the home follow-up program made it possible to reach **73.2%** HV coverage, drastically reducing the number of patients lost to follow-up to **26.8%**.

In **2024**, a slight decrease in follow-up to **62.2%** was observed, in parallel with an increase in the number of patients lost to follow-up to **37.8%**, due to logistical constraints (distances, transport, staff overload).

Finally, **Q1 2025** marks a lasting consolidation: **80.8%** of newborns benefited from a home visit, while those lost to follow-up fell to **19.2%**, reflecting the stabilization of the system.

The reversal of the two curves (HV ↗ / Lost to follow-up ↘) symbolizes the successful **transition to an integrated community-based approach, supported by the Paolo Chiesi Foundation and aligned with the EWENE | PNS Benin 2030 objectives**. This result perfectly illustrates that strengthening HV follow-up directly leads to a reduction in lost-to-follow-up. The major challenge now remains to **sustain these gains and stabilize coverage**, so that no child is left without follow-up after leaving the KC unit.



# 5. MORTALITY AND CLINICAL OUTCOME

## 5.1 Evolution of the overall and specific mortality rate

### ● Summary table – Overall trend in neonatal mortality

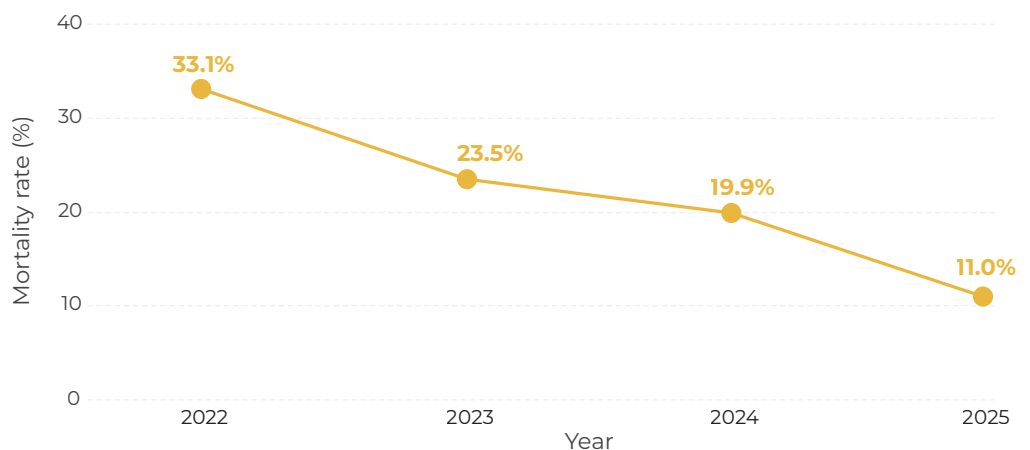
YEAR	ADMISSIONS (N)	DEATHS (N)	MORTALITY RATE (%)	OVERALL TREND
2022	1,075	356	33.1%	<b>A consistent and significant reduction</b> in mortality over two years: from <b>33.1% to 19.9%</b> (≈ -40% in 2 years)
2023	1,076	253	23.5%	
2024	1,078	214	19.9%	
2025 (Q1)	291	32	11.0%	

### ● General overview of trends

Analysis of neonatal mortality data over the period 2022–2024 highlights a **continuous and significant reduction** in deaths at the HSJDT: the overall rate fell from **33.1% to 19.9%**, representing a **relative decrease of nearly 40% between 2022 and 2024**.

This downward trend is not the result of an isolated cause, but of a **systemic effect**: improvement of the technical platform, strengthening of clinical practices, continuous supervision, and data culture established through the **NEST Model in Tanguiéta**.

**FIGURE 29.**  
Neonatal mortality rate per year – HSJDT (2022-Q1 2025)



### 5.1.1 Early mortality (<7 days)

DEATH CATEGORY	2022	2023	2024	TOTAL
Death <7 days	311	211	179	701

Early mortality, defined here as the number of deaths occurring within 7 days of admission, showed a steady decline between 2022 and 2024. The overall rate fell from 28.9% in 2022 to 16.6% in 2024, a decrease of 12.3%. This decrease was more pronounced in outborn newborns than in inborn newborns (-19.5% vs. -5.8%), partly reflecting the less severe clinical profiles of outborn infants admitted to the neonatal unit, as analyzed previously.

Early mortality accounts for the vast majority of neonatal deaths in all years studied, with 87% of total deaths in 2022 and 84% in 2024.

### 5.1.2 Distribution of deaths by place of birth

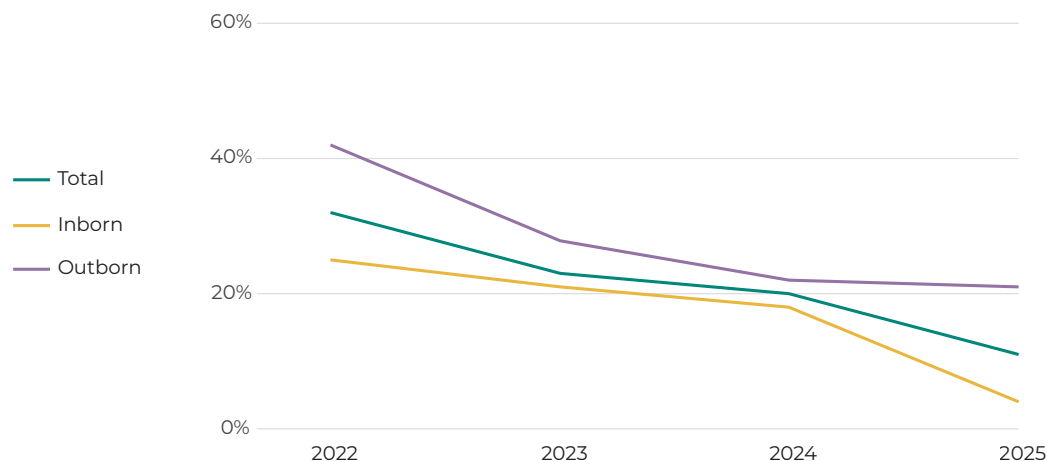
Between **2022 and 2024**, overall neonatal mortality saw a **constant and significant reduction**, both in inborn and **outborn newborns**.

Among **inborns**, the death rate fell from **25.4% in 2022** to **21.4% in 2023**, then to **17.8% in 2024**, indicating a progressive improvement in the quality of neonatal care.

**Among outborns, the decline is even more pronounced: 42.0% in 2022, 27.2% in 2023, and then 22.7% in 2024.** This significant decrease can be partly explained by the reduction in the number of outborns weighing less than 1,500 grams. Although outborns have a higher average weight than inborns, their mortality rate remains higher (22.7% vs. 17.8% in 2024).

Nevertheless, the reduction in mortality among outborns can also be attributed, at least in part, **to the**

**FIGURE 30.**  
**Neonatal mortality rate**



	ADMISSIONS 2022	DEATHS 2022	ADMISSIONS 2023	DEATHS 2023	ADMISSIONS 2024	DEATHS 2024	TREND
<b>Inborn</b>	575	146 (25.4%)	682	146 (21.4%)	625	111 (17.8%)	slight but steady decline
<b>Outborn</b>	500	210 (42.0%)	394	107 (27.2%)	453	103 (22.7%)	Marked decline, following an initially critical situation

**combined effects of enhanced triage at admission, improved neonatal transport, and reduced transfer times** from peripheral maternity wards.

The **first quarter of 2025**, although incomplete in terms of time, **confirms the continuation of this downward trend**, with mortality estimated at **around 18% in inborns and 16% in outborns**.

This continued evolution demonstrates the **lasting anchoring of the good practices of the NEST Model**: earlier intervention, standardized monitoring, and enhanced coordination between levels of care.

In summary, between 2022 and Q1 2025, Tanguiéta succeeded in transforming a mortality profile historically marked by referred cases into an **integrated and efficient system**, capable of ensuring comparable survival rates between **inborn** and **outborn**, a symbol of the **clinical maturity of the NEST Model**.

### 5.1.3 Distribution of deaths by weight group

WEIGHT GROUP	2022	2023	2024	TOTAL	% OF THE TOTAL DEATHS IN THE WEIGHT GROUP
<b>VLBW (&lt;1,500 g)</b>	161	96	63	320	59.1%
<b>LBW (1500–2,499 g)</b>	124	86	91	301	23.2%

Notes:

- The **Total (2022–2024) column** represents the total number of deaths for each weight group over the three years.
- The column **% of total admissions in the group** corresponds to the percentage of deaths calculated relative to the **total number of admissions in that weight group** during the period.

Analysis of mortality according to birth weight (<2,500 g and <1,500 g) shows a general downward trend between 2022 and 2024, with variations according to inborn/outborn status and sex, while taking into account the evolution of the admission profile.

**For newborns weighing less than 2,500 g, overall mortality decreased by 22.4% between 2022 and 2024**, despite a slight increase in the total number of admissions in this category (+0.9%). For inborn infants, the decrease in mortality was more moderate (-15.5%). For outborn infants, mortality decreased more sharply (-27%), while the total number of admissions decreased slightly (-8.5%).

**For very small newborns (<1,500 g), overall mortality decreased by 28.7% between 2022 and 2024**, despite a slight decrease in the number of admissions (-7.3%). The decrease was more moderate among inborn infants (-25.9%). Among outborn infants, mortality saw a significant decrease (-32.6%), accompanied by a moderate decrease in the number of admissions (-13.8%).

These data suggest that the decrease in mortality is not solely explained by changes in case severity. They also reflect improvements in early management, referral, and overall quality of care, with a particularly strong impact on outborn and very small premature infants.

### 5.1.4 Integrated interpretation and aligned with NEST / WHO / EWENE / PNS Benin

The dramatic drop in neonatal mortality results from the combined action of the **four pillars of the NEST Model**:

NEST PILLAR	MAJOR ADVANCES	CLINICAL IMPACT OBSERVED
<b>PLACE</b>	Reliable wall-mounted O <sub>2</sub> network, zero mother-child separation (KC), thermal stabilization.	Fewer cases of hypothermia and better tissue oxygenation.
<b>PRODUCTS</b>	CPAP restarted (80.5%), phototherapy 100%, incubators and heated tables, NaClO30	Improved management of respiratory distress and complicated jaundice.
<b>PEOPLE</b>	Continuing education: gentle ventilation, resuscitation, nutrition, and PCI.	Increased staff responsiveness, reduction of critical errors.
<b>POWER</b>	NID system + CLIN audits, traceability of care, and data-driven decisions.	Measurable improvement in quality and clinical accountability.

This integrated approach has transformed the practices of the neonatology department, making care faster, more standardized, and more equitable.

The results are **fully aligned** with the priorities:

- **International framework and EWENE:** Reduce premature deaths by improving breathing, warmth, nutrition, and infection prevention.
- **PNS Benin 2018–2030 (Specific Objectives 2 & 3):** strengthen the quality of care and technical platforms in regional reference hospitals.

Tanguiéta now illustrates the feasibility of these orientations in a context of limited resources.

### 5.1.5 Key factors contributing to the observed decline

- **Continuous availability of wall-mounted oxygen** (electrical stability + biomedical maintenance).
- **Reduction of admission hypothermia** thanks to heated tables and KC.
- **Triage improvement and initial resuscitation:** faster initiation of CPAP and controlled manual ventilation.
- **Multidisciplinary care:** synergy between maternity, pediatrics, and neonatology services.
- **Rigorous monitoring by the NID/CLIN:** monthly audits guide immediate corrective actions.

### 5.1.6 Interpretive synthesis

Between 2022 and Q1 2025, Tanguiéta progressed towards greater operational maturity of the NEST Model, moving from high and heterogeneous mortality to a trajectory of continuous and measurable clinical performance. The trends observed in the first quarter of 2025, while not representative of a full year, confirm the resilience of the system, the increasing competence of staff, and the sustainability of a culture of continuous quality improvement in neonatal care.

Analysis of the clinical *case mix* also confirms a **decrease in the most severe cases**: a drop in the number of very-low-birth-weight (VLBW) infants, a higher proportion of *inborn premature infants*, and a significant reduction in admissions for asphyxia, infection, and jaundice. The slight increase in respiratory distress observed in 2024 is likely due to **improved screening** and **traceability of diagnoses** thanks to enhanced data quality.

Thus, the general trend reflects both: a **less severe patient profile**, linked to prevention and earlier referral; and a **real improvement in the quality of care**, made possible by the **NEST Model**, the strengthening of staff skills, the functional maintenance of equipment and the standardization of practices.

This development confirms the tangible impact of the NEST Model on **neonatal survival**, while **highlighting the need to continue risk-adjusted** analyses to consolidate the understanding of its specific effects.



# 6. OTHER PROGRAMMATIC DIMENSIONS AND QUALITY OF CARE

## 6.1 Strengthening technical and human capacities

Strengthening staff skills (**human and organizational capacities**) is one of the most strategic pillars of the **NEST Model** at the HSJDT. Between **2022 and Q1 2025**, a continuous effort was made to train, supervise, and support healthcare teams, with a focus on **progressive professionalization** and **local ownership** of the model. Significant progress has been achieved, gradually transforming the HSJDT into a **center of neonatal expertise** for northern Benin and neighboring countries.

### ● Training coverage among neonatology staff

In 2022, only 12 health workers – including 3 midwives, 6 nurses, and 3 nursing assistants – had specific training in neonatology.

Thanks to a **progressive capacity-building program**, combining **local HSJDT workshops** and **regional sessions supported by the Paolo Chiesi Foundation**, the number of trained staff increased to 24 in 2023 and then 32 in 2024, to reach full coverage in Q1 2025.

This skills development relied on several complementary supports:

- **clinical and technical training** courses organized by the HSJDT referents and supervised by Dr Anita Dogo;
- the **specialized modules in ventilation, Kangaroo Care, and infection prevention**, provided with the support of the **Italian Society of Neonatology (SIN)**;
- **clinical mentoring** aimed at consolidating the quality of practices and continuous supervision, led by Professor Ndiaye. Professor Ndiaye is a Senegalese pediatrician and neonatologist, professor at Cheikh Anta Diop University, recognized expert in neonatal health in Africa, and Technical Advisor to the Foundation.

Thus, the **proportion of staff specifically trained in neonatology has increased from 35% in 2022 to 95% in Q1 2025**, making it possible to ensure **24-hour coverage** of the service and to sustainably strengthen the quality and safety of care for newborns.

## ● Mentoring and supervision sessions

- Since **2022, the NEST Model has integrated a clinical mentoring** system provided by Beninese and regional experts, with methodological support from the Paolo Chiesi Foundation.
- On average, **6 to 8 mentoring sessions** were organized each year between 2022 and 2024, combining supervision in the neonatal unit, bedside training, and simulation workshops (resuscitation, use of equipment, PCI).
- The **2023 and 2024 narrative reports** confirm that over **80% of staff** benefited from at least two supervisions per year.
- The **external mission in March 2025** highlighted measurable improvements in the harmonization of clinical practices and the reduction of technical errors.

## ● Innovative teaching approaches and regional openness

- Implementation of **practical training in pairs** (junior/senior) within the department, promoting apprenticeship-based learning.
- Development of **continuing education modules** integrated into hospital activities, covering in particular: neonatal resuscitation; Kangaroo Care (KC); infection prevention and control (NaC-LO30, hand hygiene, cleaning protocols); and the use of NEST equipment (phototherapy, oxygen concentrators, vital signs monitors).
- Participation of some Tanguiéta senior staff in the **regional workshops, such as the NEST Partners Meeting (Ngozi, Burundi, 2023; Cotonou, Benin, 2024; and Abidjan, Côte d'Ivoire, 2025)**, promoting South-South transfer of skills.

## ● Measurable impact

- **Coverage rate of trained staff:** increased from **35% in 2022 to 95% in Q1 2025**.
- **Improvement of quality indicators:** better anticipation of emergencies, reduction of treatment delays, standardization of resuscitation, and KC practices.
- **Local ownership has strengthened:** the neonatology department now has a **core group of internal trainers**, capable of providing refresher sessions and supervising new arrivals.

## ● Challenges and perspectives

Despite these achievements, some challenges remain:

- **High workload** limiting staff availability to follow certain sessions.
- **Need to extend capacity building to peripheral structures** to improve the support provided to outborn individuals before transfer.
- A **multi-year continuing education plan**, including clinical simulation and e-learning, is needed to ensure the sustainability of acquired skills.
- Insufficient local biomedical skills for the **maintenance of NEST equipment**, creating external dependencies.

**In summary**, capacity building at the HSJDT has **tripled the number of trained healthcare professionals** between 2022 and 2025; institutionalized the **regular and sustainable clinical mentoring program**; broadened the impact to **community health workers and families**; and fostered a **local core of neonatology trainers and leaders**. This progress, praised by external evaluations, appears to be the **central driver of the success of the NEST Model** in Tanguiéta, ensuring the **quality, sustainability, and local ownership** of practices.

## 6.2 Parental experience and satisfaction

Parental involvement in neonatal care is a central pillar of the **NEST Model**<sup>7</sup>, which recognizes the essential role of the family in the survival and well-being of the newborn. At the HSJDT, qualitative analysis and staff observations highlight a **gradual increase in parental presence and involvement** between 2022 and the first quarter of 2025. The information is based on historical observations from healthcare staff and feedback gathered during the evaluation period, without formalized quantitative data.

The reported elements describe the evolution of practices observed in the field (Kangaroo Care zones, parental care, parental involvement). The structured qualitative data comes exclusively from the Parental Perceptions and Satisfaction section, where beneficiaries were interviewed as part of the participatory evaluation conducted during the Consultant's mission to Tanguiéta in September.

### ● Increased parental presence time

Between 2022 and Q1 2025, the presence of families with newborns has improved significantly.

- In **2022**, the average parental presence during hospitalization did not exceed 2-3 hours per day, due to space constraints, cultural reluctance, and the absence of a structured reception protocol.
- The reorganization of spaces (implementation of **Kangaroo Care zones** and parental reception rooms) funded by the **Paolo Chiesi Foundation** has allowed for a **gradual increase in the time spent at the facility**.
- Since 2024, the formalized introduction of KC has allowed permanent presence (24 hours/day

in KC), reflecting a growing family appropriation of the care model.

These changes are based on feedback from healthcare staff and continuous observation of how the service operates, rather than on formal quantitative data.

### ● Greater involvement of mothers and fathers

- Mothers are now systematically involved in care: **KC**, exclusive breastfeeding, hygiene monitoring, and recognition of danger signs.
- Fathers, long absent from neonatal care, have been gradually integrated through awareness sessions and specific initiatives (discussion groups, participation in the Health and Social Care program). This involvement can promote **better family adherence** to recommendations after hospital discharge and a reduction in early dropout rates.

### ● KC Reinforcement

- KC has become the **main** lever for parental involvement.
- This approach has not only **improved thermoregulation and the mother-child bond**, but also **reduced parental stress** thanks to greater confidence in the child's survival abilities.

## ● Psychosocial support mechanisms

- Since 2023, minimal **psychological support** has been introduced through listening and guidance sessions led by midwives and social workers from the hospital.
  - ▶ Families benefit from **group awareness sessions** on the following topics:
    - ▶ exclusive breastfeeding;
    - ▶ hygiene and infection prevention;
    - ▶ neonatal danger signs;
    - ▶ organization of post-hospitalization follow-up.
- This helped to **reduce parental anxiety** and strengthen trust in the medical team.

## ● Parental perceptions and satisfaction

Perception refers to how mothers, fathers, or guardians assess and interpret the quality, availability, and compassion of care provided to their newborn during hospitalization and post-discharge follow-up. Parental **satisfaction corresponds to the overall level of contentment** expressed by parents regarding the care, support, and communication received in the neonatal intensive care unit.

This analysis is based on qualitative interviews conducted during the evaluation mission with a group of parents whose children benefited from the NEST Model. The interviews reveal their direct experience of the care provided, their perception of the support offered by the healthcare team, and their confidence in the continuity of care after discharge. A few illustrative testimonials are presented below.





### MOTHER 1 “I FOUND HOPE HERE”

“When my baby was born too small, I thought he would not survive. When I arrived here, the nurses welcomed me kindly and explained everything to me. Every day, they came to check on my child and took the time to reassure me. Kangaroo care helped me a lot: I felt that he was regaining strength in my arms.”

This testimony reflects a **high level of satisfaction linked to the availability and humanization of care**, characteristics of the KC model. The relationship of trust established by the team fosters a sense of security and the active participation of the mother.



### MOTHER 2 - “THE STAFF IS ALWAYS THERE, EVEN AT NIGHT”

“I was surprised to see staff who hardly sleep. Even during the night, if the baby moved even slightly, they would come and check. We never feel alone. They show us how to clean, breastfeed, and keep the baby warm.”

This return illustrates the **continuity of care 24 hours a day**, the involvement of staff, and the concrete application of the NEST principles: proximity, vigilance, and education at the bedside.



### MOTHER 3 - “WE LEARN TO BECOME MOTHERS HERE”

“Before, I did not know how to feed such a fragile baby. Here, I learned how to express my milk, monitor his breathing, and recognize when he is unwell. We learn a lot, not only for the hospital but for home as well.”

This testimony demonstrates the **educational value of KC**, where mothers become active participants in care. It reflects the skills transfer targeted by the PEOPLE pillar of the NEST Model and the logic of family-centered care.



### MOTHER 4 - “THANKS TO THE HOME VISITS, I DIDN'T FEEL ABANDONED”

“When I returned to the village, the team came to visit us. They checked the baby's weight and advised me on nutrition. It is reassuring to know that they continue to care for us even after the hospital.”

This experience illustrates the **continuity between the hospital and the community** through **Home Visits (HV)**: an approach that builds trust, reduces loss to follow-up, and improves post-discharge survival.

## ● Overall reading

These testimonials reflect a **high level of parental satisfaction** across three main areas:

- 1. Humanization and availability of staff:** caring, welcoming, constant listening, feeling of security.
- 2. Strengthening parental skills:** practical training, appropriation of care and supervision.
- 3. Continuity of post-discharge follow-up:** home support, lasting link with the KC team.

In short, the parents describe the KC of Tanguiéta as a **“place of hope and learning”**, where medical technique is combined with human warmth - a strong marker of the NEST Model at the HSJDT.

# 7. DISCUSSION AND LESSONS

The experience of implementing the **NEST Model** at the HSJDT, over the period **2022-Q1 2025**, provides valuable insight into the dynamics of change in a ru-

ral hospital context, but which plays a reference role for northern Benin and several neighboring countries (Burkina Faso, Niger, Nigeria, Togo).

## 7.1 Strengths and innovations of the NEST Model at the HSJDT

### ● Rapid integration of the NEST Model into hospital practices

- The neonatology service has benefited from continuous structural and financial support from the Paolo Chiesi Foundation, facilitating the integration of the four pillars (PLACE, PRODUCTS, PEOPLE, POWER).
- The organization of the unit, the deployment of KC, the standardization of protocols, and the availability of suitable equipment have enabled a rapid improvement in the quality of care.

### ● Local adoption by hospital teams

- The neonatology teams, including pediatricians, nurses, midwives, and nursing assistants, have strongly embraced the tools made available, notably through continuous mentoring and active participation in audits and follow-up meetings.
- This ownership is also reflected in the staff's commitment to providing post-hospitalization follow-up through home visits.

### ● Significant reduction in hospital-acquired infections

- The introduction of strict **IPC protocols**, the use of locally produced NaClO<sub>3</sub>0, and the support of the **Infection Control Committee (ICC)** have contributed to a measurable reduction in infections, confirmed by the 2024 external evaluation.

### ● Positive impact on the survival of referred (outborn) newborns

- Although they constitute the most vulnerable group, outborn newborns have benefited from more effective care thanks to improved practices and the organization of the referral network.
- The data show a decrease in mortality in this subgroup, a sign of the systemic effect of the NEST Model.

## 7.2 Persistent challenges and limitations encountered

### ● Increasing workload of staff

- The increase in the number of admissions, linked to the regional attractiveness of the service, has considerably increased the workload of the care teams.
- In some cases, this burden exceeds available capacity, highlighting the need for increased qualified human resources (pediatricians, specialized nurses, nursing assistants).

### ● Equipment maintenance and durability

- The equipment provided (incubators, phototherapy, wall oxygen, monitors) has improved the quality of care, but its regular maintenance remains a major challenge.
- The lack of specialized biomedical technicians and the high cost of spare parts expose the hospital to a risk of critical equipment failure, which could compromise achievements.

### ● Limitations of physical infrastructure

- The spaces in the neonatology and Kangaroo Care unit remain cramped in relation to the increasing volume of patients.
- The lack of additional equipment (breast milk refrigerator, modular tables, adapted sorting areas) limits the optimization of care and organization.

### ● Insufficient post-hospitalization follow-up

- Although home visits have been initiated, their coverage remains limited.
- Many newborns discharged from the hospital still escape systematic follow-up, which reduces the ability to assess relapses, post-discharge mortality, and the overall impact of the model.

### ● Financial sustainability and external dependence

- A large part of the activities (KC, meals for mothers, salaries of some agents, home visits) is financed by the Paolo Chiesi Foundation.
- This dependence on an external donor raises the question of the financial sustainability of the model if support were to decrease, in the absence of formal integration into the Beninese state budget.

## 7.3 Lessons learned and alignment with international and EWENE frameworks

### ● Importance of rigorous data tracking

- Registers, databases, narrative reports, and regular audits have proven essential for quickly detecting discrepancies and adjusting practices.
- Experience shows that **quality data** is an essential basis for driving improvements.

### ● Need for ongoing training and mentoring

- Maintaining up-to-date skills is a determining factor in the sustainability of acquired skills.
- Training and refresher sessions, combined with close mentoring, promote team motivation and confidence.

### ● Crucial role of the link with peripheral structures

- The results demonstrate that improving outborn survival depends largely on the quality of referral from peripheral maternity hospitals.
- The NEST Model highlights the importance of an **integrated** care network, including training for peripheral agents, harmonization of practices, and smooth transfers.

In summary, the NEST Model experience in Tanguiéta illustrates the possibility of achieving significant results in a resource-constrained context, thanks to **strong institutional support, local ownership, and rigorous monitoring**. However, the sustainability of these achievements will depend on resolving persistent challenges related to workload, equipment maintenance, infrastructural limitations, post-hospitalization follow-up, and financial sustainability.





## ● Summary table of the challenges and opportunities of the NEST Model at the HSJDT

CHALLENGES IDENTIFIED	CORRESPONDING OPPORTUNITIES
<p><b>Increasing workload for staff:</b> increased admissions and overload of care teams.</p>	<p>Establishing academic and hospital partnerships to recruit and train more specialized human resources. Positioning the HSJDT as a <b>sub-regional training center</b> in neonatology.</p>
<p><b>Equipment maintenance and durability:</b> lack of local biomedical technicians, high cost of spare parts.</p>	<p>Development of a <b>preventive maintenance plan</b> and training of local technicians. Negotiation of partnerships with regional suppliers.</p>
<p><b>Limitations of physical infrastructure:</b> cramped spaces, overcrowding, and increased risk of nosocomial infections.</p>	<p>Project to expand and modernize the neonatology unit to improve <b>PCI</b> and create dedicated spaces (breastfeeding, mothers' rest, treatment rooms).</p>
<p><b>Insufficient post-hospitalization follow-up:</b> limited coverage of home visits and risk of readmissions.</p>	<p>Expansion of home visits through <b>shared funding</b> (PCF, MSP, NGOs). Use of digital tools to strengthen community monitoring.</p>
<p><b>Financial sustainability and dependence on external funding:</b> strong dependence on the Paolo Chiesi Foundation.</p>	<p>Diversification of funding from other donors (UNICEF, World Bank, NGOs). Integration of the NEST Model into <b>national policies</b> to ensure budgetary support from the State.</p>

## 7.4 Opportunities for replicating the NEST Model in other sites

### ● Key lessons from the Tanguiéta experience

The experience of the HSJDT demonstrates that a peripheral hospital can become a **center of neonatal excellence** using local resources, provided a structured and integrated model is implemented. The NEST Model has gradually taken root there, transforming care through a systemic approach based on four pillars:

NEST PILLAR	PRACTICAL APPLICATION IN TANGUIÉTA	OBSERVED RESULTS
<b>PLACE</b> 	Functional neonatal spaces, KC, wall-mounted O <sub>2</sub> network.	More accessible spaces for mothers and fathers, as well as improved cleanliness, thanks to the PCI program.
<b>PRODUCTS</b> 	Reliability of essential devices (CPAP, phototherapy device e.g., Firefly, scales, incubators).	CPAP coverage 80.5%, phototherapy 100%, and a reduction in early mortality.
<b>PEOPLE</b> 	Continuing education, empowerment, and clinical supervision.	Enhanced local skills, increased motivation, 24/7 continuity.
<b>POWER</b> 	Digital NID collection, CLIN audits, data-driven management.	Real-time monitoring, evidence-based decision-making.

These results confirm that **quality does not depend on the initial technical level**, but on an **institutional culture of continuous improvement**.

## ● Transferable Success Factors

Several strategies identified in Tanguiéta can be successfully replicated in other hospitals:

- **Strong local leadership and institutional alignment:** constant involvement of hospital management and anchoring in the PNS Benin strategy (OS Objectives 2 & 3)<sup>13</sup>.
- **Staff ownership:** participatory training and the enhancement of the role of nurses and KC agents have created a dynamic of professional pride.
- **Data collection and use:** the NID allows instant monitoring of admissions, deaths, and key indicators, facilitating corrective decisions.
- **Community-hospital integration:** the HV system has consolidated continuity of care and inspired an exportable community monitoring model.
- **Flexible partnership support:** the technical and logistical support of the Paolo Chiesi Foundation accompanied the gradual transfer of skills without external substitution.

## ● Opportunities for national and regional replication

The Tanguiéta experiment opens up **concrete prospects for replication:**

### 1. Horizontal replication in Benin

- ▶ Candidate sites: district hospitals (Natitingou, Parakou, Allada).
- ▶ Approach: progressive NEST modules (PLACE/PRODUCTS as a priority), mentoring by the HSJDT.
- ▶ Support: integration into the PNS action plan and performance-based hospital funding.

### 2. Regional replication (West Africa)

- ▶ The **modularity of the model** - adaptable infrastructures, open-source NID tools, standardized protocols - makes it possible to adopt it in similar contexts (CAR, Togo, Niger, Burkina Faso).

- ▶ “*Start small, scale smart*” approach: begin with KC, thermoregulation, and oxygen management, before expanding to the four complete pillars.

### 3. Strengthening South-South research and learning

- The 2022–Q1 2025 data from Tanguiéta offer a **regional learning laboratory**, conducive to collaborative publications and the creation of a NEST West Africa network.
- A mechanism for exchanging experience (workshops, immersions, coaching) could formalize the transfer of know-how.

## ● Conditions for durability and successful replication

To guarantee durability and replication, three conditions are essential:

1. **Institutionalization:** integration of the NEST Model into hospital master plans and public budgets (dedicated line “Essential neonatal care”).

2. **Monitoring and evaluation:** maintaining the NID and quarterly CLIN audits as standard tools.

3. **Gradual empowerment:** moving from external support to total local control of the model, with strengthening of female and community leadership.

Tanguiéta proves that an integrated neonatal model, based on simple yet rigorously applied principles, can transform newborn survival and development. Replicating the NEST Model relies not only on infrastructure but also on a **culture of humane, competence, and data-driven care**. This wealth of experience now positions the HSJDT as a **regional demonstration and mentoring center** for the next phase of the NEST Model.

# 8. CONCLUSION AND OUTLOOK

## 8.1 Key findings and overall summary

The evaluation of the **NEST Model** implemented at the HSJDT between **2022 and the first quarter of 2025**, based on data from hospital registers, databases, annual narrative reports (2022, 2023, 2024), budget annexes, partnership agreements with the Paolo Chiesi Foundation, external evaluations (2024, 2025) and surveys of families, highlights a **positive, measurable and sustainable impact** on neonatal health and the healthcare system.

This improvement is the result of a coherent combination of:

### ● IMPROVING NEONATAL SURVIVAL:

Data from registries and external evaluations show a significant reduction in hospital-based neonatal mortality. This decrease is particularly marked among **inborn newborns**, but also affects **outborns** thanks to improved referral organization and increased capacity.

### ● STRENGTHENING THE QUALITY OF CARE:

The operational availability of equipment (incubators, phototherapy, wall oxygen, monitors) was maintained at a high level (>85%), despite some maintenance challenges. Infection prevention and control (IPC) protocols, supported by the Infection Control Committee (ICC) and the use of NaClO<sub>3</sub>, reduced the rate of nosocomial infections.

### ● THE DEPLOYMENT OF KANGAROO CARE (KC):

The data from 2023 and 2024 attest to increasing coverage, with posthospitalization follow-up strengthened by home visits, confirming the effectiveness of the family-centered approach, as recommended by the EWENE.

### ● ENHANCED HUMAN CAPABILITIES:

More than 90% of neonatology staff benefited from continuing education, mentoring, and refresher courses, as confirmed by mission reports and budget annexes 2023–2024. This investment in **human capital** has enabled better local ownership of the model.

### ● FAMILY SATISFACTION:

Surveys show a clear improvement in parental satisfaction, particularly in relation to support in KC, proximity to caregivers, and home follow-up.

## 8.2 Areas of consolidation 2025–2026

The priorities for the **2025–2026 period** aim to strengthen the **sustainability of achievements** and to embed the NEST Model in a logic of continuous improvement. They are structured around four strategic axes:

- **Preventive maintenance and sustainable logistics:** Consolidating local skills in first-level biomedical maintenance.
- **Clinical reinforcement and ongoing supervision:** Continue targeted coaching on non-invasive ventilation, thermoregulation, and jaundice diagnosis; and promote formative supervision, case audits, and morbidity-mortality reviews.
- **Data governance and digitization:** Strengthen monthly validation and quarterly reporting for better decision-making use.
- **Family integration and mother- and newborn-centered care:** Extend the KC model to maternity and post-discharge follow-ups; and strengthen community awareness for an effective continuum of care.

## 8.3 Lessons and perspectives

- **Data as leverage:** hospital registries, enriched by narrative reports and external evaluations confirm that systematic monitoring is essential to drive continuous improvement.
- **Continuing education and mentoring** have proven crucial for the sustainability of achievements, as highlighted in the 2024 external mission<sup>20</sup>.

- **The link with peripheral structures** remains an essential condition for improving the survival of outborns, requiring better preparation of transfers and harmonization of practices.
- **A transferable model:** Tanguiéta's participation in the NEST Partners Meeting (Ngozi 2023, Cotonou 2024, Abidjan 2025, partnership annexes 2023-2024) shows that this model is reproducible in other African contexts.

## 8.4 Conclusion

The HSJDT's experience demonstrates that it is possible, even in a rural environment with limited resources, to improve neonatal health outcomes through an integrated and tailored approach. The ongoing support of the Paolo Chiesi Foundation, combined with the HSJDT's local commitment, has enabled the integration of equipment, training, governance, and rigorous data monitoring—all key elements aligned with the objectives of the Every Woman Evert Newborn Everywhere (EWENE)<sup>21</sup>, which promotes the survival and well-being of every newborn through quality care.

**The NEST Model**, in its **Essential for Survival and Thriving dimension**, goes beyond simple material provision: it now constitutes a **regional center of excellence**, serving northern Benin and neighboring countries; a **laboratory for organizational and technical innovation**, with the implementation of KC, home visits and digitalized monitoring in perspective; and a **reproducible example**, destined to be consolidated and disseminated in other hospitals in West Africa.

Continued **longitudinal monitoring, strengthened maintenance, and the sharing of best practices** through the NEST network and national and regional bodies will be crucial to ensuring the **sustainability and expansion** of this successful experience.

## 8.5 Strategic recommendations (2025–2027):

### For the Saint Jean de Dieu Hospital of Tanguiéta

- **Expand and modernize the neonatology unit:** in order to guarantee care for the constant and high number of admissions.
- **Recruiting and retaining specialized staff:** despite progress (36 staff trained in Q1 2025), staff turnover remains a challenge. It is recommended to establish a **retention plan** (financial incentives, certified training, housing) and to recruit at least **5 additional midwives and 3 specialized nurses** by 2026.
- **Strengthen clinical supervision and operational research:** sustain internal mentoring by creating a **pool of local trainers** and promote Tanguiéta as a research site on neonatal innovations (KC studies, cost-effectiveness of NEST equipment).

### For the Paolo Chiesi Foundation

- **Maintain and increase targeted funding:** critical equipment (incubators, oxygen concentrators, vital signs monitors) has demonstrated a direct impact on neonatal survival. Its operational availability (>85% by 2024) must be strengthened through a **preventive maintenance plan** and the training of biomedical technicians.
- **Strengthen investment in continuing education:** develop an **e-learning program** in neonatology adapted to the African context; and support the mobility of managers from Tanguiéta to other sites in the NEST network (e.g., South-South partnership with Burundi and Togo).
- **Supporting capitalization and dissemination:** produce **multi-site comparative reports** to position Tanguiéta as a reference in West Africa.

### For the Ministry of Health of Benin (MSP)

- **Institutionalize the achievements of Tanguiéta:** integrate the **NEST Model** into national guidelines for neonatal care and develop a **national training plan in neonatology** inspired by the Tanguiéta experience.
- **Support scaling up the model:** extend the essential components of the model (KC, mentoring, NEST equipment) to other referral hospitals (Natitingou, Parakou, Allada); and ensure progressive **public co-financing** for sustainability
- **Strengthen links with the community level:** include post-hospitalization follow-up (home visits, telephone follow-up) in maternal and child health programs via community relays.

### For regional partners

- **Promote Tanguiéta as a learning site:** create a **regional training center in neonatology** based at the HSJDT, welcoming healthcare professionals from Burkina Faso, Togo, Niger, and Côte d'Ivoire every year.
- **Strengthen South-South exchanges:** organize **annual inter-country workshops** for sharing experiences and standardizing protocols.
- **Contribute to EWENE global targets:** Position Tanguiéta as a **demonstration site** for monitoring EWENE indicators, particularly on neonatal mortality and KC coverage.

# Bibliographical references

- 1 Ordre Hospitalier de Saint-Jean-de-Dieu. Hôpital Saint Jean de Dieu de Tanguiéta — site officiel. January 1, 2025. Accessed September 23, 2025. <https://www.tanguieta.org/>
- 2 Lobo Maria. Benin — Elective Report: Hopital de St Jean de Dieu (Tanguieta), Year of visit 2015. January 1, 2015. Accessed September 23, 2025. <https://www.anglofrenchmedical.com/elective-reports/benin/>
- 3 Paolo Chiesi Foundation. Chiesi Foundation: 20 Years of Commitment to Global Health. April 14, 2025. Accessed September 23, 2025. <https://www.chiesifoundation.org/en/chiesi-foundation-20-years/>
- 4 Ordre Hospitalier de Saint-Jean-de-Dieu – Province Saint-Raphaël. Publication: Service de néonatalogie inauguré en février 2012.... January 1, 2025. Accessed September 23, 2025. <https://www.ohsjd-psrpa.com/publications/67916f4f5804efd93de6db0b>
- 5 Paolo Chiesi Foundation. Rapport General - NEST Partners Meeting 2024. [https://www.chiesifoundation.org/wp-content/uploads/2024/11/NEST\\_Partners\\_Meeting\\_2024\\_Report.pdf](https://www.chiesifoundation.org/wp-content/uploads/2024/11/NEST_Partners_Meeting_2024_Report.pdf)
- 6 World Health Organization. Newborn mortality – Fact sheet. March 14, 2024. Accessed September 23, 2025. <https://www.who.int/news-room/fact-sheets/detail/newborn-mortality>
- 7 Paolo Chiesi Foundation. Document sur la mise en œuvre du Modèle NEST. Published online 14 Décembre. [https://www.chiesifoundation.org/wp-content/uploads/2024/12/NEST\\_Model\\_2025\\_FR.pdf](https://www.chiesifoundation.org/wp-content/uploads/2024/12/NEST_Model_2025_FR.pdf)
- 8 World Health Organization. Newborn mortality – Fact sheet. Geneva. Published online March 14, 2024. Accessed September 23, 2025. <https://www.who.int/news-room/fact-sheets/detail/newborn-mortality>
- 9 UNICEF. Benin – Country profile: Child survival (Neonatal mortality rate). Accessed September 23, 2025. [data.unicef.org/country/ben/](https://data.unicef.org/country/ben/)
- 10 Healthy Newborn Network, Save the Children, <https://healthynewbornnetwork.org/countries/>
- 11 UNICEF and WHO. Survive and thrive: transforming care for every small and sick newborn. Survive and thrive: transforming care for every small and sick newborn. Published online 2020.
- 12 UNICEF, WHO. Ending Preventable Newborn and Stillbirths by 2030: Moving Faster towards High-Quality Universal Health Coverage in 2020–2025. UNICEF; World Health Organization; 2020.
- 13 Ministère de Santé du BENIN. politique nationale de santé PNS 2018-2030 BENIN. Published online 2018. [https://files.aho.afro.who.int/afahobckpcontainer/production/files/VF\\_PNS\\_\\_19\\_01\\_2020\\_VF.pdf](https://files.aho.afro.who.int/afahobckpcontainer/production/files/VF_PNS__19_01_2020_VF.pdf)
- 14 Laube M, Thome UH. Y it matters—sex differences in fetal lung development. *Biomolecules*. 2022;12(3):437.
- 15 Townsel CD, Emmer SF, Campbell WA, Hussain N. Gender differences in respiratory morbidity and mortality of preterm neonates. *Frontiers in pediatrics*. 2017;5:6
- 16 World Health Organization. Standards for improving the quality of care for small and sick newborns in health facilities. In: Standards for Improving the Quality of Care for Small and Sick Newborns in Health Facilities. 2020:152. <https://iris.who.int/bitstream/handle/10665/334126/9789240010765-eng.pdf?sequence=1&isAllowed=y>
- 17 WHO. Normes destinées à améliorer la qualité des soins des nouveau-nés malades et de petit poids dans les établissements de santé. In: Normes Destinées à Améliorer La Qualité Des Soins Des Nouveau-Nés Malades et de Petit Poids Dans Les Établissements de Santé. 2021.
- 18 Paolo Chiesi Foundation. Rapport de mission de suivi de la mise en oeuvre du plan d'action de l'unité de Néonatalogie de l'HSJDT. Published online March 12, 2025
- 19 Paolo Chiesi Foundation. Rapport Narratif Chiesi Foundation\_HSJDT. Published online 2023\_2024.
- 20 Paolo Chiesi Foundation. Rapport d'évaluation externe de l'HSJDT. Published online April 15, 2024.
- 21 Every Woman Every Newborn Everywhere (EWENE) <https://ewene.org/>

The Paolo Chiesi Foundation is a philanthropic organization established by Paolo Chiesi and his family, inspired by the belief that every person has the right to access quality healthcare and live a healthy life. It aims to reduce neonatal mortality in sub-Saharan Africa and improve the health of patients affected by chronic respiratory diseases in the Global South. The Foundation supports international scientific research and local development programs to transfer medical-scientific knowledge and to empower families in the healthcare process, promoting sustainable growth and strengthening local communities' responsibility and engagement. Founded in Parma (Italy) in 2005 and operational since 2010, the Paolo Chiesi Foundation operates today in Benin, Burkina Faso, Burundi, Central African Republic, Ethiopia, Guyana, Ivory Coast, Nepal, Peru, Tanzania, Togo, and Uganda.

### **Vision**

We envision a world in which patients with chronic respiratory diseases and all newborns, as well as their mothers and families, regardless of where they live, have equal access to quality care and the right to live healthier lives.

### **Mission**

We support local health programs by promoting training and knowledge sharing, providing equipment, and upgrading infrastructure to reduce neonatal mortality rates in French-speaking countries in sub-Saharan Africa and improve the health of patients with chronic respiratory diseases in the Global South.



Via Paradigna 131/A

43122 - Parma (Italy)

Fiscal code 92130510347

[info@paolochiesifoundation.org](mailto:info@paolochiesifoundation.org)

[www.paolochiesifoundation.org](http://www.paolochiesifoundation.org)