Canadian Neonatal Follow-Up Network
Réseau Canadien de Suivi Néonatal

# CNFUN ANNUAL REPORT 2022

RESEARCH MULTIDISCIPLINARY COLLABORATION DATA COLLECTION FOLLOW-UP KNOWLEDGE TRANSLATION QUALITY OF CARE OUTCOMES

KGH HSC SBGH RCH BCWH HSJ NETWORK SUNY CHUS EDM HSCC CHUQ NJ MSH SMH HMR ACH/FMC SJHC IWK MUHC HHSC JGH WRH VGH/GVS

# A. Executive Summary

We are pleased to provide the fifth CNFUN annual report. CNFUN aims to provide accurate up to date information on the outcomes of children born very preterm across Canada and to improve health and the provision of health care. This report provides national and site-specific data from the start of CNFUN data collection with births from April 1, 2009, until December 31, 2019. Information is included for 11,079 survivors and non-survivors and 8,394 infants assessed at a CNFUN site and with linked neonatal data from the Canadian Neonatal Network.

Improving the health and daily functioning of the children we care for is our goal. Measuring, reporting, and sharing outcomes is important to monitor the quality of the care we provide during the perinatal period and beyond, identify targets for future preventative or therapeutic interventions, and advocate for health care services after neonatal discharge that are critical to support optimal health and child development as well as family well-being.

Sites involved in CNFUN have been essential in assessing infant outcomes for clinical and research purposes in very preterm children born at less than 29 weeks' gestational age. They have pursued their dedicated work despite constraints brought by the COVID pandemic. We are very grateful to all CNFUN participating sites for their engagement.

Over the past years, the network has started implementing interventions to improve either language or cognitive outcomes using a quality improvement approach. Furthermore, we have been working closely with the Canadian Premature Babies Foundation to identify outcomes following extremely preterm birth that mattered to families with support from the CIHR SPOR (Strategy for Patient Oriented Research) CHILD-BRIGHT research collaborative, which also provides funding for this annual report.

**The Parents' Voice Project has highlighted what parents view as important: functioning, quality of life and family well-being**. The value-based classification system of combining death and neurodevelopmental impairment in a same category has also been pointed out as a contributor to the negative stigma associated with outcomes of prematurity. In last year's annual report, we started incorporating lessons learnt from families.

**Implementing recommendations from parents of preterm children**

- We are removing value-based labels of severity and are using objective descriptions such as cerebral palsy levels of function and hearing status.
- Based on our preliminary results, we have restricted '*severe*' neurodevelopmental impairment (NDI) to health conditions likely to persist over time and have an impact on child functioning (page 18). This is different from significant NDI which encompasses milder conditions. Severe NDI does not imply poor quality of life.
- We are adding the outcome of survival without NDI, significant NDI or severe NDI.
- We removed the composite outcome of death and NDI from this report.

Indeed, when thinking about the composite outcome of death and NDI, or even how we have defined significant NDI, a composite itself of different neurodevelopmental components, some methodological issues arise. Composite outcomes were originally designed for clinical trials, not observational studies, to increase statistical efficiency. Basic rules for the appropriate use of composite outcomes are that the individual components have (1) similar importance to patients/families, (2) comparable effect sizes and (3) comparable event rates, and (4) share similar pathophysiological mechanisms (Montori VM et al. BMJ. 2005; 330 (7491):594). In addition, to address competing risk, experts state that it might be justified to use a composite outcome if (1) the biology suggests that the exposure/intervention might realistically increase the more serious event, thus misleadingly reduce the less serious one (for example, reduced rates of cerebral palsy, but increased neonatal mortality); (2) the more serious outcome occurs frequently enough that, if the exposure/intervention truly increases its frequency, the result would be a misleading decrease in the less serious event (Manja V, AlBashir S, Guyatt G. J Clinical Epidemiol 2007;82: 4-11). However, in neonatal outcome research, one could argue that if an intervention/exposure significantly increased mortality, this would be the primary concern and therefore, the longer-term outcome would become less relevant. Furthermore, based on the Parents' Voice Project, most of the components making the composite outcome of significant NDI are not perceived as severe by majority of parents of preterm children (Synnes A et al. Children (Basel);10(5):880). Therefore, reporting death or significant NDI in the same composite outcome is not clinically meaningful and philosophically appropriate.

In this year annual report, key findings are highlighted below, but must be interpreted with caution. Lower follow-up rates have been observed over the past two years due to COVID. **Children at higher biological risk of NDI are more likely to be seen in follow-up**, thus potentially leading to an overestimation of rates of NDI.

**Key Findings:**

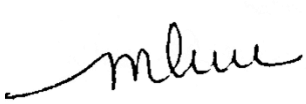
- The majority (6954/11079 = 62.8%) of infants born <29 weeks' gestational age survive without significant NDI.
- For children born at 22 weeks (n=112 infants with linked CNN and CNFUN data), 14% survive without significant NDI.
- There are also trends towards lower rates of need for hearing aids/cochlear implants.
- Significant NDI rates have remained stable over time.
- About one third of infants are re-admitted after NICU discharge.

Finally, CNFUN has recently partnered with the Hammersmith Infant Neurological Examination Canadian working group, led by Dr Darcy Fehlings, so neonatal follow-up staff across the country can be trained in the best practices for earlier diagnosis of high-risk of cerebral palsy. The next step will be to continue implementing these international recommendations and measure the effect on preterm infant follow-up care and outcomes.

In addition, we are aiming to implement outcome measures identified by parents as priorities as part of ongoing CNFUN data collection. This will be done in partnership with all CNFUN sites, collaborators from CHILD-BRIGHT and families from the Canadian Premature Babies Foundation.

We would like to thank the CNFUN Annual Report Working Group and acknowledge the support of the CNFUN Steering Committee. Thank you to the MiCare Coordinating site: Sonny Yeh for developing and supporting the database, Junmin Yang for the analyses, and Dr. Prakesh Shah for his leadership. Thank you to Dr Anne Synnes, the Founding member and past director of CNFUN, who continues to share her time, passion and wisdom with us, despite her retirement from clinic. She serves as a mentor

for many clinicians from the neonatal follow-up community. Most importantly, we want to show our appreciation of the families of children born preterm to attend the follow-up visits. Parents are grateful of the care they receive; contributing data is their way to give back to science to improve the care of infants born preterm.



**Thuy Mai Luu** MD, MSc
Director, CNFUN

**Jehier Afifi** MbBCh, MSc
Co-Director, CNFUN

## Introduction

The Canadian Neonatal Follow-Up Network (CNFUN) is a collaboration between Neonatal and Perinatal Follow-Up Programs in Canada and their multidisciplinary team members. It was developed in liaison with the Canadian Neonatal Network (CNN) to facilitate collaboration in research, integrated data collection, and knowledge translation, and to improve the quality of care and long-term outcomes of children seen in their programs.

## CNFUN's Mission

CNFUN's mission is to be a network of health care professionals dedicated to improving the care of newborns and children at high risk of adverse outcome as a result of conditions requiring intensive medical care.

## CNFUN's Goals

- Establish a network of Canadian health care professionals involved in neonatal / perinatal follow-up programs.
- Develop a common standardized set of assessments to be done at standardized ages and common definitions to create the CNFUN data set.
- Develop a national electronic database of the CNFUN dataset and link it to neonatal and perinatal datasets including the Canadian Neonatal Network.
- Use the CNFUN database to improve health care and its delivery by providing accurate up to date information for decision making, identifying best practices, and facilitating the acquisition of long-term outcomes data in neonatal, perinatal and early intervention research.
- Advocate for our population of children by ensuring that the best evidence is translated into practice.

## Administrative Structure

A Steering Committee oversees CNFUN activities and makes policy decisions. Site representatives from participating institutions provide representation, input, and liaison for participating institutions.

The Steering Committee was appointed for the first 5 years and there have been elections every 2 years. Members serve 4-year terms. The last election was held February 2022.

The Steering Committee is composed of 11 members:

- The director of the network.
- The past director.
- A co-director chosen by the CNFUN Steering Committee.
- 5 members representing different geographic regions of Canada.
- 3 members representing allied health professionals in the fields of nursing, psychology, occupational therapy, physiotherapy or speech and language therapy. One of these professionals must be familiar with the Bayley Scales of Infant and Toddler Development.

The Network Coordinating Centre will provide administrative support to CNFUN, its committees and institutional and individual members.

**CNFUN Membership**
Membership is open to all health care professionals with an interest in neonatal/ perinatal follow-up. There are two types of membership – institutional and individual.

**Institutional Membership** is open to all institutions with a neonatal or perinatal follow-up program.

- **Application**: To be submitted to the Chair of the Steering Committee.
- **Membership fee**: None.
- **Obligations**: Membership requires commitment by the institution to collect and contribute data to the CNFUN database with research ethics board approval. Institutional members agree that their data may be used at the discretion of the network, within guidelines agreed upon between network members.
- **Benefits**: The database will be maintained, and error checked by CNFUN and MiCare (Maternal Infant Care Network). An institution's own data will be available for its own use. Research projects and resultant manuscripts using network data need to be approved by the Steering Committee.
- **Representation**: The institution will appoint a liaison representative who will represent the institution for policy decisions of the Network. The

number of members who can vote for members of the Steering Committee shall be proportional to the number of participant data submitted to the CNFUN database.

- **Renewal and Termination**: Institutional membership is ongoing until terminated by the institution, by written notice to the Chair of the Steering Committee. Membership may also be terminated by the Steering Committee if an institution fails to maintain data contribution to the CNFUN database.

**Individual Membership** is open to all health care professionals with an interest in neonatal / perinatal follow-up.

- **Application**: To be submitted to the Chair of the Steering Committee and be endorsed by an existing member.
- **Membership fee**: None.
- **Obligations**: Members agree to abide by the rules governing research conduct and use of the data.
- **Benefits**: Members may use network infrastructure for research collaboration. Research projects using network data must be approved by the Steering Committee.
- **Renewal and termination**: Individual membership will need to be renewed every four years.

**CNFUN Funding**

CNFUN was initiated with support from the Canadian Institutes of Health Research through a grant to the CIHR Team in Maternal-Infant Care (CTP 87518). The study coordinating center, the Maternal-Infant Care Research Centre, is supported by program funding from the Ontario Ministry of Health and Long-Term Care.

Current funding is from the CIHR SPOR grant "CHILD-BRIGHT" (Child Health Initiatives Limiting Disability - Brain Research Improving Growth and Health Trajectories) for the "Parent-EPIQ" project and the CIHR Pan-Canadian Network to Improve Outcomes of Preterm Birth.

Participating sites contribute additional funding for patient outcome assessments.

**CNFUN Steering Committee**

Dr. Thuy Mai Luu – Pediatrician / director (Québec)

Dr. Anne Synnes – Neonatologist / past director (British Columbia)

Dr. Jehier Afifi – Neonatologist / co-director (Nova Scotia)

Dr. Rudaina Banihani – Neonatologist / developmental behavioural pediatrician (Ontario)

Lindsay Colby – Nurse (British Columbia)

Dr. Matthew Hicks – Neonatologist / developmental behavioural pediatrician (Alberta)

Dr. Florencia Ricci – Developmental behavioural pediatrician (Manitoba)

Dr. Marie-Noëlle Simard – Occupational therapist/ researcher (Quebec)

Dr. Karen Thomas – Neonatologist / developmental behavioural pediatrician (Ontario)

Dr. Jill Zwicker – Occupational therapist / researcher (British Columbia)

**2022 CNFUN Annual Report Working Group**

Dr. Thuy Mai Luu – Pediatrician, neonatal follow-up (Québec)

Dr. Jehier Afifi – Neonatologist, neonatal follow-up (Nova Scotia)

Dr. Matthew Hicks – Neonatologist, developmental behavioural pediatrician (Alberta)

Dr. Leonora Hendson – Neonatologist, neonatal follow-up (Alberta)

Heather Kehler – Research Coordinator, neonatal follow-up (Alberta)

Lindsay Richter – CNFUN National Coordinator (British Columbia)

Dr. Marie-Noëlle Simard – Occupational therapist/ researcher (Quebec)

Dr. Anne Synnes – Neonatologist, neonatal follow-up (British Columbia)

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# B. Participating Sites

## Presentation No 1: CNFUN site descriptions

| Active members | | | | | |
|---|---|---|---|---|---|
| **Province** | **Abbreviation** | **NFUP Program Name / City** | **Hospital Site** | **Site Investigator** | **Number of CNFUN Members** |
| BC | **BCWH** | Neonatal Follow-Up Program, Vancouver | BC Women's Hospital & Health Centre | Jessie VanDyk, Shelagh Anson | 10 |
| | **RCH** | Neonatal Follow-Up Program, New Westminster | Royal Columbian Hospital | Miroslav Stavel, Anitha Moodley | 3 |
| | **SMH** | Neonatal Follow-Up Program, Surrey | Surrey Memorial Hospital | Rebecca Sherlock | 4 |
| | **VGH/GVS** | Neonatal Follow-Up Team, Victoria | Victoria General Hospital | Thevanisha Pillay | 4 |
| AB | **ACH/FMC** | Neonatal Follow-up Clinic, Calgary | Alberta Children's Hospital & Foothills Hospital, University of Calgary | Leonora Hendson, Amina Benlamri | 7 |
| | **EDM** | Neonatal and Infant Follow-Up Clinic, Edmonton | Glenrose Rehabilitation Hospital | Amber Reichert, Amy Shafey | 9 |
| MB | **HSCC** | High Risk Newborn Follow-Up Program, Winnipeg | University of Manitoba Health Sciences Centre / Children's Hospital | Diane Moddemann, Florencia Ricci | 7 |
| | **SBGH** | High Risk Newborn Follow-Up Program, Winnipeg | St. Boniface General Hospital | Cecilia del Cabo | 6 |
| ON | **HHSC** | Neonatal Follow-Up Clinic, Hamilton | Hamilton Health Sciences Centre, McMaster Children's Hospital | Karen Thomas | 9 |
| | **HSC** | Neonatal Follow-Up Program, Toronto | Hospital for Sick Children | Linh Ly | 7 |

| | | | | | |
|---|---|---|---|---|---|
| | **KGH** | Special Infant Clinic, Kingston | Kingston General Hospital | Sarah McKnight | 3 |
| | **MSH** | Neonatal Follow-Up Program, Toronto | Mount Sinai Hospital | Kamini Raghuram | 9 |
| | **SJHC (LHSC)** | Developmental Follow-Up Clinic, London | St. Joseph's Health Care London | Kevin Coughlin | 10 |
| | **SUNY** | Neonatal Follow-Up Program, Toronto | Sunnybrook Health Sciences Center | Paige Church, Rudaina Banihani | 8 |
| | **WRH** | Neonatal Neurodevelopment Follow-Up Program, Windsor | Windsor Regional Hospital | Judy Seesahai | 6 |
| QC | **CHUS** | Clinique de suivi néonatal, Sherbrooke | Centre Hospitalier Universitaire de Sherbrooke | Alyssa Morin | 2 |
| | **CHUQ** | Centre Mère Enfant, Centre Hospitalier de L'Université Laval, Québec | Centre Hospitalier Universitaire de Québec (Laval Site) | Sylvie Bélanger | 3 |
| | **HMR** | Clinique de suivi néonatal, Montréal | Hôpital Maisonneuve-Rosemont | Marie St-Hilaire | 2 |
| | **HSJ** | Clinique de suivi néonatal, Montréal | Université de Montréal, Hôpital Sainte-Justine | Thuy Mai Luu | 6 |
| | **JGH** | Neonatal Follow-Up Clinic, Montréal | Jewish General Hospital | Kim-Anh Nguyen. Ruth Mandel | 5 |
| | **MUHC** | Neonatal Follow-Up Program, Clinique de suivi néonatal, Montréal | McGill University Health Centre/ Montréal Children's Hospital/ L'Hôpital de Montréal pour enfants | May Khairy, Jarred Garfinkle | 10 |
| NS | **IWK** | Perinatal Follow-Up Program, Halifax | IWK Health Centre and Cape Breton Regional Hospital | Jehier Afifi | 9 |

| Past members | | | | |
|---|---|---|---|---|
| **Province** | **Abbreviation** | **NFUP Program Name / City** | **Hospital Site** | **Site Investigator** |
| SK | **RQHR** | Developmental Assessment Clinic, Regina | Regina General Hospital | J.P. Bodani |
| | **RUH** | Neonatal Follow-Up Program, Saskatoon | Royal University Hospital | Sibasis Daspal |
| ON | **CHEO/OTTA*** | Neonatal Follow-Up Clinic, Ottawa | Children's Hospital of Eastern Ontario | Jana Feberova |
| NB | **ECH*** | Neonatal Follow-Up Program, Fredericton | Dr. Everett Chalmers Hospital | Hala Makary |
| | **SEHC*** | Neonatal Follow-Up Clinic, Moncton | Moncton Hospital | Maad Bakr Saleem |
| | **SJRH*** | Neonatal Follow-Up Program, Saint John | Saint John Regional Hospital | Alana Newman |
| NFLD | **JCHC*** | High-Risk Follow-Up Clinic, St. John's | Janeway Children's Health & Rehabilitation Centre | Nadine McEvoy |

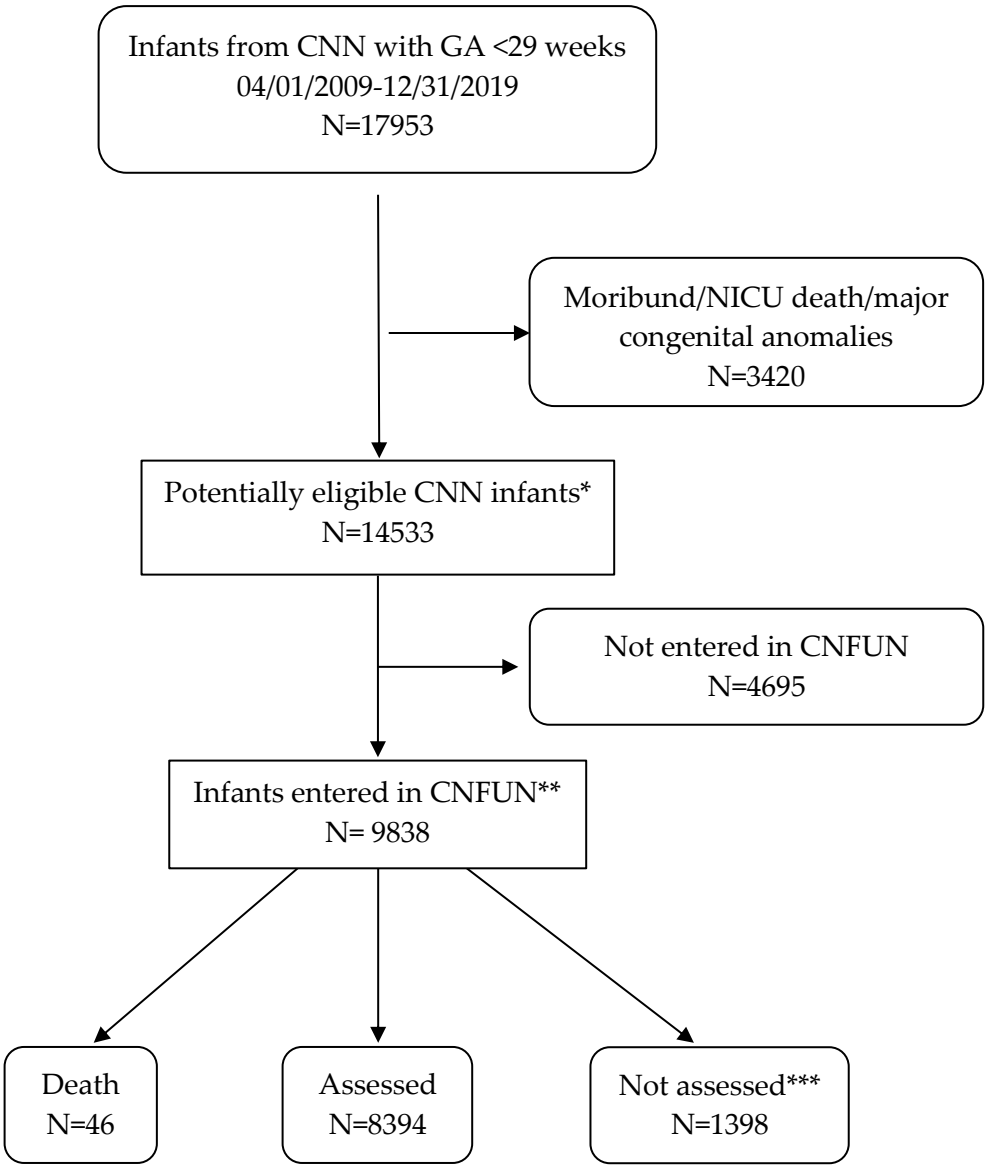
*sites intending to contribute to CNFUN data collection for upcoming projects

## Presentation No 2: CNFUN Sites Participation and Follow-up Rates†

| CNFUN Site | Epoch 1 Follow-Up Rate (Births April 1, 2009 – September 30, 2011) n/N (%) | Epoch 2 Follow-Up Rate (Births October 1, 2011 – December 31, 2019) n/N (%) |
|---|---|---|
| 1 | 220/311 (70.7) | 572/1092 (52.4) |
| 2 | 122/135 (90.4) | 365/444 (82.2) |
| 3 | 10/13 (76.9) | 116/158 (73.4) |
| 4 | 13/17 (76.5) | 7/48 (14.6) |
| 5 | 221/257 (86) | 177/946 (18.7) |
| 6 | 218/249 (87.6) | 722/992 (72.8) |
| 7 | 28/51 (54.9) | 56/173 (32.4) |
| 8 | 146/203 (71.9) | 11/730 (1.5) |
| 9 | 55/110 (50) | 87/194 (44.8) |
| 10 | 56/69 (81.2) | 168/278 (60.4) |
| 11 | 181/223 (81.2) | 518/591 (87.6) |
| 12 | 84/102 (82.4) | 279/323 (86.4) |
| 13 | 23/37 (62.2) | |
| 14 | 106/135 (78.5) | 342/437 (78.3) |
| 15 | 31/51 (60.8) | 17/125 (13.6) |
| 16 | 250/301 (83.1) | 786/1190 (66.1) |
| 17 | 23/41 (56.1) | |
| 18 | 42/46 (91.3) | 9/150 (6) |
| 19 | 17/66 (25.8) | 5/211 (2.4) |
| 20 | 134/223 (60.1) | 302/898 (33.6) |
| 21 | 56/59 (94.9) | 140/204 (68.6) |
| 22 | 13/20 (65) | 14/92 (15.2) |
| 23 | 139/165 (84.2) | 235/436 (53.9) |
| 24 | 7/13 (53.8) | |
| 25 | 242/308 (78.6) | 898/1264 (71) |
| 26 | 19/23 (82.6) | 60/91 (65.9) |
| 27 | | 52/70 (74.3) |

†Follow-up rate denominator: infants with GA<29 weeks discharged live from NICU (infants with moribund or major congenital anomalies were excluded).

**Presentation No 3: CNN and CNFUN flow diagram for births Apr 1, 2009 – Dec 31, 2019**




*Data linkage with CNN occurs by the CNFUN site contacting the CNN data abstractor to obtain the unique identifier. When a matching unique identifier is not available in CNN and CNFUN, probabilistic matching is used. Children not entered in CNFUN could not be linked with CNN (n=4695).

**CNFUN children are recruited locally by a CNFUN site and recorded in the CNFUN database as assessed, not assessed, or deceased.

***Children were not assessed for the following reasons: declined/consent not obtained (n=385), no contact information (n=32), unable to reach (n=291), missed appointment (n=233), other reason (n=414), missing information (n=40).

# C. Outcomes Definitions

| Level of health (body function) | Neurodevelopmental impairment (NDI)<br>(Any one or more of the following)* | Significant neurodevelopmental impairment (sNDI)<br>(Any one or more of the following)** | Severe neurodevelopmental impairment<br>(Any one or more of the following)*** |
|---|---|---|---|
| **Motor** | CP with GMFCS 1 or higher | CP with GMFCS 3, 4 or 5 | CP with GMFCS 4 or 5 |
| | Bayley Motor Composite <85 | Bayley Motor Composite <70 | Not included |
| **Cognitive** | Bayley Cognitive Composite <85 | Bayley Cognitive Composite <70 | Bayley Cognitive Composite <55 |
| **Language** | Bayley Language Composite <85 | Bayley Language Composite <70 | Bayley Language Composite <55 |
| **Hearing** | Sensorineural/mixed hearing loss | Sensorineural/mixed hearing loss requiring a hearing aid or cochlear implant | Not included |
| **Vision** | Uni- or bilateral visual impairment | Bilateral visual impairment | Bilateral visual impairment |

**CP:** cerebral palsy defined as per Rosenbaum *et al.* Dev Med Child Neurol suppl 2007;109:8-14: "*group of disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain."*

**Bayley:** Bayley Scales of Infant and Toddler Development – 3rd or 4th edition. The Bayley scales reflect what the child was able to do during the assessment. Results can be influenced by child collaboration and behavior. The Bayley scales are not meant to predict future cognitive, language or motor functioning.

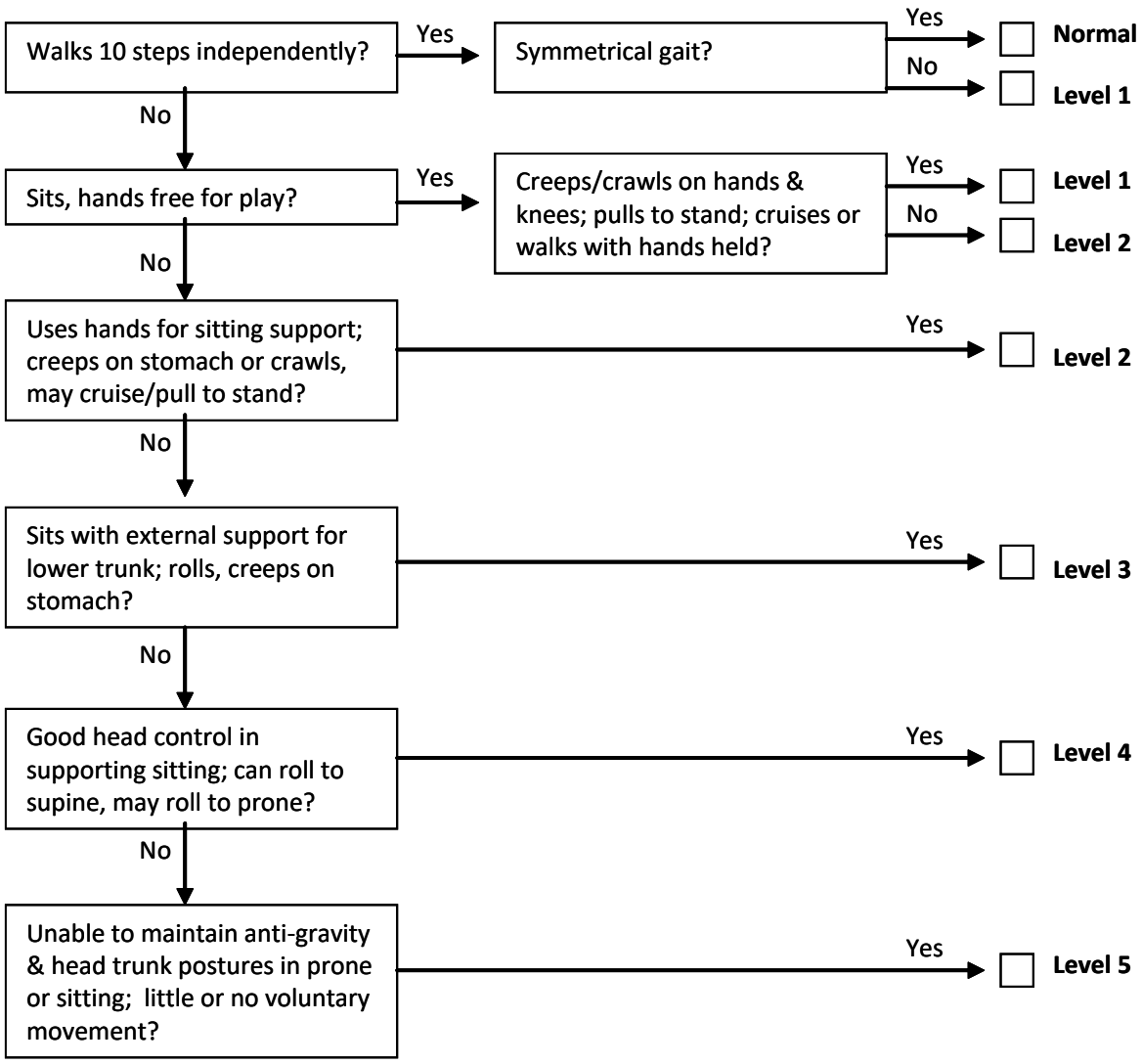
**Hearing status**: determined from audiology reports.

**Visual impairment:** determined from ophthalmology consult if available and defined as report of ROP stage 3 (with macular drag or macular traction), 4 or 5; visual acuity of 20/70 or worse in best eye. If no report is available, impairment is defined as a small, scarred eye or sustained sensory nystagmus or lack of response to a 1 cm object (cheerio) on a white background at 30 cm.

*Children are also included in this category if they could not be tested using the Bayley and obtained a Bayley Adaptive Behavior *score <85; **score <70 or were considered to have a significant developmental delay which did not allow completion of the Bayley.

***Severe NDI: using definition of severe neurodevelopmental disability by Cheong *et al.* JAMA Pediatr 2021;175(10):1035-1042. Children are also included in this category if they could not be tested using the Bayley and obtained a Bayley Adaptive Behavior score <55 or were considered to have a developmental delay which did not allow completion of the Bayley.

## Gross Motor Function Classification System (GMFCS)




The algorithm is based on Palisano[1].

1) Palisano R, Rosenbaum P, Walter S et al. Development and reliability of a system to classify gross motor function in children with cerebral palsy. Dev Med Child Neurol 1997; 39:214-223

# D. Descriptive Analyses

**Presentation No 4: Survival and 18–24-month assessments among all CNN sites**

| **Year of birth** | **NICU admission** (n) | **Moribund or with major congenital anomalies** n (%) | **NICU death** n (%) | **NICU survivors#** n (%) | **Death after NICU** n (%) | **Linked CNN-CNFUN data for NICU survivors** n (%) | **Known outcome** for NICU deaths and survivors** n (%) |
|---|---|---|---|---|---|---|---|
| 2009* | 1227 | 108 (8.8) | 214 (17.4) | 905 (73.8) | 6 (0.5) | 678 (74.9) | 898 (80.3) |
| 2010 | 1655 | 34 (2.1) | 252 (15.2) | 1369 (82.7) | 14 (0.8) | 1065 (77.8) | 1331 (82.1) |
| 2011 | 1579 | 53 (3.4) | 263 (16.7) | 1263 (80) | 5 (0.3) | 899 (71.2) | 1167 (76.5) |
| 2012 | 1653 | 56 (3.4) | 256 (15.5) | 1341 (81.1) | 1 (0.1) | 700 (52.2) | 957 (59.9) |
| 2013 | 1698 | 60 (3.5) | 261 (15.4) | 1377 (81.1) | 3 (0.2) | 666 (48.4) | 930 (56.8) |
| 2014 | 1675 | 73 (4.4) | 238 (14.2) | 1364 (81.4) | 1 (0.1) | 683 (50.1) | 922 (57.6) |
| 2015 | 1615 | 91 (5.6) | 206 (12.8) | 1318 (81.6) | 1 (0.1) | 744 (56.4) | 951 (62.4) |
| 2016 | 1740 | 105 (6) | 227 (13) | 1408 (80.9) | 6 (0.3) | 764 (54.3) | 997 (61) |
| 2017 | 1696 | 84 (5) | 222 (13.1) | 1390 (82) | 4 (0.2) | 744 (53.5) | 970 (60.2) |
| 2018 | 1751 | 70 (4) | 256 (14.6) | 1425 (81.4) | 3 (0.2) | 749 (52.6) | 1008 (60) |
| 2019 | 1664 | 47 (2.8) | 244 (14.7) | 1373 (82.5) | 2 (0.1) | 702 (51.1) | 948 (58.6) |
| 2009-2019 | 17953 | 781 (4.4) | 2639 (14.7) | 14533 (81) | 46 (0.3) | 8394 (57.8) | 11079 (64.5) |

*April 1, 2009 to December 31, 2009.

**Children with known long-term outcomes (death or neurodevelopmental outcomes as per CNFUN definition) at 18-24 months corrected age. Of note, 570 children (6.8%) were seen between 24-36 months corrected age during the COVID pandemic after March 2020.

#Newborns admitted to NICUs who were moribund or had major congenital anomalies are excluded.

**COMMENTS:**

These results include participating and non-participating CNFUN sites. Partial funding by the CIHR team in MiCare for data collection and abstraction was provided for the April 1, 2009 – September 30, 2011 birth cohort (Epoch 1). Data collection and participation dropped significantly with no or limited funding (Epoch 2: Oct 2011-December 2019).

## Presentation 5a: Survival and 18–24-month assessments among all CNN sites by gestational age

| **Gestational age** (weeks) | **NICU admission** (n) | **Moribund or with major congenital anomalies** n (%) | **NICU death** n (%) | **NICU survivors#** n (%) | **Death after NICU** n (%) | **Linked CNN-CNFUN data for NICU survivors** n (%) | **Known outcome* for NICU deaths and survivors** n (%) |
|---|---|---|---|---|---|---|---|
| 22 | 222 | 88 (39.6) | 85 (38.3) | 49 (22.1) | 0 (0) | 27 (55.1) | 112 (83.6) |
| 23 | 1072 | 114 (10.6) | 494 (46.1) | 464 (43.3) | 4 (0.4) | 283 (61) | 781 (81.5) |
| 24 | 2168 | 108 (5) | 651 (30) | 1409 (65) | 8 (0.4) | 870 (61.7) | 1529 (74.2) |
| 25 | 2915 | 96 (3.3) | 551 (18.9) | 2268 (77.8) | 10 (0.3) | 1380 (60.8) | 1941 (68.9) |
| 26 | 3270 | 103 (3.1) | 379 (11.6) | 2788 (85.3) | 8 (0.2) | 1665 (59.7) | 2052 (64.8) |
| 27 | 3808 | 130 (3.4) | 271 (7.1) | 3407 (89.5) | 11 (0.3) | 1944 (57.1) | 2226 (60.5) |
| 28 | 4498 | 142 (3.2) | 208 (4.6) | 4148 (92.2) | 5 (0.1) | 2225 (53.6) | 2438 (56) |
| 22-28 | 17953 | 781 (4.4) | 2639 (14.7) | 14533 (81) | 46 (0.3) | 8394 (57.8) | 11079 (64.5) |

* Children with known long-term outcomes (death or neurodevelopmental outcomes as per CNFUN definition) at 18-24 months corrected age.
#Newborns admitted moribund or with major congenital anomalies are excluded.

## Presentation 5b: Survival and 18–24-month assessments among all CNN sites by birth weight for neonates <29 weeks' gestation

| **Birth Weight** (grams) | **NICU admission** (n) | **Moribund or with major congenital anomalies** n (%) | **NICU death** n (%) | **NICU survivors#** n (%) | **Death after NICU** n (%) | **Linked CNN-CNFUN data for NICU survivors** n (%) | **Known outcome* for NICU deaths and survivors** n (%) |
|---|---|---|---|---|---|---|---|
| < 500 | 484 | 100 (20.7) | 211 (43.6) | 173 (35.7) | 2 (0.4) | 108 (62.4) | 321 (83.6) |
| 500-749 | 4670 | 269 (5.8) | 1312 (28.1) | 3089 (66.1) | 18 (0.4) | 1912 (61.9) | 3242 (73.7) |
| 750-999 | 6337 | 230 (3.6) | 756 (11.9) | 5351 (84.4) | 17 (0.3) | 3226 (60.3) | 3999 (65.5) |
| 1000-1249 | 4740 | 130 (2.7) | 276 (5.8) | 4334 (91.4) | 9 (0.2) | 2389 (55.1) | 2674 (58) |
| > 1250 | 1703 | 43 (2.5) | 80 (4.7) | 1580 (92.8) | 0 (0) | 755 (47.8) | 835 (50.3) |
| All | 17934 | 772 (4.3) | 2635 (14.7) | 3407 (19) | 46 (0.3) | 8390 (246.3) | 11071 (64.5) |

* Children with known long-term outcomes (death or neurodevelopmental outcomes as per CNFUN definition) at 18-24 months corrected age.
#Newborns admitted moribund or with major congenital anomalies are excluded.

## Presentation No 6: Follow-up rates among active CNFUN sites

| Year of birth | NICU survivors at participating sites# (n) | CNFUN data** (n) | Follow-up rate for participating CNFUN sites n (%) |
|---|---|---|---|
| 2009* | 905 | 866 | 678 (74.9) |
| 2010 | 1369 | 1311 | 1065 (77.8) |
| 2011 | 1263 | 1114 | 899 (71.2) |
| 2012 | 932 | 852 | 700 (75.1) |
| 2013 | 974 | 811 | 666 (68.4) |
| 2014 | 953 | 836 | 683 (71.7) |
| 2015 | 920 | 854 | 744 (80.9) |
| 2016 | 1210 | 941 | 764 (63.1) |
| 2017 | 1173 | 949 | 744 (63.4) |
| 2018 | 1266 | 932 | 749 (59.2) |
| 2019 | 1248 | 838 | 702 (56.3) |
| 2009-2019 | 12213 | 10304 | 8394 (68.7) |

*April 1, 2009 to December 31, 2009.
**Not all CNFUN patients can be linked to CNN.
#For 2012-2015, participating sites include Victoria General Hospital, BC Women's Hospital & Health Centre, Alberta Children's Hospital & Foothills Hospital, University of Calgary, University of Manitoba Health Sciences Centre/ Children's Hospital, St. Boniface General Hospital, Windsor Regional Hospital, St. Joseph's Health Care London, Mount Sinai Hospital, Sunnybrook Health Sciences Center, Hôpital Sainte-Justine, Jewish General Hospital, Montreal Children's Hospital, Centre Hospitalier Universitaire de Sherbrooke, Centre Hospitalier de l'Université Laval, IWK Health Centre and Cape Breton Regional Hospital. In 2016, Edmonton, Hamilton Health Sciences Centre, Kingston General Hospital and Hôpital Maisonneuve Rosemont were also participating sites. Since 2017, Royal Columbian Hospital and Surrey Memorial Hospital are also participating sites. No additional sites were added in 2018 and 2019.

**COMMENTS:**

Analyses using the Epoch 1 cohort are more reliable than the Epoch 2 cohort due to larger attrition bias in the later period.

## Presentation 7: Follow-up rates among CNFUN sites by gestational age

| **Gestational age** (weeks) | **All NICU survivors** n | **NICU survivors at participating sites#** (n) | **CNFUN data** (n) | **Linked* CNN-CNFUN data for NICU survivors** n (%) | **Follow-up rate for participating CNFUN sites^** n (%) |
|---|---|---|---|---|---|
| 22 | 49 | 40 | 46 | 27 (55.1) | 27 (67.5) |
| 23 | 464 | 394 | 341 | 283 (61) | 283 (71.8) |
| 24 | 1409 | 1181 | 1072 | 870 (61.7) | 867 (73.4) |
| 25 | 2268 | 1921 | 1584 | 1380 (60.8) | 1370 (71.3) |
| 26 | 2788 | 2350 | 1979 | 1665 (59.7) | 1647 (70.1) |
| 27 | 3407 | 2847 | 2417 | 1944 (57.1) | 1935 (68) |
| 28 | 4148 | 3480 | 2815 | 2225 (53.6) | 2218 (63.7) |
| 22-28 | 14533 | 12213 | 10254 | 8394 (57.8) | 8347 (68.3) |

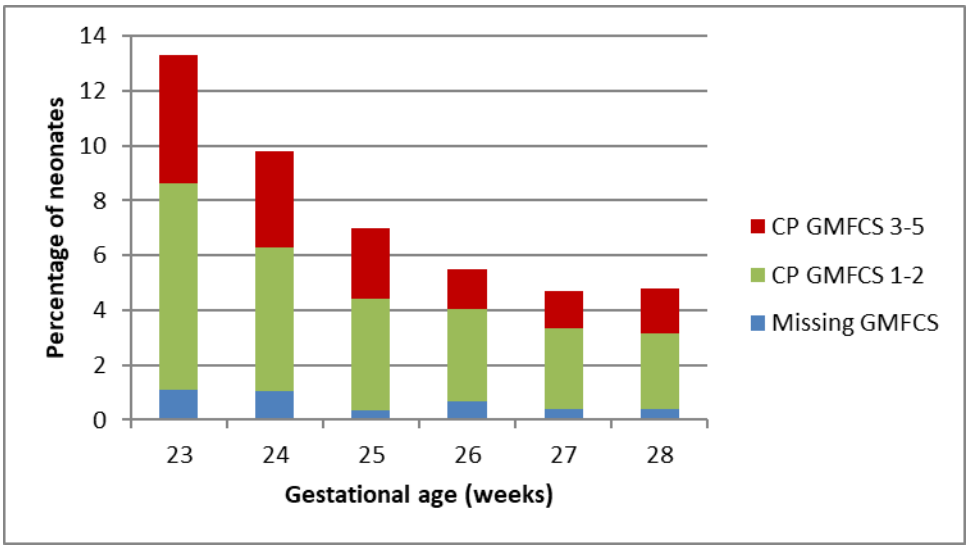
*Reasons for the non-linked babies: no CNN patient ID or cannot be linked with CNN data.

^ Denominator is NICU survivors (referred for follow up at CNFUN sites)

# E. Gestational Age Based Outcomes

## Presentation No 8: Cerebral palsy rates by gestational age

| GA | CNN-CNFUN linked cases (n) | CNN-CNFUN linked cases with CP data (n) | Definitive CP n (%) | Missing CP GMFCS n (%) | CP with GMFCS 1-2 n (%) | CP with GMFCS 3-5 n (%) | Suspected CP n (%) |
|---|---|---|---|---|---|---|---|
| 22 wks | 27 | 27 | 2 (7.4) | 0 (0) | 1 (50) | 1 (50) | 0 (0) |
| 23 wks | 283 | 279 | 37 (13.3) | 3 (8.1) | 21 (56.8) | 13 (35.1) | 14 (5) |
| 24 wks | 870 | 854 | 84 (9.8) | 9 (10.7) | 45 (53.6) | 30 (35.7) | 48 (5.6) |
| 25 wks | 1380 | 1369 | 95 (6.9) | 5 (5.3) | 55 (57.9) | 35 (36.8) | 51 (3.7) |
| 26 wks | 1665 | 1631 | 90 (5.5) | 11 (12.2) | 55 (61.1) | 24 (26.7) | 54 (3.3) |
| 27 wks | 1944 | 1913 | 92 (4.8) | 8 (8.7) | 57 (62) | 27 (29.3) | 60 (3.1) |
| 28 wks | 2225 | 2186 | 104 (4.8) | 9 (8.7) | 59 (56.7) | 36 (34.6) | 45 (2.1) |
| Total | 8394 | 8259 | 504 (6.1) | 45 (8.9) | 293 (58.1) | 166 (32.9) | 272 (3.3) |

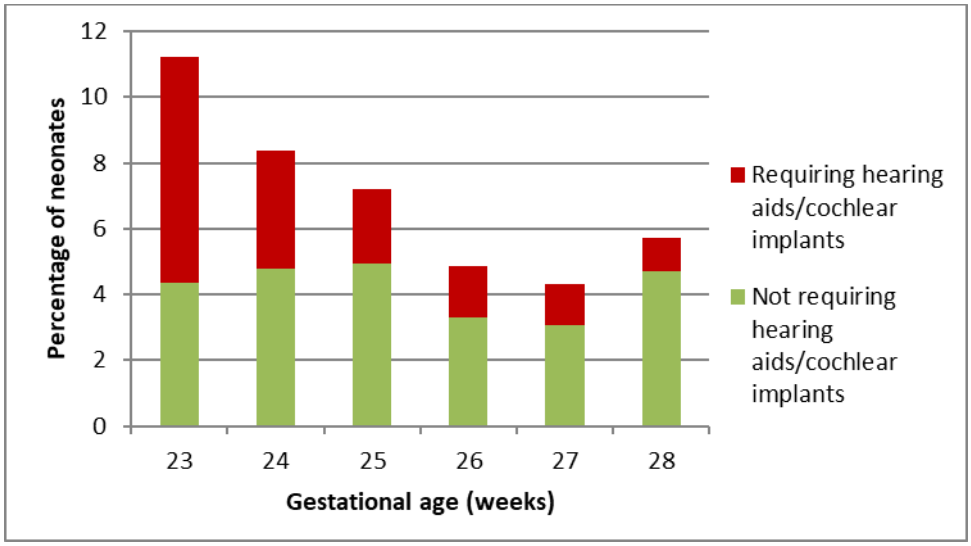



**COMMENTS:**

Rates for cerebral palsy (CP) with GMFCS 1-2 are calculated by subtracting number of children with CP with GMFCS 3-4-5 from definitive CP cases. CP rates decrease with increasing gestational age. Due to small numbers, 22 weeks' gestation was not included in the bar graph. (GMFCS: Gross Motor Function Classification System).

**Presentation No 9: Hearing status by gestational age**

| GA | CNN-CNFUN linked cases (n) | CNN-CNFUN linked cases with data for hearing (n) | Normal hearing n (%) | Hearing loss not requiring hearing aids/cochlear implants n (%) | Requiring hearing aids / cochlear implants n (%) |
|---|---|---|---|---|---|
| 22 wks | 27 | 26 | 26 (100) | 0 (0) | 0 (0) |
| 23 wks | 283 | 276 | 245 (88.8) | 12 (4.3) | 19 (6.9) |
| 24 wks | 870 | 858 | 786 (91.6) | 41 (4.8) | 31 (3.6) |
| 25 wks | 1380 | 1359 | 1261 (92.8) | 67 (4.9) | 31 (2.3) |
| 26 wks | 1665 | 1629 | 1550 (95.2) | 54 (3.3) | 25 (1.5) |
| 27 wks | 1944 | 1919 | 1836 (95.7) | 59 (3.1) | 24 (1.3) |
| 28 wks | 2225 | 2190 | 2065 (94.3) | 103 (4.7) | 22 (1) |
| Total | 8394 | 8257 | 7769 (94.1) | 336 (4.1) | 152 (1.8) |

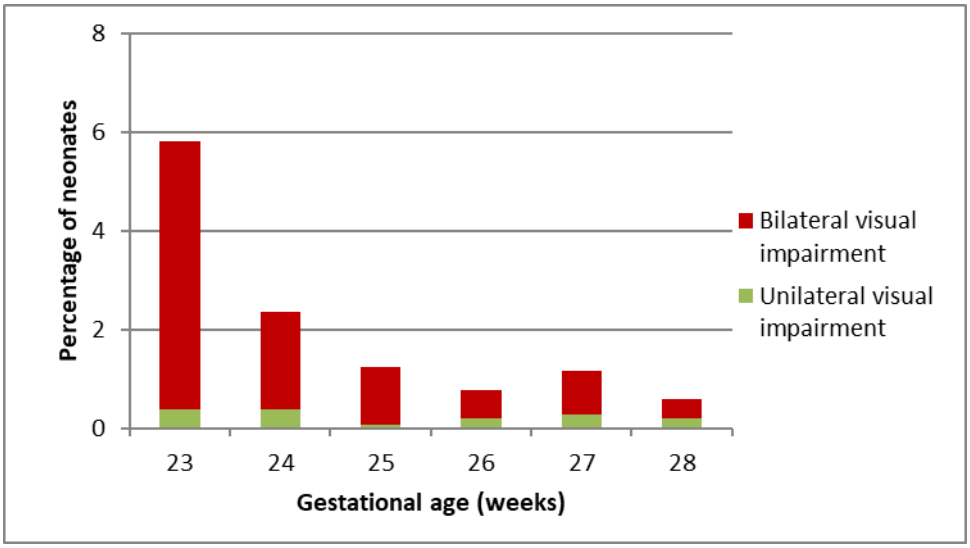



**COMMENTS:**

Hearing loss was determined at CNFUN sites based on audiology reports. Hearing loss is infrequent but approximately 10 times as frequent in the very preterm infant than in the general population. Rates of hearing loss requiring hearing aids or cochlear implants decrease with increasing gestational age. Due to small numbers, 22 weeks' gestation was not included in the bar graph.

**Presentation No 10: Visual function by gestational age**

| GA | CNN-CNFUN linked cases (n) | CNN-CNFUN linked cases with data for vision (n) | Normal vision n (%) | Unilateral visual impairment n (%) | Bilateral visual impairment n (%) |
|---|---|---|---|---|---|
| 22 wks | 27 | 26 | 23 (88.5) | 1 (3.8) | 2 (7.7) |
| 23 wks | 283 | 258 | 243 (94.2) | 1 (0.4) | 14 (5.4) |
| 24 wks | 870 | 804 | 785 (97.6) | 3 (0.4) | 16 (2) |
| 25 wks | 1380 | 1293 | 1277 (98.8) | 1 (0.1) | 15 (1.2) |
| 26 wks | 1665 | 1549 | 1537 (99.2) | 3 (0.2) | 9 (0.6) |
| 27 wks | 1944 | 1821 | 1800 (98.8) | 5 (0.3) | 16 (0.9) |
| 28 wks | 2225 | 2086 | 2074 (99.4) | 4 (0.2) | 8 (0.4) |
| Total | 8394 | 7837 | 7739 (98.7) | 18 (0.2) | 80 (1) |

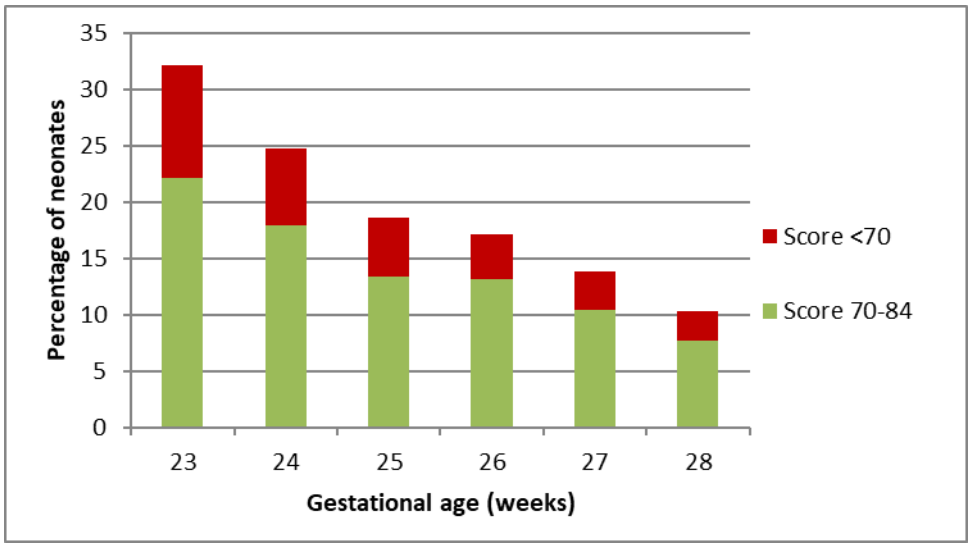



**COMMENTS:**

Visual impairment was determined from ophthalmology reports. If no report was available, impairment was defined as a small, scarred eye, sustained sensory nystagmus or lack of response to a 1cm object (cheerio) on a white background at 30cm. Visual impairment is an infrequent outcome. Bilateral visual impairment rates decrease with increasing gestational age. Due to small numbers, 22 weeks' gestation was not included in the bar graph.

## Presentation No 11: Bayley Cognitive Composite scores by gestational age

| GA | CNN-CNFUN linked cases (n) | CNN-CNFUN linked cases with cognitive data (n) | Median score (IQR) | Bayley≥85 n (%) | Score 70-84 n (%) | Score <70 n (%) |
|---|---|---|---|---|---|---|
| 22 wks | 27 | 23 | 85 (75, 100) | 13 (56.5) | 8 (34.8) | 2 (8.7) |
| 23 wks | 283 | 230 | 90 (80, 100) | 156 (67.8) | 51 (22.2) | 23 (10) |
| 24 wks | 870 | 746 | 90 (85, 100) | 561 (75.2) | 134 (18) | 51 (6.8) |
| 25 wks | 1380 | 1239 | 95 (85, 105) | 1008 (81.4) | 166 (13.4) | 65 (5.2) |
| 26 wks | 1665 | 1460 | 95 (85, 105) | 1209 (82.8) | 192 (13.2) | 59 (4) |
| 27 wks | 1944 | 1741 | 95 (90, 105) | 1500 (86.2) | 181 (10.4) | 60 (3.4) |
| 28 wks | 2225 | 1977 | 100 (90, 105) | 1774 (89.7) | 153 (7.7) | 50 (2.5) |
| Total | 8394 | 7416 | 95 (90, 105) | 6221 (83.9) | 885 (11.9) | 310 (4.2) |

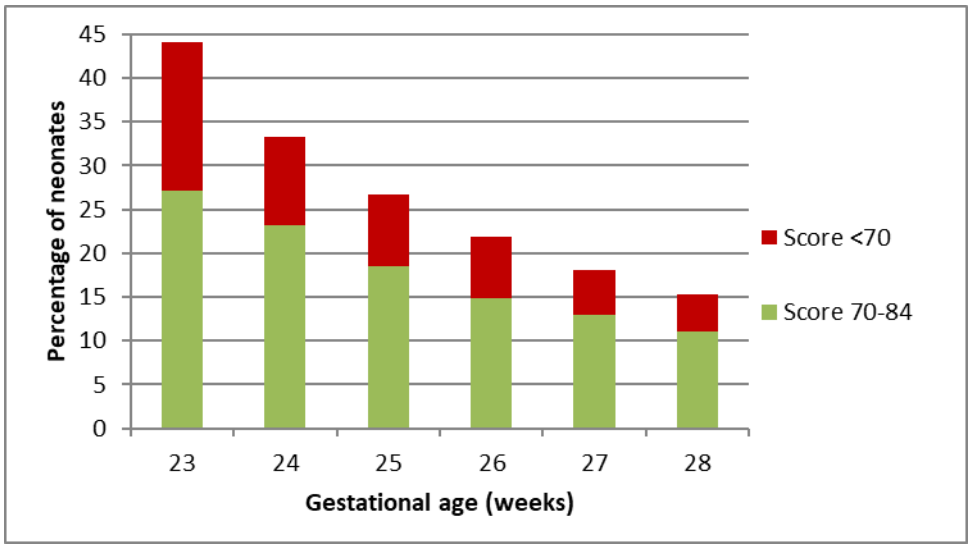



**COMMENTS:**

Cognitive scores on the Bayley Scales of Infant and Toddler Development – 3rd or 4th edition (Bayley) improve with increasing gestational age and are skewed in this population. The Bayley scales have a mean score of 100 and standard deviation of 15 (less than 70 is therefore < -2 standard deviations). Bayley scores tend to underestimate developmental delay and have limited predictive ability. Due to small numbers, 22 weeks' gestation was not included in the bar graph.

## Presentation No 12: Bayley Motor Composite scores by gestational age

| GA | CNN-CNFUN linked cases (n) | CNN-CNFUN linked cases with motor data (n) | Median score (IQR) | Bayley≥85 n (%) | Score 70-84 n (%) | Score <70 n (%) |
|---|---|---|---|---|---|---|
| 22 wks | 27 | 23 | 79 (70, 88) | 7 (30.4) | 11 (47.8) | 5 (21.7) |
| 23 wks | 283 | 218 | 87 (73, 97) | 122 (56) | 59 (27.1) | 37 (17) |
| 24 wks | 870 | 711 | 91 (79, 97) | 474 (66.7) | 165 (23.2) | 72 (10.1) |
| 25 wks | 1380 | 1183 | 94 (82, 100) | 867 (73.3) | 219 (18.5) | 97 (8.2) |
| 26 wks | 1665 | 1383 | 94 (85, 100) | 1080 (78.1) | 205 (14.8) | 98 (7.1) |
| 27 wks | 1944 | 1647 | 94 (88, 103) | 1351 (82) | 214 (13) | 82 (5) |
| 28 wks | 2225 | 1899 | 97 (88, 103) | 1608 (84.7) | 209 (11) | 82 (4.3) |
| Total | 8394 | 7064 | 94 (85, 100) | 5509 (78) | 1082 (15.3) | 473 (6.7) |

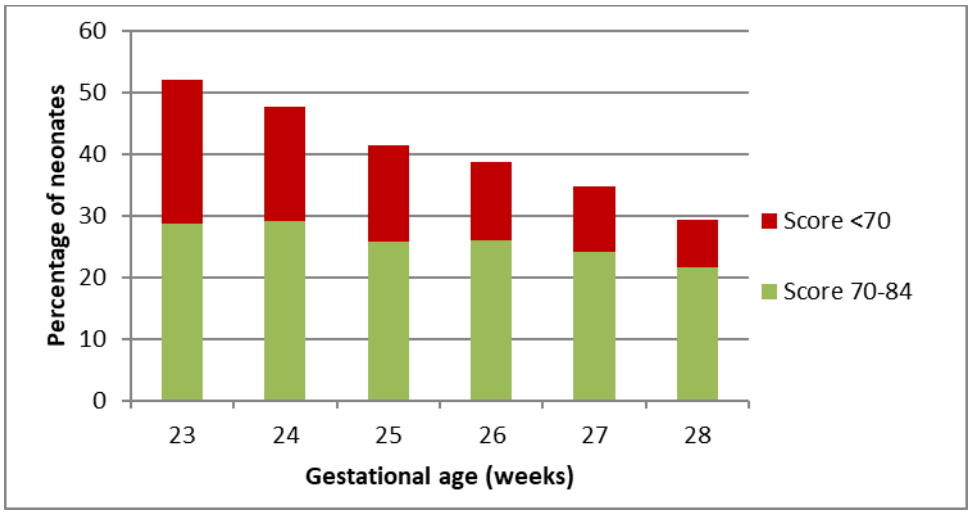



**COMMENTS:**

Motor scores on the Bayley Scales of Infant and Toddler Development – 3rd or 4th edition (Bayley) improve with increasing gestational age and are skewed in this population. The Bayley scales have a mean score of 100 and standard deviation of 15 (less than 70 is therefore < -2 standard deviations). Bayley scores tend to underestimate developmental delay and have limited predictive ability. Due to small numbers, 22 weeks' gestation was not included in the bar graph.

## Presentation No 13: Bayley Language Composite scores by gestational age

| GA | CNN-CNFUN linked cases (n) | CNN-CNFUN linked cases with language data (n) | Median score (IQR) | Bayley≥85 n (%) | Score 70-84 n (%) | Score <70 n (%) |
|---|---|---|---|---|---|---|
| 22 wks | 27 | 21 | 79 (68, 91) | 8 (38.1) | 7 (33.3) | 6 (28.6) |
| 23 wks | 283 | 217 | 83 (71, 94) | 104 (47.9) | 62 (28.6) | 51 (23.5) |
| 24 wks | 870 | 715 | 86 (74, 97) | 375 (52.4) | 207 (29) | 133 (18.6) |
| 25 wks | 1380 | 1186 | 89 (77, 100) | 696 (58.7) | 306 (25.8) | 184 (15.5) |
| 26 wks | 1665 | 1405 | 89 (77, 100) | 863 (61.4) | 364 (25.9) | 178 (12.7) |
| 27 wks | 1944 | 1660 | 91 (79, 100) | 1083 (65.2) | 400 (24.1) | 177 (10.7) |
| 28 wks | 2225 | 1881 | 91 (83, 103) | 1330 (70.7) | 408 (21.7) | 143 (7.6) |
| Total | 8394 | 7085 | 89 (77, 100) | 4459 (62.9) | 1754 (24.8) | 872 (12.3) |

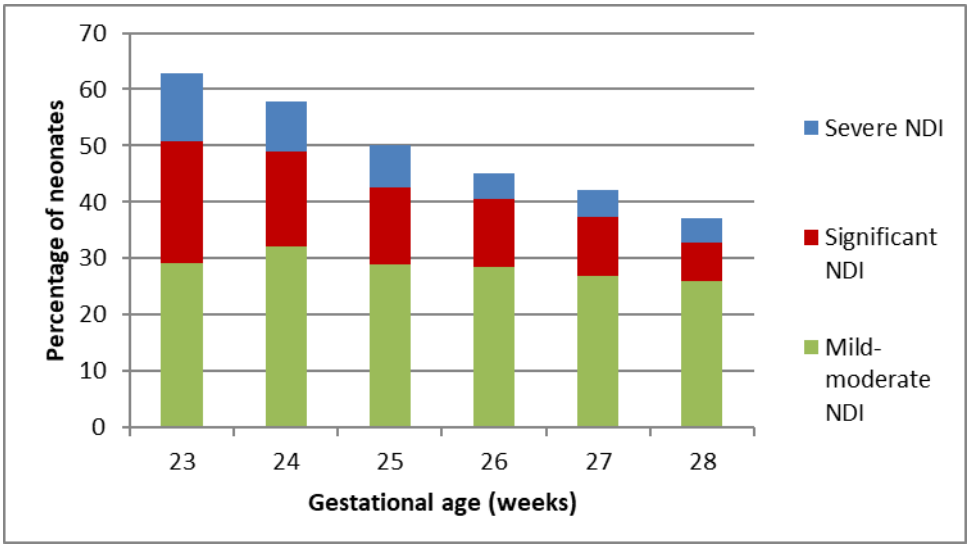



**COMMENTS:**

Language scores on the Bayley Scales of Infant and Toddler Development – 3rd or 4th edition (Bayley) improve with increasing gestational age and are skewed in this population. The Bayley scales have a mean score of 100 and standard deviation of 15 (less than 70 is therefore < -2 standard deviations). Bayley scores tend to underestimate developmental delay and have limited predictive ability. Due to small numbers, 22 weeks' gestation was not included in the bar graph.

## Presentation No 14: Neurodevelopmental outcomes by gestational age among survivors

| GA | CNN-CNFUN linked cases with complete data (n) | No NDI n (%) | Mild-moderate NDI n (%) | Significant NDI | |
|---|---|---|---|---|---|
| | | | | All n (%) | Severe only n (%) |
| 22 wks | 27 | 8 (29.6) | 8 (29.6) | 11 (40.7) | 5 (18.5) |
| 23 wks | 282 | 105 (37.2) | 82 (29.1) | 95 (33.7) | 34 (12.1) |
| 24 wks | 869 | 366 (42.1) | 280 (32.2) | 223 (25.7) | 78 (9) |
| 25 wks | 1371 | 685 (50) | 397 (29) | 289 (21.1) | 103 (7.5) |
| 26 wks | 1656 | 910 (55) | 473 (28.6) | 273 (16.5) | 75 (4.5) |
| 27 wks | 1928 | 1118 (58) | 518 (26.9) | 292 (15.1) | 89 (4.6) |
| 28 wks | 2208 | 1388 (62.9) | 571 (25.9) | 249 (11.3) | 94 (4.3) |
| Total | 8341 | 4580 (54.9) | 2329 (27.9) | 1432 (17.2) | 478 (5.7) |



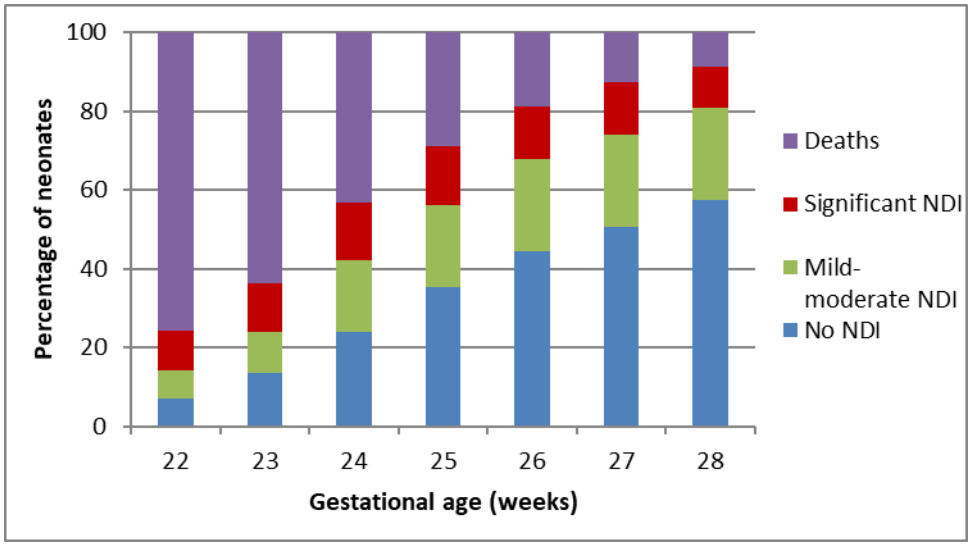

**COMMENTS:**

See page 18 for NDI definitions. Neurodevelopmental impairment rates decrease with increasing gestational age. Mild-moderate NDI includes children with any of the following: CP with GMFCS 1-2, Bayley motor, cognitive, language or adaptive behavior composite between 70-84, hearing loss not requiring hearing aids or cochlear implants, or unilateral visual impairment. Significant NDI includes children with any of the following: CP with GMFCS 3-4-5, Bayley motor, cognitive, language or adaptive behavior composite <70, hearing loss requiring

hearing aids or cochlear implants, or bilateral visual impairment. Severe NDI, a subcategory of significant NDI, includes children with any of the following: CP with GMFCS 4-5, Bayley cognitive, language or adaptive behavior composite <55, or bilateral visual impairment. Children considered to have a developmental delay which did not allow completion of the Bayley are also included in the significant and severe categories. Due to small numbers at 22 weeks gestation, results should be interpreted with caution, and 22 weeks was not included in the bar graph.

## Presentation No 15: Survival without neurodevelopmental impairment (NDI) rates by gestational age

| GA | CNN-CNFUN linked cases or deaths (n) | Survivors n (%) | No NDI n (%) | Any NDI n (%) | Significant NDI n (%) | Survival without any NDI n (%) | Survival without significant NDI n (%) |
|---|---|---|---|---|---|---|---|
| 22 wks | 112 | 27 (24.1) | 8 (7.1) | 19 (17) | 11 (9.8) | 8 (7.1) | 16 (14.3) |
| 23 wks | 781 | 283 (36.2) | 105 (13.4) | 178 (22.8) | 95 (12.2) | 105 (13.4) | 188 (24.1) |
| 24 wks | 1529 | 870 (56.9) | 366 (23.9) | 504 (33) | 223 (14.6) | 366 (23.9) | 647 (42.3) |
| 25 wks | 1941 | 1380 (71.1) | 690 (35.5) | 690 (35.5) | 289 (14.9) | 690 (35.5) | 1091 (56.2) |
| 26 wks | 2052 | 1665 (81.1) | 912 (44.4) | 753 (36.7) | 277 (13.5) | 912 (44.4) | 1388 (67.6) |
| 27 wks | 2226 | 1944 (87.3) | 1125 (50.5) | 819 (36.8) | 295 (13.3) | 1125 (50.5) | 1649 (74.1) |
| 28 wks | 2438 | 2225 (91.3) | 1398 (57.3) | 827 (33.9) | 250 (10.3) | 1398 (57.3) | 1975 (81) |
| Total | 11079 | 8394 (75.8) | 4604 (41.6) | 3790 (34.2) | 1440 (13) | 4604 (41.6) | 6954 (62.8) |




**COMMENTS:**

This figure shows outcome distribution for all CNN-CNFUN-linked cases including death. Death decreased with increasing gestational age. Survival without significant NDI increased with increasing gestational age.

## Presentation No 16: Hospitalization rates by gestational age

| GA | CNN-CNFUN linked cases (n) | Any hospital admission n (%) | One hospital admission n (%) | >1 hospital admission n (%) |
|---|---|---|---|---|
| 22 wks | 27 | 10 (37) | 5 (18.5) | 5 (18.5) |
| 23 wks | 283 | 132 (46.6) | 67 (23.7) | 64 (22.6) |
| 24 wks | 870 | 403 (46.3) | 227 (26.1) | 173 (19.9) |
| 25 wks | 1380 | 529 (38.3) | 300 (21.7) | 225 (16.3) |
| 26 wks | 1665 | 571 (34.3) | 301 (18.1) | 265 (15.9) |
| 27 wks | 1944 | 613 (31.5) | 378 (19.4) | 231 (11.9) |
| 28 wks | 2225 | 640 (28.8) | 408 (18.3) | 228 (10.2) |
| Total | 8394 | 2898 (34.5) | 1686 (20.1) | 1191 (14.2) |

**COMMENTS:**

About 30% of preterm infants in our cohort are re-admitted between discharge from the neonatal intensive care unit and the 18-24 month-visit. One out of 8 children is re-admitted more than one time. The main reasons for re-admission, which may be elective in nature (for example, planned surgery), are: 1. respiratory (infectious), 2. surgery, and 3. respiratory (non-infectious)

## Presentation No 17a: Use of aids at home from discharge to follow-up visit by gestational age

| GA | CNN-CNFUN linked cases (n) | Use of any aids at home* n (%) | Home supplemental O2 | Gavage feeding, gastrostomy or jejunostomy n (%) | Tracheostomy n (%) | Any mobility aid n (%) |
|---|---|---|---|---|---|---|
| 22 wks | 27 | 15 (55.6) | 9 (33.3) | 7 (25.9) | 0 (0) | 1 (3.7) |
| 23 wks | 283 | 138 (48.8) | 95 (33.6) | 63 (22.3) | 9 (3.2) | 30 (10.6) |
| 24 wks | 870 | 346 (39.8) | 242 (27.8) | 128 (14.7) | 13 (1.5) | 55 (6.3) |
| 25 wks | 1380 | 408 (29.6) | 276 (20) | 140 (10.1) | 20 (1.4) | 63 (4.6) |
| 26 wks | 1665 | 378 (22.7) | 224 (13.5) | 129 (7.7) | 12 (0.7) | 80 (4.8) |
| 27 wks | 1944 | 351 (18.1) | 153 (7.9) | 125 (6.4) | 12 (0.6) | 115 (5.9) |
| 28 wks | 2225 | 335 (15.1) | 126 (5.7) | 127 (5.7) | 9 (0.4) | 100 (4.5) |
| Total | 8394 | 1971 (23.5) | 1125 (13.4) | 719 (8.6) | 75 (0.9) | 444 (5.3) |

*Aids at home include the use of any of the following items: supplemental O2; respiratory/CPAP; gavage feeding; gastrostomy or jejunostomy; ileostomy/colostomy; tracheostomy; apnea monitor; pulse oximeter; adapted wheelchair or stroller; braces, splints, or orthoses; and walker.

## Presentation No 17b: Aids at home still in use at the follow-up visit by gestational age

| GA | CNN-CNFUN linked cases (n) | Use of any aids at home* n (%) | Home supplemental O2 | Gavage feeding, gastrostomy or jejunostomy n (%) | Tracheostomy n (%) | Any mobility aid n (%) |
|---|---|---|---|---|---|---|
| 22 wks | 27 | 3 (11.1) | 1 (3.7) | 2 (7.4) | 0 (0) | 0 (0) |
| 23 wks | 283 | 49 (17.3) | 10 (3.5) | 28 (9.9) | 7 (2.5) | 25 (8.8) |
| 24 wks | 870 | 127 (14.6) | 36 (4.1) | 65 (7.5) | 9 (1) | 40 (4.6) |
| 25 wks | 1380 | 117 (8.5) | 26 (1.9) | 61 (4.4) | 16 (1.2) | 46 (3.3) |
| 26 wks | 1665 | 110 (6.6) | 26 (1.6) | 56 (3.4) | 8 (0.5) | 43 (2.6) |
| 27 wks | 1944 | 119 (6.1) | 8 (0.4) | 41 (2.1) | 7 (0.4) | 75 (3.9) |
| 28 wks | 2225 | 107 (4.8) | 12 (0.5) | 39 (1.8) | 3 (0.1) | 61 (2.7) |
| Total | 8394 | 632 (7.5) | 119 (1.4) | 292 (3.5) | 50 (0.6) | 290 (3.5) |

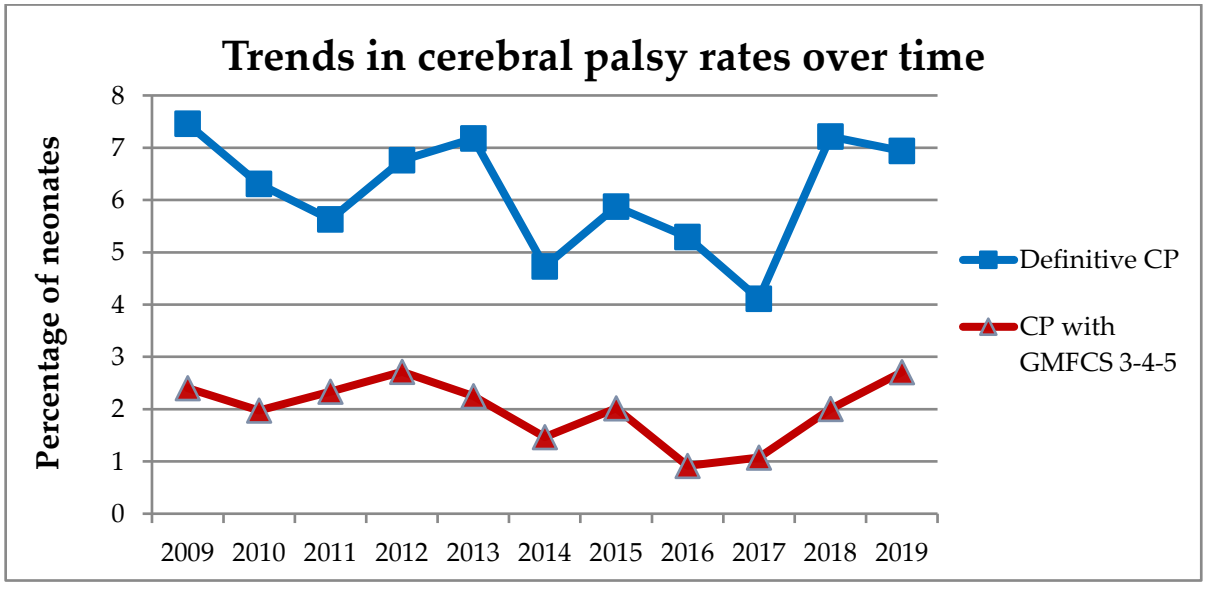
*Aids at home include the use of any of the following items: supplemental O2; respiratory/CPAP; gavage feeding; gastrostomy or jejunostomy; ileostomy/colostomy; tracheostomy; apnea monitor; pulse oximeter; adapted wheelchair or stroller; braces, splints, or orthoses; and walker. Almost one in 5 infants use aids at home after NICU discharge, but the majority are discontinued by 18-24 months of corrected age.

## F. Outcomes Over Time

**The data presented in this section have not been adjusted for confounding variables**. There is variability in attrition rates. Therefore, no statistical analyses for changes over time were conducted.

### Presentation No 18: Trends in cerebral palsy rates over time

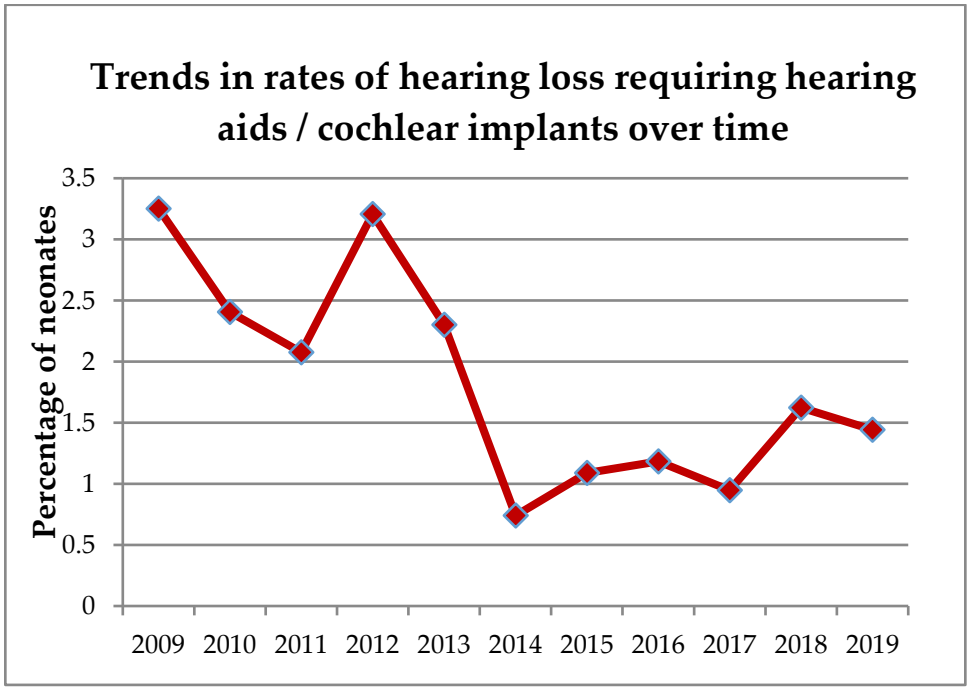
| Year of birth | CNFUN complete data (n) | Missing CP data (n) | No CP* n (%) | Suspected CP n (%) | Definitive CP n (%) | CP GMFCS 1-2 n (%) | CP GMFCS 3-5 n (%) |
|---|---|---|---|---|---|---|---|
| 2009 | 678 | 8 | 602 (88.8) | 19 (2.8) | 49 (7.2) | 25 (3.7) | 16 (2.4) |
| 2010 | 1065 | 19 | 935 (87.8) | 45 (4.2) | 66 (6.2) | 33 (3.1) | 21 (2) |
| 2011 | 899 | 28 | 794 (88.3) | 28 (3.1) | 49 (5.5) | 23 (2.6) | 21 (2.3) |
| 2012 | 700 | 5 | 621 (88.7) | 27 (3.9) | 47 (6.7) | 25 (3.6) | 19 (2.7) |
| 2013 | 666 | 11 | 589 (88.4) | 19 (2.9) | 47 (7.1) | 29 (4.4) | 15 (2.3) |
| 2014 | 683 | 6 | 626 (91.7) | 19 (2.8) | 32 (4.7) | 21 (3.1) | 10 (1.5) |
| 2015 | 744 | 12 | 667 (89.7) | 22 (3) | 43 (5.8) | 26 (3.5) | 15 (2) |
| 2016 | 764 | 8 | 696 (91.1) | 20 (2.6) | 40 (5.2) | 28 (3.7) | 7 (0.9) |
| 2017 | 744 | 14 | 672 (90.3) | 28 (3.8) | 30 (4) | 20 (2.7) | 8 (1.1) |
| 2018 | 749 | 14 | 656 (87.6) | 26 (3.5) | 53 (7.1) | 36 (4.8) | 15 (2) |
| 2019 | 702 | 10 | 625 (89) | 19 (2.7) | 48 (6.8) | 27 (3.8) | 19 (2.7) |
| 2009-2019 | 8394 | 135 | 7483 (89.1) | 272 (3.2) | 504 (6) | 293 (3.5) | 166 (2) |



**COMMENTS:** Cerebral palsy rates fell until 2017 births. In 2018, COVID-19 restrictions may have biased towards seeing more children with CP. Data are not adjusted for risk factors. The majority of cerebral palsy cases are with a GMFCS $\leq$2 (missing GMFCS data for 44/501 children).

## Presentation No 19: Trends in hearing status over time

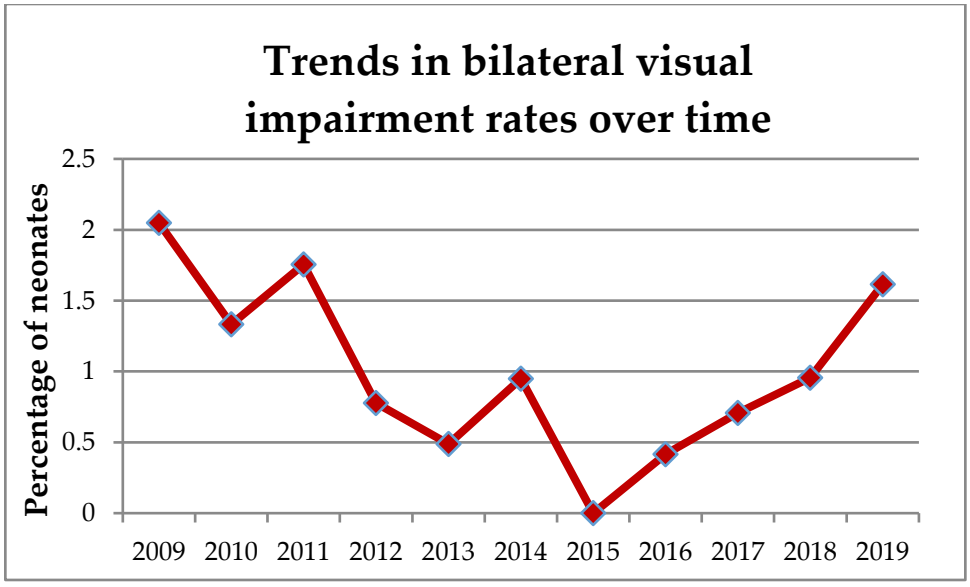
| Year of birth | CNFUN complete data (n) | Missing hearing data (n) | Normal hearing n (%) | Hearing loss requiring hearing aids/cochlear implants n (%) | Requiring hearing aids/ cochlear implants n (%) |
|---|---|---|---|---|---|
| 2009 | 678 | 10 | 612 (91.6) | 35 (5.2) | 21 (3.1) |
| 2010 | 1065 | 26 | 959 (92.3) | 55 (5.3) | 25 (2.4) |
| 2011 | 899 | 32 | 815 (94) | 34 (3.9) | 18 (2.1) |
| 2012 | 700 | 14 | 643 (93.7) | 21 (3.1) | 22 (3.2) |
| 2013 | 666 | 14 | 617 (94.6) | 20 (3.1) | 15 (2.3) |
| 2014 | 683 | 7 | 652 (96.4) | 19 (2.8) | 5 (0.7) |
| 2015 | 744 | 9 | 700 (95.2) | 27 (3.7) | 8 (1.1) |
| 2016 | 764 | 3 | 715 (94) | 37 (4.9) | 9 (1.2) |
| 2017 | 744 | 5 | 693 (93.8) | 39 (5.3) | 7 (0.9) |
| 2018 | 749 | 9 | 705 (95.3) | 23 (3.1) | 12 (1.6) |
| 2019 | 702 | 8 | 658 (94.8) | 26 (3.7) | 10 (1.4) |
| 2009-2019 | 8394 | 137 | 7769 (94.1) | 336 (4.1) | 152 (1.8) |



**COMMENTS:** There is a trend toward decreasing rates of hearing loss requiring hearing aid(s) or cochlear implant(s) over time. Higher attrition rates in the later years may impact the results.

**Presentation No 20: Trends in visual function over time**

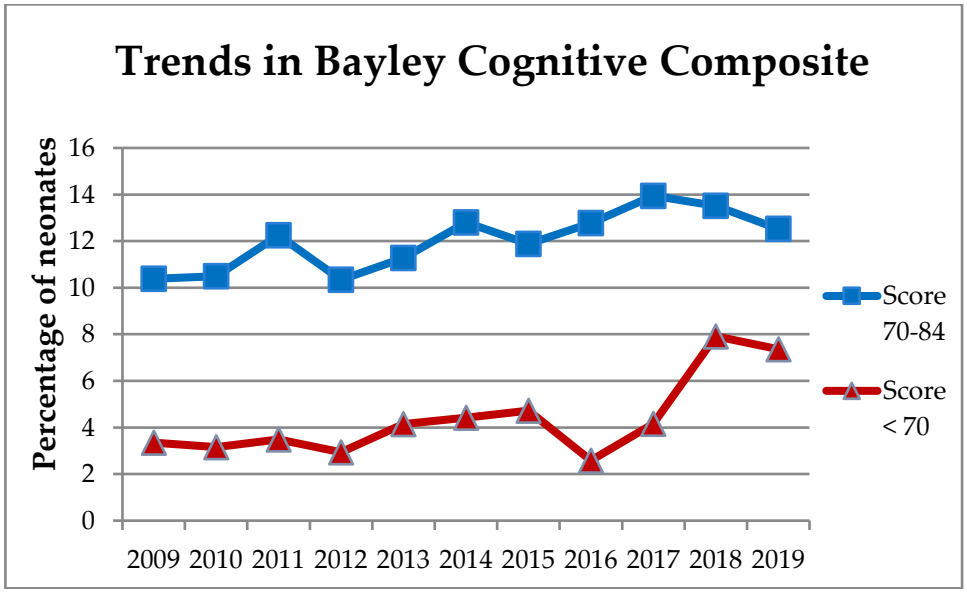
| Year of birth | CNFUN complete data (n) | Missing vision data (n) | Normal vision n (%) | Bilateral visual impairment n (%) |
|---|---|---|---|---|
| 2009 | 678 | 44 | 617 (97.3) | 13 (2.1) |
| 2010 | 1065 | 90 | 961 (98.6) | 13 (1.3) |
| 2011 | 899 | 101 | 783 (98.1) | 14 (1.7) |
| 2012 | 700 | 56 | 638 (99.1) | 5 (0.8) |
| 2013 | 666 | 52 | 611 (99.5) | <5 |
| 2014 | 683 | 50 | 626 (98.9) | 6 (1.0) |
| 2015 | 744 | 47 | 695 (99.7) | <5 |
| 2016 | 764 | 42 | 719 (99.6) | <5 |
| 2017 | 744 | 37 | 699 (98.9) | 5 (0.7) |
| 2018 | 749 | 17 | 724 (98.9) | 7 (1.0) |
| 2019 | 702 | 21 | 666 (97.8) | 11 (1.6) |
| 2009-2019 | 8394 | 557 | 7739 (98.8) | 79 (1.0) |




**COMMENTS:**
Visual impairment at 18-24 months corrected age is now a rare complication of prematurity. Higher attrition rates in the later years may impact the results.

## Presentation No 21: Trends in Bayley Cognitive Composite scores over time

| Year of birth | CNFUN complete data (n) | Missing Bayley cognitive score (n) | Median score (IQR) | Bayley≥85 n (%) | Score 70-84 n (%) | Score <70 n (%) |
|---|---|---|---|---|---|---|
| 2009 | 678 | 52 | 95 (90, 105) | 540 (86.3) | 65 (10.4) | 21 (3.4) |
| 2010 | 1065 | 83 | 95 (90, 105) | 848 (86.4) | 103 (10.5) | 31 (3.2) |
| 2011 | 899 | 66 | 95 (90, 105) | 702 (84.3) | 102 (12.2) | 29 (3.5) |
| 2012 | 700 | 52 | 95 (90, 105) | 562 (86.7) | 67 (10.3) | 19 (2.9) |
| 2013 | 666 | 63 | 95 (90, 105) | 510 (84.6) | 68 (11.3) | 25 (4.1) |
| 2014 | 683 | 50 | 95 (85, 105) | 524 (82.8) | 81 (12.8) | 28 (4.4) |
| 2015 | 744 | 45 | 95 (90, 105) | 583 (83.4) | 83 (11.9) | 33 (4.7) |
| 2016 | 764 | 67 | 95 (90, 105) | 590 (84.6) | 89 (12.8) | 18 (2.6) |
| 2017 | 744 | 70 | 95 (85, 105) | 552 (81.9) | 94 (13.9) | 28 (4.2) |
| 2018 | 749 | 231 | 95 (85, 105) | 407 (78.6) | 70 (13.5) | 41 (7.9) |
| 2019 | 702 | 199 | 95 (85, 105) | 403 (80.1) | 63 (12.5) | 37 (7.4) |
| 2009-2019 | 8394 | 978 | 95 (90, 105) | 6221 (83.9) | 885 (11.9) | 310 (4.2) |

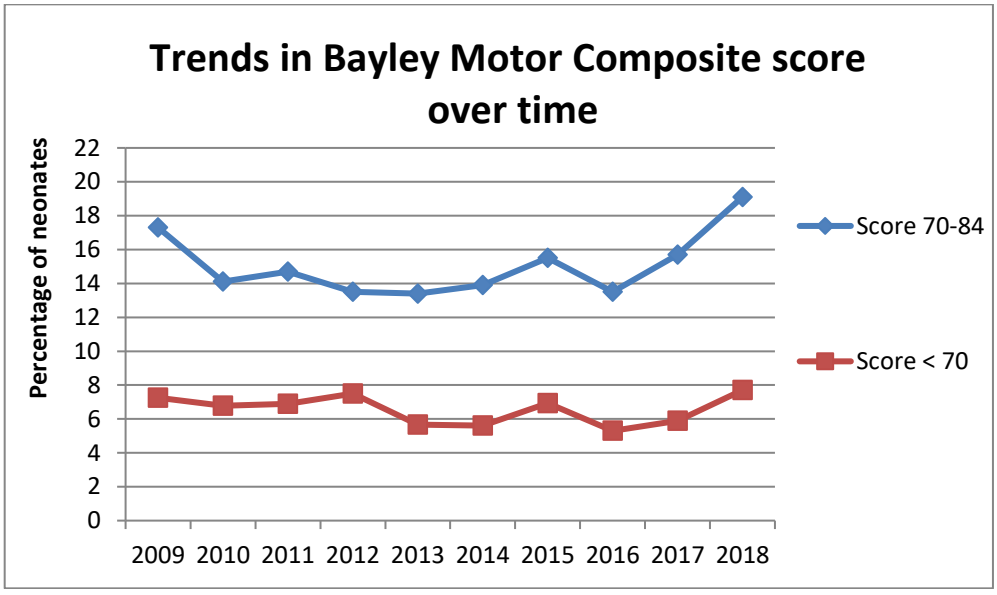



**COMMENTS:**

Rates of cognitive scores <70 or between 70-84 have not changed appreciably. Higher attrition rates in the later years may impact the results.

**Presentation No 22: Trends in Bayley Motor Composite scores over time**

| Year of birth | CNFUN complete data (n) | Missing Bayley motor score (n) | Median score (IQR) | Bayley≥85 n (%) | Score 70-84 n (%) | Score <70 n (%) |
|---|---|---|---|---|---|---|
| 2009 | 678 | 82 | 94 (85, 100) | 452 (75.8) | 102 (17.1) | 42 (7) |
| 2010 | 1065 | 126 | 94 (85, 100) | 744 (79.2) | 133 (14.2) | 62 (6.6) |
| 2011 | 899 | 92 | 94 (85, 100) | 637 (78.9) | 115 (14.3) | 55 (6.8) |
| 2012 | 700 | 67 | 94 (85, 100) | 500 (79) | 86 (13.6) | 47 (7.4) |
| 2013 | 666 | 95 | 94 (85, 100) | 458 (80.2) | 80 (14) | 33 (5.8) |
| 2014 | 683 | 83 | 94 (88, 100) | 482 (80.3) | 85 (14.2) | 33 (5.5) |
| 2015 | 744 | 83 | 94 (85, 103) | 514 (77.8) | 101 (15.3) | 46 (7) |
| 2016 | 764 | 102 | 94 (88, 103) | 538 (81.3) | 90 (13.6) | 34 (5.1) |
| 2017 | 744 | 108 | 94 (85, 100) | 493 (77.5) | 104 (16.4) | 39 (6.1) |
| 2018 | 749 | 256 | 94 (82, 100) | 340 (69) | 108 (21.9) | 45 (9.1) |
| 2019 | 702 | 236 | 94 (85, 103) | 351 (75.3) | 78 (16.7) | 37 (7.9) |
| 2009-2019 | 8394 | 1330 | 94 (85, 100) | 5509 (78) | 1082 (15.3) | 473 (6.7) |

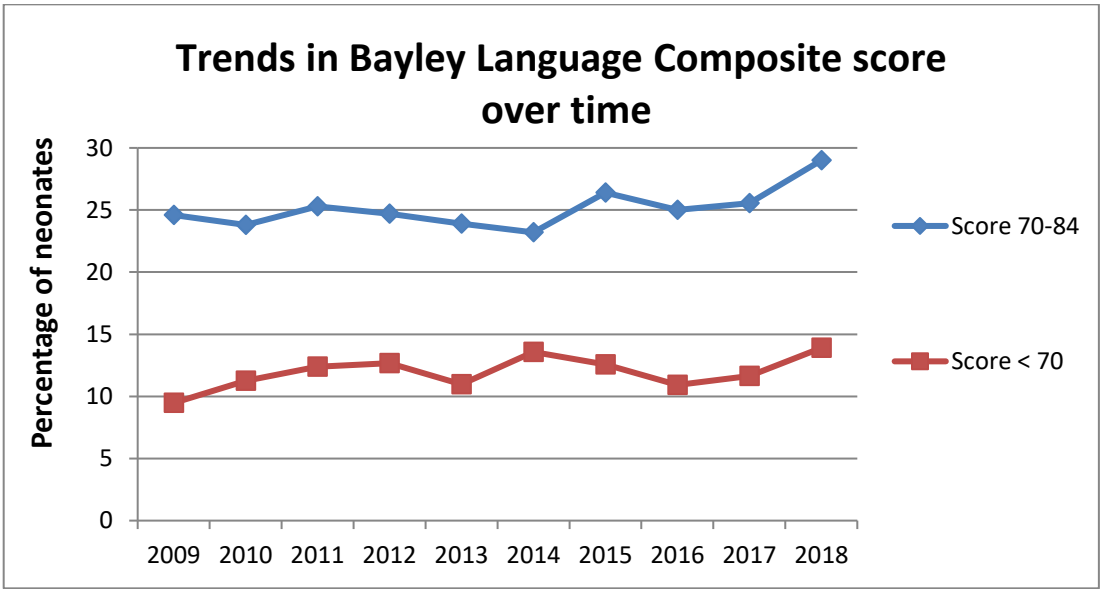



**COMMENTS:**

Rates of motor scores <70 or between 70-84 have not changed appreciably. Higher attrition rates in the later years may impact the results.

**Presentation No 23: Trends in Bayley Language Composite scores over time**

| **Year of birth** | **CNFUN complete data** (n) | **Missing Bayley language score** n (%) | **Median score** (IQR) | **Bayley ≥85** n (%) | **Score 70-84** n (%) | **Score <70** n (%) |
|---|---|---|---|---|---|---|
| 2009 | 678 | 81 | 91 (79, 100) | 395 (66.2) | 146 (24.5) | 56 (9.4) |
| 2010 | 1065 | 112 | 89 (79, 100) | 622 (65.3) | 227 (23.8) | 104 (10.9) |
| 2011 | 899 | 87 | 91 (79, 100) | 514 (63.3) | 202 (24.9) | 96 (11.8) |
| 2012 | 700 | 63 | 90 (79, 100) | 401 (63) | 156 (24.5) | 80 (12.6) |
| 2013 | 666 | 108 | 91 (79, 100) | 362 (64.9) | 134 (24) | 62 (11.1) |
| 2014 | 683 | 84 | 89 (77, 100) | 379 (63.3) | 138 (23) | 82 (13.7) |
| 2015 | 744 | 77 | 89 (77, 97) | 407 (61) | 173 (25.9) | 87 (13) |
| 2016 | 764 | 104 | 89 (79, 100) | 430 (65.2) | 161 (24.4) | 69 (10.5) |
| 2017 | 744 | 116 | 89 (77, 100) | 390 (62.1) | 163 (26) | 75 (11.9) |
| 2018 | 749 | 260 | 89 (77, 99) | 269 (55) | 137 (28) | 83 (17) |
| 2019 | 702 | 217 | 89 (74, 103) | 290 (59.8) | 117 (24.1) | 78 (16.1) |
| 2009-2019 | 8394 | 1309 | 89 (79, 100) | 4459 (62.9) | 1754 (24.8) | 872 (12.3) |




**COMMENTS:**

Rates of language scores <70 or between 70-84 have not changed appreciably. Higher attrition rates in the later years may impact the results.

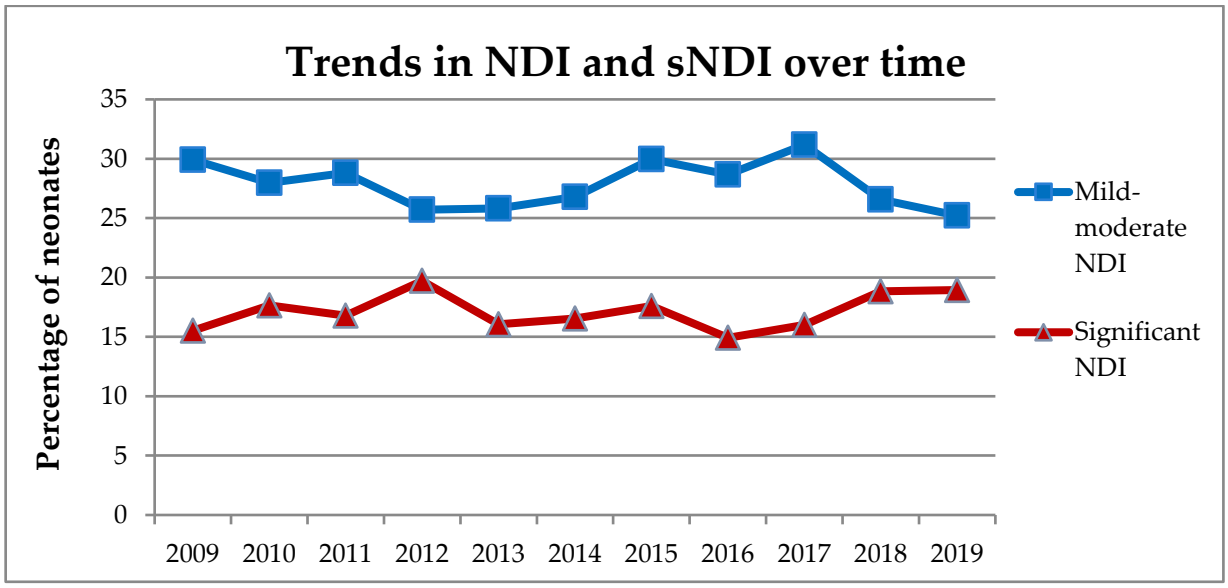
## Presentation No 24: Trends in neurodevelopmental outcomes over time

| Year of birth | CNFUN complete data (n) | Missing data (n) | No NDI n (%) | Mild-moderate NDI n (%) | Significant NDI# | |
|---|---|---|---|---|---|---|
| | | | | | All n (%) | Severe only* n (%) |
| 2009 | 678 | 0 | 365 (53.8) | 208 (30.7) | 105 (15.5) | 36 (5.3) |
| 2010 | 1065 | 0 | 579 (54.4) | 298 (28) | 188 (17.7) | 68 (6.4) |
| 2011 | 899 | 0 | 489 (54.4) | 259 (28.8) | 151 (16.8) | 42 (4.7) |
| 2012 | 700 | 0 | 382 (54.6) | 180 (25.7) | 138 (19.7) | 42 (6) |
| 2013 | 666 | 0 | 387 (58.1) | 172 (25.8) | 107 (16.1) | 36 (5.4) |
| 2014 | 683 | 0 | 387 (56.7) | 183 (26.8) | 113 (16.5) | 37 (5.4) |
| 2015 | 744 | 0 | 390 (52.4) | 223 (30) | 131 (17.6) | 42 (5.6) |
| 2016 | 764 | 0 | 431 (56.4) | 219 (28.7) | 114 (14.9) | 39 (5.1) |
| 2017 | 744 | 0 | 393 (52.8) | 232 (31.2) | 119 (16) | 39 (5.2) |
| 2018 | 749 | 0 | 409 (54.6) | 199 (26.6) | 141 (18.8) | 50 (6.7) |
| 2019 | 702 | 0 | 392 (55.8) | 177 (25.2) | 133 (18.9) | 50 (7.1) |
| 2009-2019 | 8394 | 0 | 4604 (54.8) | 2350 (28) | 1440 (17.2) | 481 (5.7) |

Refer to page 18 for NDI definitions

#Significant NDI includes children with any of the following: CP with GMFCS 3-4-5, Bayley motor, cognitive, language or adaptive behavior composite <70, hearing loss requiring hearing aids or cochlear implants, or bilateral visual impairment. Children considered to have a significant developmental delay which did not allow completion of the Bayley are also included.

*Severe NDI, a sub-category of significant NDI, includes children with any of the following: CP with GMFCS 4-5, Bayley cognitive, language or adaptive behavior composite <55, or bilateral visual impairment. Children considered to have a significant developmental delay which did not allow completion of the Bayley are also included.



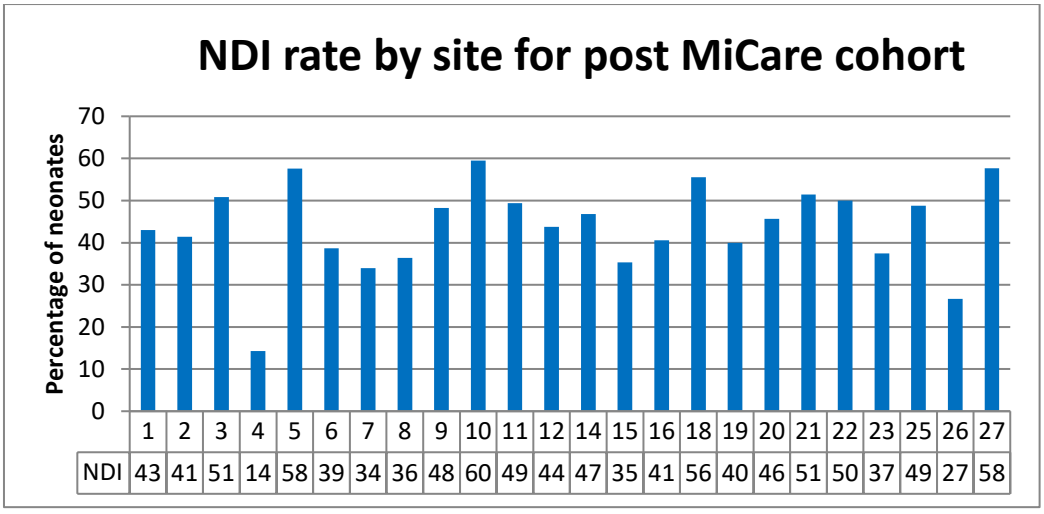

**COMMENTS:** There has not been a clinically important change in NDI rates over time. Higher attrition rates in the later years may impact the results.

# G. Site Comparisons for Epoch 2 – Crude

## Presentation No 25: Neurodevelopmental impairment rates for Epoch 2 cohort (Births October 1, 2011 – December 31, 2019)*

| Site | CNFUN (n) | No NDI n (%) | Any NDI n (%) | CP GMFCS 1-5 n (%) | Any hearing loss n (%) | Any visual impairment n (%) | Bayley score <85 Motor n (%) | Bayley score <85 Language n (%) | Bayley score <85 Cognitive n (%) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 572 | 326 (57) | 246 (43) | 37 (7) | 29 (5) | 6 (1) | 99 (19) | 160 (30) | 47 (9) |
| 2 | 365 | 214 (59) | 151 (41) | 16 (4) | 32 (9) | < 5% | 33 (12) | 107 (33) | 35 (10) |
| 3 | 116 | 57 (49) | 59 (51) | 5 (4) | 6 (5) | < 5% | 27 (27) | 43 (42) | 18 (17) |
| 4 | 7 | 6 (86) | < 20% | < 5% | < 5% | < 5% | < 5% | < 5% | < 20% |
| 5 | 177 | 75 (42) | 102 (58) | 9 (5) | 15 (9) | < 5% | 50 (42) | 68 (59) | 43 (33) |
| 6 | 722 | 443 (61) | 279 (39) | 34 (5) | 22 (3) | 12 (2) | 124 (28) | 157 (37) | 84 (16) |
| 7 | 56 | 37 (66) | 19 (34) | < 5% | < 5% | < 5% | 8 (15) | 12 (22) | 6 (11) |
| 8 | 11 | 7 (64) | < 40% | < 5% | < 5% | < 5% | < 45% | < 60% | < 25% |
| 9 | 87 | 45 (52) | 42 (48) | 9 (10) | < 5% | < 5% | 21 (31) | 27 (40) | 14 (19) |
| 10 | 168 | 68 (41) | 100 (60) | 13 (8) | 16 (10) | < 5% | 44 (30) | 82 (55) | 31 (21) |
| 11 | 518 | 262 (51) | 256 (49) | 45 (9) | 41 (8) | < 5% | 121 (25) | 176 (36) | 90 (18) |
| 12 | 279 | 157 (56) | 122 (44) | 29 (10) | < 5% | < 5% | 67 (27) | 80 (34) | 43 (17) |
| 14 | 342 | 182 (53) | 160 (47) | 15 (5) | 23 (7) | 7 (2) | 60 (20) | 114 (37) | 40 (13) |
| 15 | 17 | 11 (65) | 6 (35) | < 5% | < 10% | < 10% | 5 (31) | 3 (19) | < 10% |
| 16 | 786 | 467 (60) | 319 (41) | 45 (6) | 25 (3) | 6 (1) | 93 (16) | 223 (39) | 133 (21) |
| 18 | 9 | 4 (44) | 5 (56) | < 5% | < 5% | < 5% | < 15% | 5 (71) | 1 (13) |
| 19 | 5 | 3 (60) | 2 (40) | < 5% | < 5% | < 5% | < 5% | < 50% | < 5% |
| 20 | 302 | 164 (54) | 138 (46) | 12 (4) | 41 (14) | < 5% | 52 (26) | 94 (48) | 43 (21) |
| 21 | 140 | 68 (49) | 72 (51) | 14 (10) | 5 (4) | < 5% | 35 (28) | 58 (46) | 30 (24) |
| 22 | 14 | 7 (50) | 7 (50) | 2 (14) | < 5% | < 5% | < 25% | 6 (67) | < 30% |
| 23 | 235 | 147 (63) | 88 (37) | 25 (11) | 12 (5) | < 5% | 34 (18) | 47 (25) | 29 (15) |
| 25 | 898 | 460 (51) | 438 (49) | 31 (4) | 23 (3) | < 5% | 184 (22) | 355 (43) | 161 (19) |
| 26 | 60 | 44 (73) | 16 (27) | < 5% | < 5% | < 5% | 8 (14) | 12 (20) | < 10% |
| 27 | 52 | 22 (42) | 30 (58) | < 10% | < 5% | < 5% | 13 (26) | 21 (42) | 7 (14) |
| Total | 5938 | 3276 (55) | 2662 (45) | 350 (6) | 305 (5) | 55 (1) | 1084 (22) | 1856 (38) | 866 (17) |

*Cells with less than 5 show only % , rounded up to a multiple of 5%.

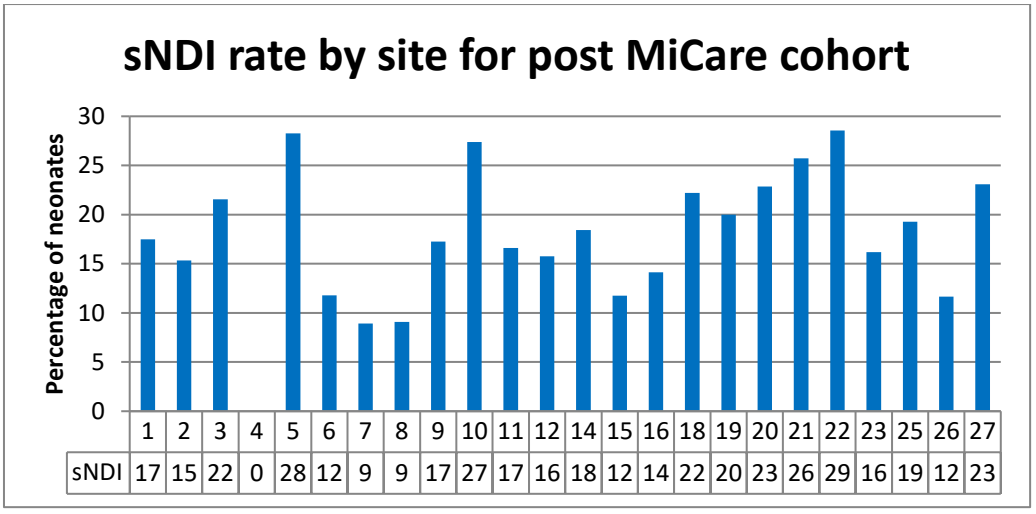



| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 14 | 15 | 16 | 18 | 19 | 20 | 21 | 22 | 23 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NDI | 43 | 41 | 51 | 14 | 58 | 39 | 34 | 36 | 48 | 60 | 49 | 44 | 47 | 35 | 41 | 56 | 40 | 46 | 51 | 50 | 37 | 49 | 27 | 58 |

## Presentation No 26: Significant neurodevelopmental impairment rates for Epoch 2 cohort (Births October 1, 2011 – December 31, 2019)*

| Site | CNFUN (n) | No NDI n (%) | Significant NDI n (%) | CP GMFCS 3-5 n (%) | Hearing aids/Cochlear implants n (%) | Bilateral visual impairment n (%) | Bayley score <70 Motor n (%) | Bayley score <70 Language n (%) | Bayley score <70 Cognitive n (%) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 572 | 326 (57) | 100 (18) | 22 (4) | 15 (3) | < 5% | 31 (6) | 45 (8) | 11 (2) |
| 2 | 365 | 214 (59) | 56 (15) | 6 (2) | 5 (1) | < 5% | 6 (2) | 38 (12) | 11 (3) |
| 3 | 116 | 57 (49) | 25 (22) | < 5% | < 5% | < 5% | 8 (8) | 19 (18) | 2 (2) |
| 4 | 7 | 6 (86) | < 5% | < 5% | < 5% | < 5% | < 5% | < 5% | < 5% |
| 5 | 177 | 75 (42) | 50 (28) | < 5% | 9 (5) | < 5% | 14 (12) | 31 (27) | 19 (15) |
| 6 | 722 | 443 (61) | 85 (12) | 10 (1) | 5 (1) | 9 (2) | 25 (6) | 60 (14) | 22 (4) |
| 7 | 56 | 37 (66) | 5 (9) | < 5% | < 5% | < 5% | < 10% | < 10% | < 5% |
| 8 | 11 | 7 (64) | < 10% | < 5% | < 5% | < 5% | < 15% | < 15% | < 15% |
| 9 | 87 | 45 (52) | 15 (17) | < 5% | < 5% | < 5% | 5 (7) | 8 (12) | 5 (7) |
| 10 | 168 | 68 (41) | 46 (27) | < 5% | 5 (3) | < 5% | 14 (9) | 35 (24) | 10 (7) |
| 11 | 518 | 262 (51) | 86 (17) | 13 (3) | < 5% | < 5% | 44 (9) | 44 (9) | 23 (5) |
| 12 | 279 | 157 (56) | 44 (16) | 8 (3) | < 5% | < 5% | 19 (8) | 26 (11) | 13 (5) |
| 14 | 342 | 182 (53) | 63 (18) | 6 (2) | < 5% | 7 (2) | 27 (9) | 32 (11) | 12 (4) |
| 15 | 17 | 11 (65) | < 15% | < 5% | < 10% | < 10% | < 10% | < 10% | < 5% |
| 16 | 786 | 467 (59) | 111 (14) | 9 (1) | 11 (1) | < 5% | 31 (5) | 66 (11) | 31 (5) |
| 18 | 9 | < 45% | < 25% | < 5% | < 5% | < 5% | < 5% | < 30% | < 5% |
| 19 | 5 | < 60% | < 20% | < 5% | < 5% | < 5% | < 5% | < 25% | < 5% |
| 20 | 302 | 164 (54) | 69 (23) | < 5% | 5 (2) | < 5% | 22 (11) | 55 (28) | 13 (6) |
| 21 | 140 | 68 (49) | 36 (26) | 6 (4) | < 5% | < 5% | 15 (12) | 27 (21) | 12 (9) |
| 22 | 14 | 7 (50) | < 30% | < 10% | < 5% | < 5% | < 25% | < 15% | < 15% |
| 23 | 235 | 147 (63) | 38 (16) | 9 (4) | 5 (2) | < 5% | 11 (6) | 12 (6) | < 5% |
| 25 | 898 | 460 (51) | 173 (19) | 12 (1) | 15 (2) | < 5% | 44 (5) | 119 (14) | 41 (5) |
| 26 | 60 | 44 (73) | 7 (12) | < 5% | < 5% | < 5% | < 10% | < 10% | < 5% |
| 27 | 52 | 22 (42) | 12 (23) | < 5% | < 5% | < 5% | < 105% | 8 (16) | < 10% |
| Total | 5938 | 3276 (55) | 1031 (17) | 113 (2) | 92 (2) | 43 (1) | 329 (7) | 638 (13) | 236 (5) |

*Cells with less than 5 show only % , rounded up to a multiple of 5%.

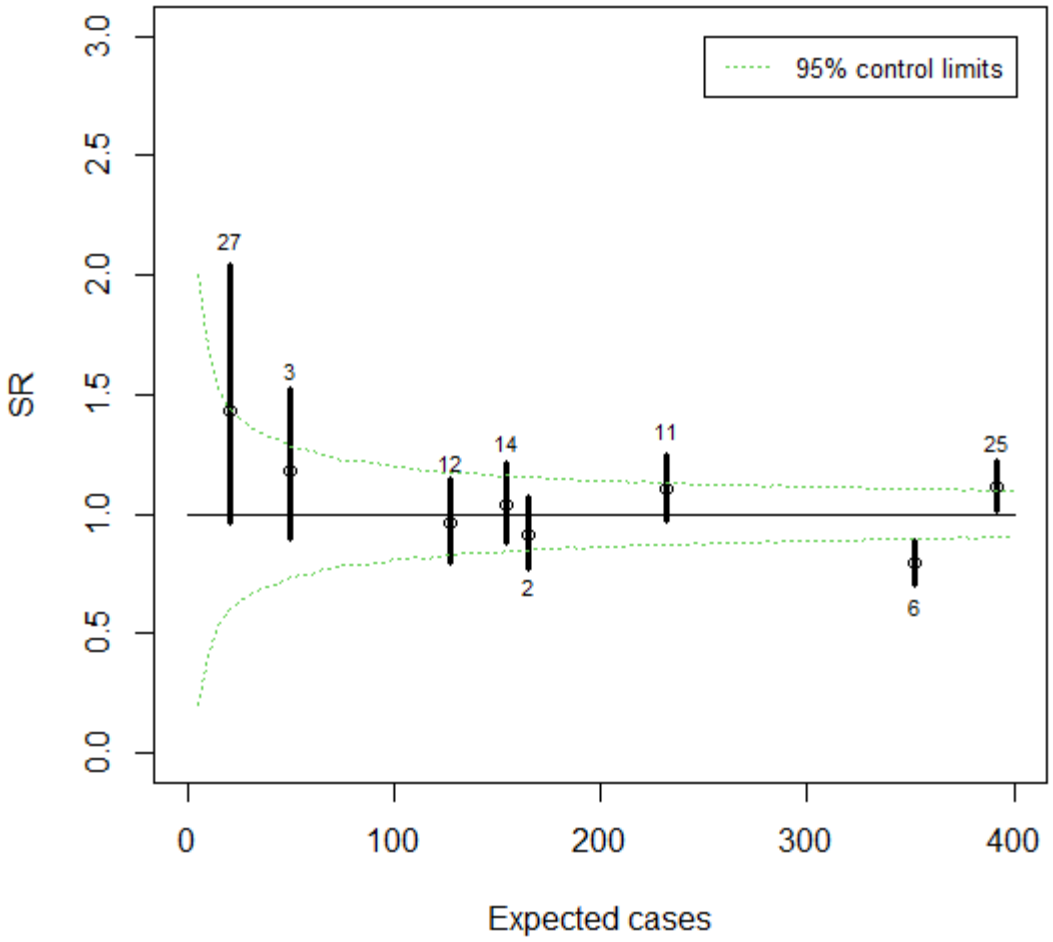

sNDI rate by site for post MiCare cohort
Percentage of neonates
30
25
20
15
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12 14 15 16 18 19 20 21 22 23 25 26 27
sNDI 17 15 22 0 28 12 9 9 17 27 17 16 18 12 14 22 20 23 26 29 16 19 12 23

# H. Site Comparisons for Epoch 2 – Adjusted Standardized Ratios by Site

## Presentation No 27: Adjusted standardized ratios by site Neurodevelopmental impairment for Epoch 2 cohort (Births October 1, 2011 – December 31, 2019)

| Site | Children (n) | Follow-up rate (%) | Included (Yes/No) | NDI (n) | Adjusted expected NDI (n) | Adjusted standardized ratio (95%CI) |
|---|---|---|---|---|---|---|
| 1 | 572 | 52.4 | | 246 | | |
| 2 | 365 | 82.2 | Yes | 151 | 165 | 0.92 (0.78, 1.07) |
| 3 | 116 | 73.4 | Yes | 59 | 50 | 1.18 (0.90, 1.52) |
| 4 | 7 | 14.6 | | 1 | | |
| 5 | 177 | 18.7 | | 102 | | |
| 6 | 722 | 72.8 | Yes | 279 | 352 | 0.79 (0.70, 0.89) |
| 7 | 56 | 32.4 | | 19 | | |
| 8 | 11 | 1.5 | | 4 | | |
| 9 | 87 | 44.8 | | 42 | | |
| 10 | 168 | 60.4 | | 100 | | |
| 11 | 518 | 87.6 | Yes | 256 | 232 | 1.10 (0.97, 1.25) |
| 12 | 279 | 86.4 | Yes | 122 | 127 | 0.96 (0.80, 1.15) |
| 14 | 342 | 78.3 | Yes | 160 | 154 | 1.04 (0.88, 1.21) |
| 15 | 17 | 13.6 | | 6 | | |
| 16 | 786 | 66.1 | | 319 | | |
| 18 | 9 | 6.0 | | 5 | | |
| 19 | 5 | 2.4 | | 2 | | |
| 20 | 302 | 33.6 | | 138 | | |
| 21 | 140 | 68.6 | | 72 | | |
| 22 | 14 | 15.2 | | 7 | | |
| 23 | 235 | 53.9 | | 88 | | |
| 25 | 898 | 71.0 | Yes | 438 | 392 | 1.12 (1.02, 1.23) |
| 26 | 60 | 65.9 | | 16 | | |
| 27 | 52 | 74.3 | Yes | 30 | 21 | 1.43 (0.96, 2.04) |

1. Sites with <20 participants for the Epoch 2 cohort period and/or <70% follow-up rates are excluded.
2. Model is adjusted for gestational age, sex, outborn status, severity of illness (SNAP>20), bronchopulmonary dysplasia, necrotizing enterocolitis Bell's stage 2 or greater and severe brain injury, defined as any grade 3 intraventricular hemorrhage, intraparenchymal hemorrhage, moderate-severe posthemorrhagic ventricular dilatation or periventricular leukomalacia.

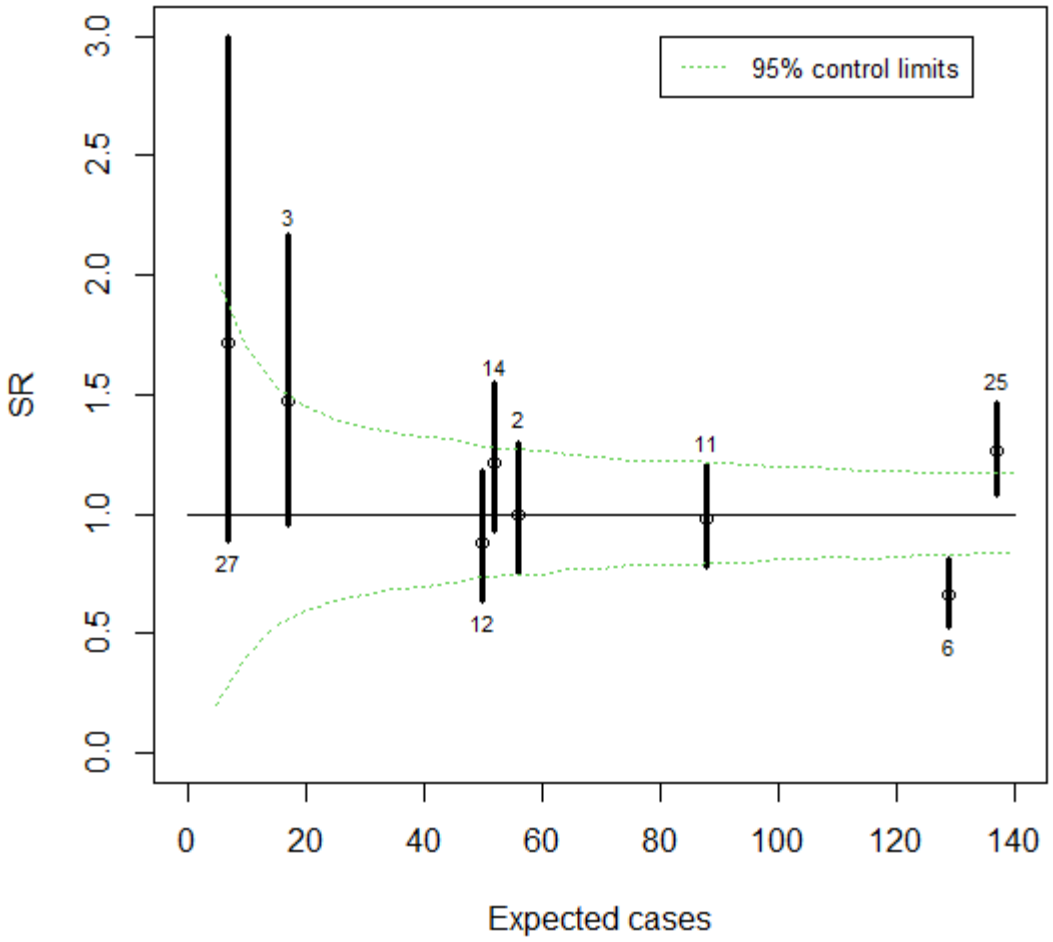



**COMMENTS:**
Sites with points outside the green "funnel" represent higher or lower adjusted NDI rates than expected. When the 95% confidence interval does not cross 1, the results are statistically significant. Therefore, one site (25) has a statistically higher NDI rate, and one site (6) has a statistically lower NDI rate.

## Presentation No 28: Adjusted standardized ratios by site
## Significant neurodevelopmental impairment for Epoch 2 cohort
## (Births October 1, 2011 – December 31, 2019)

| **Site** | **Children** (n) | **Follow-up rate** (%) | **Included** (Yes/No) | **sNDI** (n) | **Adjusted expected sNDI** (n) | **Adjusted standardized ratio** (95%CI) |
|---|---|---|---|---|---|---|
| 1 | 572 | 52.4 | | 100 | | |
| 2 | 365 | 82.2 | Yes | 56 | 56 | 1.00 (0.76, 1.30) |
| 3 | 116 | 73.4 | Yes | 25 | 17 | 1.47 (0.95, 2.17) |
| 4 | 7 | 14.6 | | 0 | | |
| 5 | 177 | 18.7 | | 50 | | |
| 6 | 722 | 72.8 | Yes | 85 | 129 | 0.66 (0.53, 0.81) |
| 7 | 56 | 32.4 | | 5 | | |
| 8 | 11 | 1.5 | | 1 | | |
| 9 | 87 | 44.8 | | 15 | | |
| 10 | 168 | 60.4 | | 46 | | |
| 11 | 518 | 87.6 | Yes | 86 | 88 | 0.98 (0.78, 1.21) |
| 12 | 279 | 86.4 | Yes | 44 | 50 | 0.88 (0.64, 1.18) |
| 14 | 342 | 78.3 | Yes | 63 | 52 | 1.21 (0.93, 1.55) |
| 15 | 17 | 13.6 | | 2 | | |
| 16 | 786 | 66.1 | | 111 | | |
| 18 | 9 | 6.0 | | 2 | | |
| 19 | 5 | 2.4 | | 1 | | |
| 20 | 302 | 33.6 | | 69 | | |
| 21 | 140 | 68.6 | | 36 | | |
| 22 | 14 | 15.2 | | 4 | | |
| 23 | 235 | 53.9 | | 38 | | |
| 25 | 898 | 71.0 | Yes | 173 | 137 | 1.26 (1.08, 1.47) |
| 26 | 60 | 65.9 | | 7 | | |
| 27 | 52 | 74.3 | Yes | 12 | 7 | 1.71 (0.89, 2.99) |

1. Sites with <20 participants for the Epoch 2 cohort period and/or <70% follow-up rates are excluded.
2. Model is adjusted for gestational age, sex, antenatal steroids, severity of illness (SNAP>20), severe retinopathy of prematurity defined as stage 3 or greater in either eye or treatment with laser or injections of anti-vascular endothelial growth factor, nosocomial infection and brain injury, defined as any grade 3 or 4 intraventricular hemorrhage, ventricular dilatation ≥10 mm, intraparenchymal hemorrhage or periventricular leukomalacia.

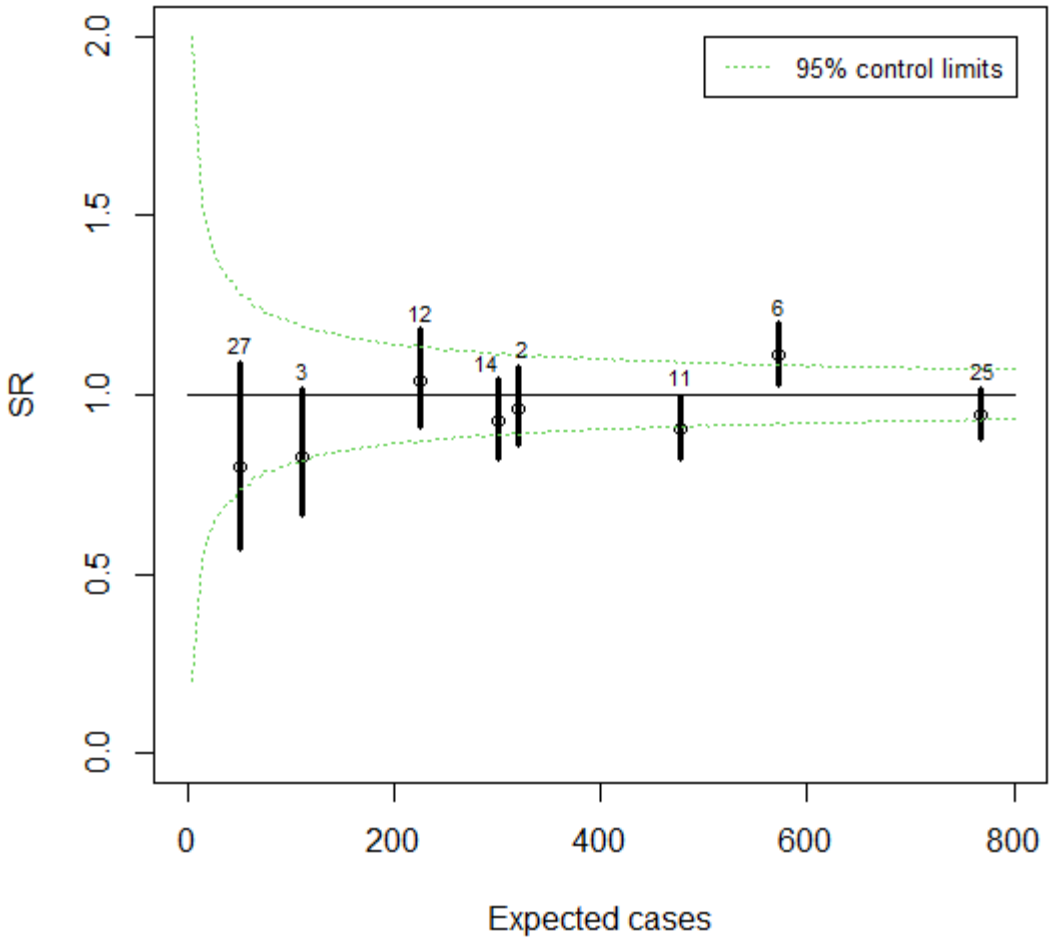



**COMMENTS:**
Sites with points outside the green "funnel" represent higher or lower adjusted sNDI rates than expected. When the 95% confidence interval does not cross 1, the results are statistically significant. Therefore, one site (25) has a statistically higher, and one site (6) has a statistically lower sNDI rate.

## Presentation No 29: Adjusted standardized ratios by site
## Survival without significant neurodevelopmental impairment for Epoch 2 cohort
## (Births October 1, 2011 – December 31, 2019)

| Site | Children (n) | Follow-up rate (%) | Included (Yes/No) | Survival without sNDI (n) | Adjusted expected outcome (n) | Adjusted standardized ratio (95%CI) |
|---|---|---|---|---|---|---|
| 1 | 709 | 52.4 | | 472 | | |
| 2 | 451 | 82.2 | Yes | 309 | 321 | 0.96 (0.86, 1.08) |
| 3 | 154 | 73.4 | Yes | 91 | 110 | 0.83 (0.67, 1.02) |
| 4 | 18 | 14.6 | | 7 | | |
| 5 | 338 | 18.7 | | 127 | | |
| 6 | 824 | 72.8 | Yes | 637 | 573 | 1.11 (1.03, 1.20) |
| 7 | 76 | 32.4 | | 51 | | |
| 8 | 143 | 1.5 | | 10 | | |
| 9 | 117 | 44.8 | | 72 | | |
| 10 | 221 | 60.4 | | 122 | | |
| 11 | 687 | 87.6 | Yes | 432 | 477 | 0.91 (0.82, 1.00) |
| 12 | 319 | 86.4 | Yes | 235 | 226 | 1.04 (0.91, 1.18) |
| 14 | 415 | 78.3 | Yes | 279 | 301 | 0.93 (0.82, 1.04) |
| 15 | 55 | 13.6 | | 15 | | |
| 16 | 1018 | 66.1 | | 675 | | |
| 18 | 44 | 6.0 | | 7 | | |
| 19 | 42 | 2.4 | | 4 | | |
| 20 | 471 | 33.6 | | 233 | | |
| 21 | 206 | 68.6 | | 104 | | |
| 22 | 36 | 15.2 | | 10 | | |
| 23 | 335 | 53.9 | | 197 | | |
| 25 | 1074 | 71.0 | Yes | 725 | 767 | 0.95 (0.88, 1.02) |
| 26 | 72 | 65.9 | | 53 | | |
| 27 | 62 | 74.3 | Yes | 40 | 50 | 0.80 (0.57, 1.09) |

1. Sites with <20 participants for the 8 year Epoch 2 cohort period and/or <70% follow-up rates are excluded.
2. Model is adjusted for gestational age, sex, antenatal steroids, 5 minute Apgar score <7, multiples, outborn, severity of illness (SNAP>20), necrotizing enterocolitis Bell's stage 2 or greater and severe brain injury, defined as any grade 3 or 4 intraventricular hemorrhage, ventricular dilatation ≥10 mm, intraparenchymal hemorrhage or periventricular leukomalacia.




**COMMENTS:**
Sites with points outside the green "funnel" represent higher or lower adjusted survival without significant NDI rates than expected. When the 95% confidence interval does not cross 1, the results are statistically significant. Therefore, one site (6) has statistically higher survival without significant NDI rates.

# I. Summary of Publications

**CNFUN Manuscripts 2016:**

1. Morin J, Luu TM, Superstein R, Ospina LH, Lefebvre F, Simard MN, Shah V, Shah PS, Kelly EN; Canadian Neonatal Network and the Canadian Neonatal Follow-Up Network Investigators. Neurodevelopmental Outcomes Following Bevacizumab Injections for Retinopathy of Prematurity. Pediatrics 2016 Apr;137(4) pii: e20153218. doi: 10.1542/peds.2015-3218.

**CNFUN Manuscripts 2017:**

1. Isayama T, Lee SK, Yang J, Lee D, Daspal S, Dunn M, Shah PS; Canadian Neonatal Network and Canadian Neonatal Follow -Up Network Investigators. Revisiting the Definition of Bronchopulmonary Dysplasia: Effect of Changing Panoply of Respiratory Support for Preterm Neonates. JAMA Pediatr. 2017 Mar 1;171(3):271-279.
2. Asztalos E, Church PT, Riley P, Fajardo C, Shah PS, Canadian Neonatal Network and Canadian Neonatal Follow-Up Network investigators. Neonatal factors associated with a good neurodevelopmental outcome in the very preterm infant. Am J Perinatol. 2017 Mar;34(4):388-396.
3. Asztalos E, Church PT, Riley P, Fajardo C, Shah PS, Canadian Neonatal Network and Canadian Neonatal Follow-Up Network investigators. Association between Primary Caregiver Education and Cognitive and Language Development of Preterm Neonates. Am J Perinatol. 2017 Mar;34(4):364-371.
4. Synnes A, Luu TM, Moddemann D, Church P, Lee D, Vincer M, Ballantyne M, Majnemer A, Creighton D, Yang J, Sauve R, Saigal S, Shah P, Lee S, CNN, CNFUN. Determinants of developmental outcomes in a very preterm Canadian cohort. Arch Dis Child Fetal Neonatal Ed. 2017 May;102(3):F235-F234.
5. Raghuram K, Yang J, Church PT, Cieslak Z, Synnes A, Mukerji A, Shah PS, CNN and CNFUN. Canadian Neonatal Network and Canadian Neonatal Follow-Up Network Investigators. Head growth trajectory and neurodevelopmental outcomes in preterm neonates. Pediatrics. 2017 Jul;140(1) pii: e20170216. doi: 10.1542/peds.2017-0216.
6. Soraisham AS, Rabi Y, Lodha AK, Shah PS, Synnes A, Yang J, Singhal N, CNN, CNFUN Neurodevelopmental outcomes of preterm infants resuscitated with different oxygen concentration at birth. J Perinatol, 2017 Oct;37(10):1141-1147.

**CNFUN Manuscripts 2018:**

1. Shah P, McDonald S, Barrett J, Synnes A, Robson K, Foster J, Pasquier JC, Joseph KS Piedboeuf B, Lacaze-Masmonteil T, O'Brien K, Shivananda S, Chaillet N, Pechlivanoglou P, for the Canadian Preterm Birth Network Investigators. The Canadian Preterm Birth Network: a study protocol for improving outcomes for preterm infants and their families. doi: 10.9778/cmajo.20170128 CMAJO January 18, 2018 vol. 6 no. 1 E44-E49.
2. Amer R, Moddemann D, Seshia M, Alvaro R, Synnes A, Lee KS, Lee SK, Shah PS; Canadian Neonatal Network and Canadian Neonatal Follow-up Network Investigators.

Neurodevelopmental Outcomes of Infants Born at <29 Weeks of Gestation Admitted to Canadian Neonatal Intensive Care Units Based on Location of Birth. J Pediatr. 2018 May;196:31-37.e1.
3. Haslam MD, Lisonkova S, Creighton D, Church P ,Yang J, Shah PS, Joseph KS, and Synnes A; Canadian Neonatal Network and the Canadian Neonatal Follow-Up Network. Severe Neurodevelopmental Impairment in Neonates Born Preterm: Impact of Varying Definitions in a Canadian Cohort. J Pediatr. 2018 Jun;197:75-81.
4. Ting JY, Synnes AR, Lee SK, Shah PS Canadian Neonatal Network and Canadian Neonatal Follow-Up Network. Association of admission temperature and death or adverse neurodevelopmental outcomes in extremely low-gestational age neonates. J Perinatol. 2018 Jul;38(7):844-849.
5. Ting JY, Synnes A, Roberts A, Deshpandey AC, Dow K, Yang J, Lee KS, Lee SK, Shah PS; Canadian Neonatal Network and Canadian Neonatal Follow-Up Network. Association of Antibiotic Utilization and Neurodevelopmental Outcomes among Extremely Low Gestational Age Neonates without Proven Sepsis or Necrotizing Enterocolitis. Am J Perinatol. 2018 Aug;35(10):972-978.
6. Kelly EN, Shah VS, Levenbach J, Vincer M, DaSilva O, Shah PS; Canadian Neonatal Network and Canadian Neonatal Follow-Up Network Investigators. Inhaled and systemic steroid exposure and neurodevelopmental outcome of preterm neonates. J Matern Fetal Neonatal Med.2018 Oct;31(20):2665-2672.
7. Stockley EL, Ting JY, Kingdom JC, McDonald SD, Barrett JF, Synnes AR, Monterrosa L, Shah PS; Canadian Neonatal Network; Canadian Neonatal Follow-up Network; Canadian Preterm Birth Network Investigators. Intrapartum magnesium sulfate is associated with neuroprotection in growth-restricted fetuses. Am J Obstet Gynecol. 2018 Dec;219(6):606.e1-606.e8.
8. Iwami H, Isayama T, Lodha A, Canning R, Abou Mehrem A, Lee SK, Synnes A, Shah PS; Canadian Neonatal Network and Canadian Neonatal Follow-Up Network Investigators. Outcomes after Neonatal Seizures in Infants Less Than 29 Weeks' Gestation: A Population-Based Cohort Study. Am J Perinatol. 2018 Jul 17. doi: 10.1055/s-0038-1667107. [Epub ahead of print] PMID:30016820.
9. Nassel D, Chartrand C, Doré-Bergeron MJ, Lefebvre F, Ballantyne M, Van Overmeire B, Luu TM; Canadian Neonatal Network and the Canadian Neonatal Follow-Up Network.Very Preterm Infants with Technological Dependence at Home: Impact on Resource Use and Family. Neonatology. 2019 Mar 25;115(4):363-370.

**CNFUN Manuscripts 2019:**

1. Lodha A, Entz R, Synnes A, Creighton D, Yusuf K, Lapointe A, Yang J, Shah PS; investigators of the Canadian Neonatal Network (CNN) and the Canadian Neonatal Follow-up Network (CNFUN). Early caffeine administration and neurodevelopmental outcomes in preterm infants. Pediatrics. 2019 Jan;143(1).
2. Fischer N, Soraisham A, Shah PS, Synnes A, Rabi Y, Singhal N, Ting JY, Creighton D, Dewey D, Ballantyne M, Lodha A; Canadian Neonatal Network™ (CNN); Canadian Neonatal Follow-up Network (CNFUN); Investigators. Extensive cardiopulmonary resuscitation of preterm

neonates at birth and mortality and developmental outcomes. Resuscitation. 2019 Feb;135:57-65.
3. Ediger K, Hasan SU, Synnes A, Shah J, Creighton D, Isayama T, Shah PS, Lodha A; Canadian Neonatal Network; Canadian Neonatal Follow-Up Network. Maternal smoking and neurodevelopmental outcomes in infants <29 weeks gestation: a multicenter cohort study. J Perinatol. 2019 Apr 17. doi: 10.1038/s41372-019-0356-3. [Epub ahead of print].
4. Shafey A, Bashir RA, Shah PS, Synnes A, Kelly E, Canadian Neonatal Network and Canadian Neonatal Follow-Up Network Investigators. Outcomes and resource usage of infants born at ≤ 25 weeks gestation in Canada. Accepted to Paediatrics & Child Health. Feb 7, 2019.
5. Synnes A, Gillone J, Majnemer A, Lodha A, Creighton D, Moddemann D, Shah PS; Canadian and Neonatal Network; Canadian and Neonatal Follow-up Network. Preterm children with suspected cerebral palsy at 19 months corrected age in the Canadian neonatal follow-up network. Early Hum Dev. 2019 Sep;136:7-13.
6. Morgan-Feir M, Abbott A, Synnes A, Creighton D, Pillay T, Zwicker JG, on behalf of the Canadian Neonatal Follow-Up Network. Comparing Standardized and Parent-Reported Motor Outcomes of Extremely Preterm Infants. Children (Basel). 2019 Aug 1;6(8). pii: E90. doi: 10.3390/children6080090.
7. Albaghli F, Church P, Ballantyne M, Girardi A, Synnes A. Neonatal follow-up programs in Canada: A national survey. Paediatr Child Health. 2019 Nov 29;26(1):e46-e51. doi: 10.1093/pch/pxz159. PMID: 33542778; PMCID: PMC7850286.
8. Puthattayil ZB, Luu TM, Beltempo M, Cross S, Pillay T, Ballantyne M, Synnes A, Shah P, Daboval T; Canadian Neonatal Follow-Up Network. Risk factors for re-hospitalization following neonatal discharge of extremely preterm infants in Canada. Paediatr Child Health. 2019 Dec 3;26(2):e96-e104. doi: 10.1093/pch/pxz143. eCollection 2021 Feb. PMID: 33747317; PMCID: PMC7962711.

**CNFUN Manuscripts 2020:**

1. Shafey A, Bashir RA, Shah P, Synnes A, Yang J, Kelly EN; Canadian Neonatal Network and Canadian Neonatal Follow-Up Network Investigators Outcomes and resource usage of infants born at ≤ 25 weeks gestation in Canada. Paediatr Child Health. 2020 Jun;25(4):207-215.
2. DiLabio J, Zwicker JG, Sherlock R, Daspal S, Shah PS, Shah V; Canadian Neonatal Network and Canadian Neonatal Follow-Up Network. Maternal age and long-term neurodevelopmental outcomes of preterm infants < 29 weeks gestational age. J Perinatol. 2021 Jun;41(6):1304-1312. doi: 10.1038/s41372-020-0735-9. Epub 2020 Jul 21. PMID: 32694856.
3. Grass B, Ye XY, Kelly E, Synnes A, Lee S. Association between Transport Risk Index of Physiologic Stability in Extremely Premature Infants and Mortality or Neurodevelopmental Impairment at 18 to 24 Months. J Pediatr. 2020 Sep;224:51-56.e5. PMID: 32442448.

**CNFUN Manuscripts 2021:**

1. Zozaya C, Shah J, Pierro A, Zani A, Synnes A, Lee S, Shah PS; Canadian Neonatal Network and the Canadian Neonatal Follow-Up Network Investigators. Neurodevelopmental and Growth

Outcomes of Extremely Preterm Infants with Necrotizing Enterocolitis or Spontaneous Intestinal Perforation. J Pediatr Surg. 2021 Feb;56(2): 309-316 doi: 10.1016/j.jpedsurg.2020.05.013 PMID: 32553453

2. Doucette SM, Kelly EN, Church PT, Lee S, Shah V; Canadian Neonatal Network (CNN) Investigators and CNFUN Investigators and Steering Committee. Association of inotrope use with neurodevelopmental outcomes in infants <29 weeks gestation: a retrospective cohort study. J Matern Fetal Neonatal Med. 2021 Apr 7:1-9. doi: 10.1080/14767058.2021.1904872. Epub ahead of print. PMID: 33827395.
3. Rustogi D, Synnes A, Alshaikh B, Hasan S, Drolet C, Masse E, Murthy P, Shah PS, Yusuf K; Canadian Neonatal Network and the Canadian Neonatal Follow-Up Program. Neurodevelopmental outcomes of singleton large for gestational age infants <29 weeks' gestation: a retrospective cohort study. J Perinatol. 2021 Jun;41(6):1313-1321. doi: 10.1038/s41372-021-01080-z. Epub 2021 May 25. PMID: 34035448.
4. Roychoudhury S, Lodha A, Synnes A, Abou Mehrem A, Canning R, Banihani R, Beltempo M, Yang J, Shah P, Soraisham A on behalf of Canadian Neonatal Network (CNN) and Canadian Neonatal Follow-Up Network (CNFUN). Neurodevelopmental Outcomes of Preterm Infants Conceived by Assisted Reproductive Technology. Am J Obstet Gynecol. 2021 Sep;225(3):276.e1-276.e9.

**Parent-EPIQ Manuscripts 2021:**

1. Luu TM, Pearce R. Parental voice - what outcomes of preterm birth matter most to families? Seminars in Perinatology. 2021 Nov 11;000(151550). doi: 10.1016/j.semperi.2021.151550.

**CNFUN Manuscripts 2022:**

1. Ghotra S, Feeny D, Barr R, Yang J, Saigal S, Vincer M, Afifi J, Shah PS, Lee SK, Synnes AR; Canadian Neonatal Follow-Up Network Investigators; Canadian Neonatal Network Site Investigators. Parent-reported health status of preterm survivors in a Canadian cohort. Arch Dis Child Fetal Neonatal Ed. 2022 Jan;107(1):87-93. doi: 10.1136/archdischild-2021-321635
2. Synnes AR, Petrie J, Grunau RE, Church P, Kelly E, Moddemann D, Ye X, Lee SK, O'Brien K; Canadian Neonatal Network Investigators; Canadian Neonatal Follow-Up Network Investigators. Family integrated care: very preterm neurodevelopmental outcomes at 18 months. Arch Dis Child Fetal Neonatal Ed. 2022 Jan;107(1):76-81. doi: 10.1136/archdischild-2020-321055.
3. Ricci MF, Shah PS, Moddemann D, Alvaro R, Ng E, Lee SK, Synnes A; Canadian Neonatal Network (CNN) and the Canadian Neonatal Follow-Up Network (CNFUN) Investigators. Neurodevelopmental Outcomes of Infants <29 Weeks' Gestation Born in Canada Between 2009 and 2016. J Pediatr. 2022 May 10:S0022-3476(22)00408-5. doi: 10.1016/j.jpeds.2022.04.048. Epub ahead of print. PMID: 35561804.
4. Chan NH, Synnes A, Grunau RE, Colby L. Petrie J, Elfring T, Richter L, Hendson L, Banihani R, Luu TM on behalf of the Canadian Neonatal Follow-Up Network investigators. Impact of differing language background exposures on Bayley-III Language assessment in a national cohort of children born less than 29 weeks' gestation. Children (Basel). 2022 Jul 14;9(7):1048. doi: 0.3390/children9071048.PMID: 35884032.

5. Chevallier M, Debillon T, Darlow BA, Synnes AR, Pierrat V, Hurrion E, Yang J, Ego A, Ancel PY, Lui K, Shah PS, Luu TM; Australian and New Zealand Neonatal Network (ANZNN); Canadian Neonatal Network (CNN); Canadian Neonatal Follow-Up Network (CNFUN); Etude Epidémiologique sur les Petits Ages Gestationnels (EPIPAGE-2) Investigators. Mortality and significant neurosensory impairment in preterm infants: an international comparison. Arch Dis Child Fetal Neonatal Ed. 2022 May;107(3):317-323. doi: 10.1136/archdischild-2021-322288.
6. Bando N, Fenton TR, Yang J, Ly L, Luu TM, Unger S, O'Connor DL, Shah PS; Canadian Neonatal Network and Canadian Neonatal Follow-Up Network Investigators. Association of postnatal growth changes and neurodevelopmental outcomes in preterm neonates of <29 weeks' gestation. J Pediatr. 2022 Dec 9:S0022-3476(22)01111-8. doi: 10.1016/j.jpeds.2022.11.039. Epub ahead of print. PMID: 36509160.
7. Kandraju H, Jasani B, Shah PS, Church PT, Luu TM, Ye XY, Stavel M, Mukerji A, Shah V, The Cnn Investigators, The Cnfun Investigators. Timing of Systemic Steroids and Neurodevelopmental Outcomes in Infants < 29 Weeks Gestation. Children (Basel). 2022 Nov 3;9(11):1687. doi: 10.3390/children9111687. PMID: 36360415; PMCID: PMC9688446.

**Parent-EPIQ Manuscripts 2022:**

1. Milette AA, Richter LL, Bourque CJ, Janvier A, Pearce R, Church PT, Synnes A, Luu TM. Parental perspectives of outcomes following very preterm birth: Seeing the good, not just the bad. Acta Paediatr. 2022 Dec 7. doi: 10.1111/apa.16616. Epub ahead of print. PMID: 36479723.
2. Thivierge E, Luu TM, Bourque CJ, Duquette LA, Pearce R, Jaworski M, Barrington KJ, Synnes A, Janvier A. Guilt and regret experienced by parents of children born extremely preterm. J Pediatr. 2022 Dec 1:S0022-3476(22)01019-8. doi: 10.1016/j.jpeds.2022.10.042. Epub ahead of print. PMID: 36463935.
3. Jaworski M, Janvier A, Bourque CJ, Mai-Vo TA, Pearce R, Synnes AR, Luu TM. Parental perspective on important health outcomes of extremely preterm infants. Arch Dis Child Fetal Neonatal Ed. 2022 Sep;107(5):495-500. doi: 10.1136/archdischild-2021-322711. Epub 2021 Nov 23. PMID: 34815239; PMCID: PMC9411910.

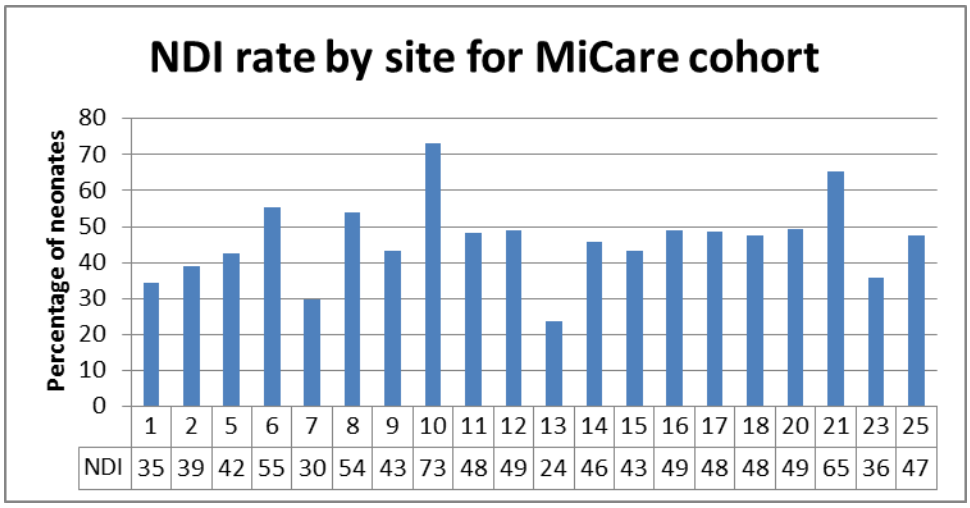
# J. Appendices

## Appendix I. Site Comparisons for Epoch 1 – Crude

### Presentation No 30: Neurodevelopmental impairment rates for Epoch 1 cohort (Births April 1, 2009 – September 30, 2011)*

| **Site** | **CNFUN** (n) | **No NDI** n (%) | **Any NDI** n (%) | **CP with GMFCS 1-5** n (%) | **Any hearing loss** n(%) | **Any visual Impairment** n (%) | **Bayley score <85 Motor** n (%) | **Bayley score <85 Language** n (%) | **Bayley score <85 Cognitive** n (%) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 168 | 110 (66) | 58 (35) | < 5% | 9 (5) | 0 (0) | 23 (14) | 40 (24) | 8 (5) |
| 2 | 115 | 70 (61) | 45 (39) | < 5% | 12 (10) | 0 (0) | 17 (15) | 29 (25) | 10 (9) |
| 5 | 205 | 118 (58) | 87 (42) | 7 (3) | 29 (14) | < 5% | 24 (12) | 57 (28) | 21 (10) |
| 6 | 212 | 95 (45) | 117 (55) | 11 (5) | 25 (12) | 11 (5) | 58 (27) | 76 (36) | 30 (14) |
| 7 | 27 | 19 (70) | 8 (30) | < 5% | 0 (0) | < 5% | 5 (19) | 7 (26) | < 10% |
| 8 | 145 | 67 (46) | 78 (54) | 14 (10) | < 5% | < 5% | 41 (28) | 53 (37) | 31 (21) |
| 9 | 53 | 30 (57) | 23 (43) | 5 (9) | < 5% | 0 (0) | < 10% | 10 (19) | 9 (17) |
| 10 | 56 | 15 (27) | 41 (73) | < 10% | 9 (16) | < 5% | 19 (34) | 34 (61) | 18 (32) |
| 11 | 178 | 92 (52) | 86 (48) | 9 (5) | 13 (7) | < 5% | 45 (25) | 55 (31) | 20 (11) |
| 12 | 84 | 43 (51) | 41 (49) | 12 (14) | < 5% | < 5% | 25 (30) | 26 (31) | 14 (17) |
| 13 | 21 | 16 (76) | 5 (24) | < 15% | < 15% | 0 (0) | 0 (0) | < 5% | 0 (0) |
| 14 | 103 | 56 (54) | 47 (46) | 6 (6) | < 5% | 0 (0) | 17 (17) | 42 (41) | 12 (12) |
| 15 | 30 | 17 (57) | 13 (43) | < 5% | 6 (20) | 0 (0) | < 15% | 9 (30) | 5 (17) |
| 16 | 250 | 128 (51) | 122 (49) | 18 (7) | 16 (6) | < 5% | 48 (19) | 75 (30) | 44 (18) |
| 17 | 64 | 33 (52) | 31 (48) | 0 (0) | < 5% | < 5% | 18 (28) | 22 (34) | 12 (19) |
| 18 | 43 | 23 (54) | 20 (47) | < 10% | < 5% | < 5% | 9 (21) | 14 (33) | 9 (21) |
| 20 | 79 | 40 (51) | 39 (49) | 5 (6) | < 5% | < 5% | 14 (18) | 34 (43) | 9 (11) |
| 21 | 55 | 19 (35) | 36 (66) | 5 (9) | 10 (18) | < 5% | 19 (35) | 29 (53) | 15 (27) |
| 23 | 132 | 85 (64) | 47 (36) | 10 (8) | 11 (8) | < 5% | 17 (13) | 27 (21) | 10 (8) |
| 25 | 238 | 125 (53) | 113 (48) | 0 (0) | 13 (6) | < 5% | 40 (17) | 95 (40) | 33 (14) |
| Total | 2258 | 1198 (53) | 1055 (47) | 123 (5) | 174 (8) | 38 (2) | 446 (20) | 735 (33) | 312 (14) |

*Cells with less than 5 show only % , rounded up to a multiple of 5%.

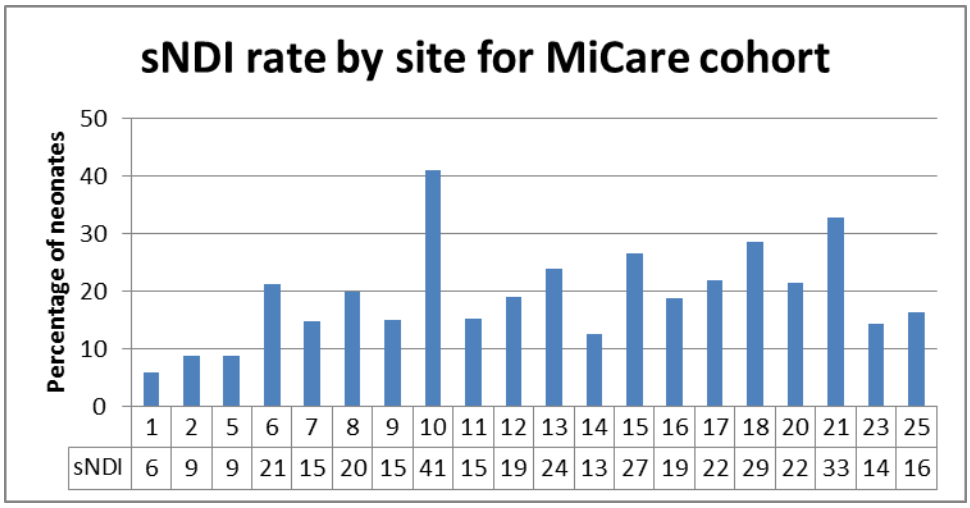



| | 1 | 2 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 21 | 23 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NDI | 35 | 39 | 42 | 55 | 30 | 54 | 43 | 73 | 48 | 49 | 24 | 46 | 43 | 49 | 48 | 48 | 49 | 65 | 36 | 47 |

## Presentation No 31: Significant neurodevelopmental impairment rates for Epoch 1 cohort (Births April 1, 2009 – September 30, 2011)*

| Site | CNFUN (n) | No NDI n (%) | Significant NDI n (%) | CP GMFCS 3-5 n (%) | Disabling hearing loss n (%) | Bilateral visual impairment n (%) | Bayley score <70 Motor n (%) | Bayley score <70 Language n (%) | Bayley score <70 Cognitive n (%) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 168 | 110 (66) | 10 (6) | < 5% | 0 (0) | 0 (0) | 6 (4) | 7 (4) | < 5% |
| 2 | 115 | 70 (61) | 10 (9) | 0 (0) | < 5% | 0 (0) | < 5 % | < 5 % | < 5% |
| 5 | 205 | 118 (58) | 18 (9) | < 5% | < 5% | < 5 % | 5 (2) | 9 (4) | < 5% |
| 6 | 212 | 95 (45) | 45 (21) | < 5% | < 5% | 9 (4) | 15 (7) | 32 (15) | 5 (2) |
| 7 | 27 | 19 (70) | < 15% | < 5% | 0 (0) | < 5% | < 15% | < 15% | < 5% |
| 8 | 145 | 67 (46) | 29 (20) | 6 (4) | < 5% | < 5% | 13 (9) | 14 (10) | 7 (5) |
| 9 | 53 | 30 (57) | 8 (15) | 0 (0) | < 5% | 0 (0) | < 5% | < 10% | < 5% |
| 10 | 56 | 15 (27) | 23 (41) | 0 (0) | 0 (0) | < 5% | 8 (14) | 22 (39) | < 10% |
| 11 | 178 | 92 (52) | 27 (15) | 5 (3) | 5 (3) | < 5% | 13 (7) | 16 (9) | 7 (4) |
| 12 | 84 | 43 (51) | 16 (19) | < 5% | < 5% | < 5% | 9 (11) | 6 (7) | < 5% |
| 13 | 21 | 16 (76) | 5 (24) | < 15% | < 15% | 0 (0) | 0 (0) | < 5% | 0 (0) |
| 14 | 103 | 56 (54) | 13 (13) | < 5% | < 5% | 0 (0) | 6 (6) | 8 (8) | 0 (0) |
| 15 | 30 | 17 (57) | 8 (27) | < 5% | < 15% | 0 (0) | < 10% | < 15% | 0 (0) |
| 16 | 250 | 128 (51) | 47 (19) | 8 (3) | 10 (4) | < 5% | 10 (4) | 24 (10) | 9 (4) |
| 17 | 64 | 33 (52) | 14 (22) | 0 (0) | 0 (0) | 0 (0) | 6 (9) | 10 (16) | < 5% |
| 18 | 43 | 23 (54) | 12 (28) | < 10% | 0 (0) | < 5% | 6 (14) | 7 (16) | < 10% |
| 20 | 79 | 39 (49) | 17 (22) | < 5% | < 5% | < 5% | < 10% | 12 (15) | < 5% |
| 21 | 55 | 19 (35) | 18 (33) | < 5% | < 5% | < 5% | 9 (16) | 15 (27) | 6 (11) |
| 23 | 132 | 85 (64) | 19 (14) | 5 (4) | 9 (7) | < 5% | 5 (4) | 5 (4) | < 5% |
| 25 | 238 | 125 (53) | 39 (16) | 0 (0) | 10 (4) | < 5% | 9 (4) | 26 (11) | < 5% |
| Total | 2258 | 1198 (53) | 380 (17) | 49 (2) | 58 (3) | 34 (2) | 133 (6) | 228 (10) | 67 (3) |

*Cells with less than 5 show only % , rounded up to a multiple of 5%.




| | 1 | 2 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 21 | 23 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| sNDI | 6 | 9 | 9 | 21 | 15 | 20 | 15 | 41 | 15 | 19 | 24 | 13 | 27 | 19 | 22 | 29 | 22 | 33 | 14 | 16 |

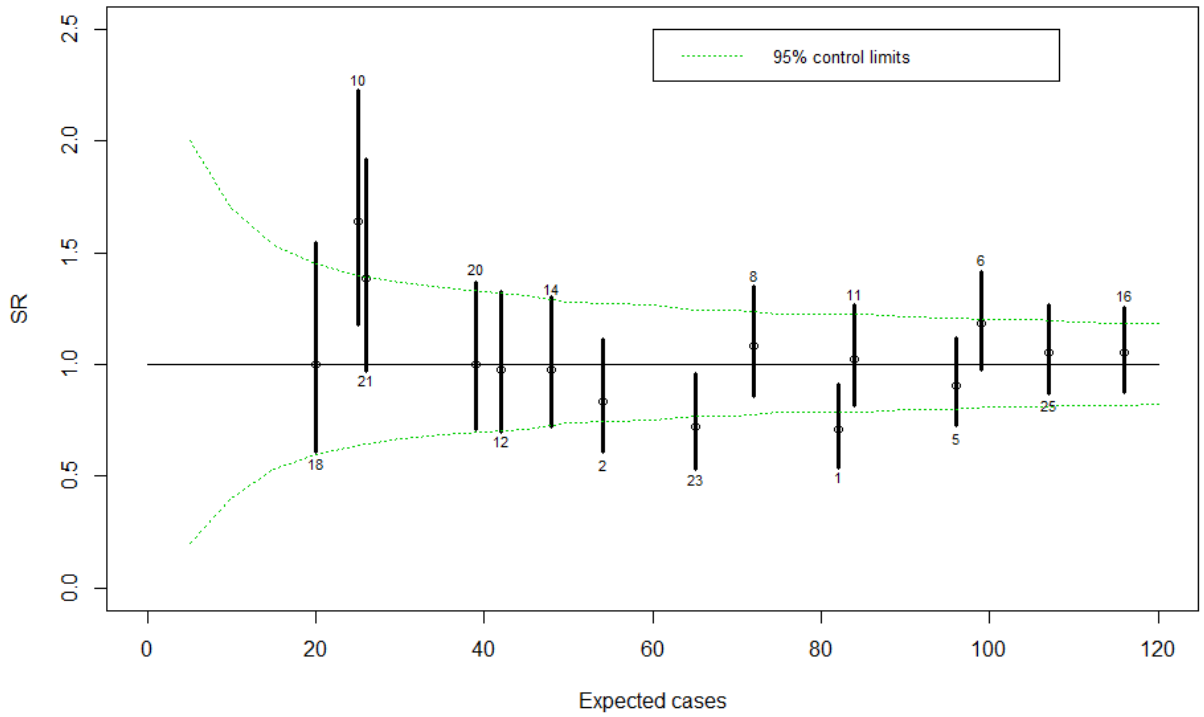
# Appendix II. Site Comparisons for Epoch 1– Adjusted Standardized Ratios by Site

## Presentation No 32: Adjusted standardized ratios by site Neurodevelopmental impairment for Epoch 1 cohort (Births April 1, 2009 – September 30, 2011)

| Site | Children (n) | Follow-up rate (%) | Included (Yes/No) | NDI (n) | Adjusted expected NDI (n) | Adjusted standardized ratio (95%CI) |
|---|---|---|---|---|---|---|
| 1 | 168 | 76.6 | Y | 58 | 82 | 0.71 (0.54, 0.91) |
| 2 | 115 | 87.8 | Y | 45 | 54 | 0.83 (0.61, 1.12) |
| 3 | 10 | 84.6 | N | 7 | | |
| 4 | 13 | 76.5 | N | 3 | | |
| 5 | 205 | 80.1 | Y | 87 | 96 | 0.91 (0.73, 1.12) |
| 6 | 212 | 85.5 | Y | 117 | 99 | 1.18 (0.98, 1.42) |
| 7 | 27 | 56.6 | N | 8 | | |
| 8 | 145 | 71.4 | Y | 78 | 72 | 1.08 (0.86, 1.35) |
| 9 | 53 | 48.2 | N | 23 | | |
| 10 | 56 | 81.2 | Y | 41 | 25 | 1.64 (1.18, 2.22) |
| 11 | 178 | 79.8 | Y | 86 | 84 | 1.02 (0.82, 1.26) |
| 12 | 84 | 82.4 | Y | 41 | 42 | 0.98 (0.70, 1.32) |
| 13 | 21 | 56.8 | N | 5 | | |
| 14 | 103 | 76.3 | Y | 47 | 48 | 0.98 (0.72, 1.30) |
| 15 | 30 | 60.8 | N | 13 | | |
| 16 | 250 | 83.1 | Y | 122 | 116 | 1.05 (0.87, 1.26) |
| 17 | 64 | 39.3 | N | 31 | | |
| 18 | 43 | 91.5 | Y | 20 | 20 | 1.00 (0.61, 1.54) |
| 19 | 17 | 25.8 | N | 5 | | |
| 20 | 79 | 78.2 | Y | 39 | 39 | 1.00 (0.71, 1.37) |
| 21 | 55 | 93.2 | Y | 36 | 26 | 1.38 (0.97, 1.92) |
| 22 | 13 | 65 | N | 2 | | |
| 23 | 132 | 79.5 | Y | 47 | 65 | 0.72 (0.53, 0.96) |
| 24 | 7 | 53.8 | N | 4 | | |
| 25 | 238 | 78.2 | Y | 113 | 107 | 1.06 (0.87, 1.27) |
| 26 | 18 | 81.8 | N | 9 | | |

1. Sites with <20 participants for the 2.5year Epoch 1 cohort period and/or <70% follow-up rates are excluded.
2. Model is adjusted for gestational age, sex, outborn, severity of illness (SNAP>20), bronchopulmonary dysplasia, necrotizing enterocolitis Bell's stage 2 or greater and severe brain injury, defined as any grade

3 or 4 intraventricular hemorrhage, ventricular dilatation ≥10 mm, intraparenchymal hemorrhage or periventricular leukomalacia.



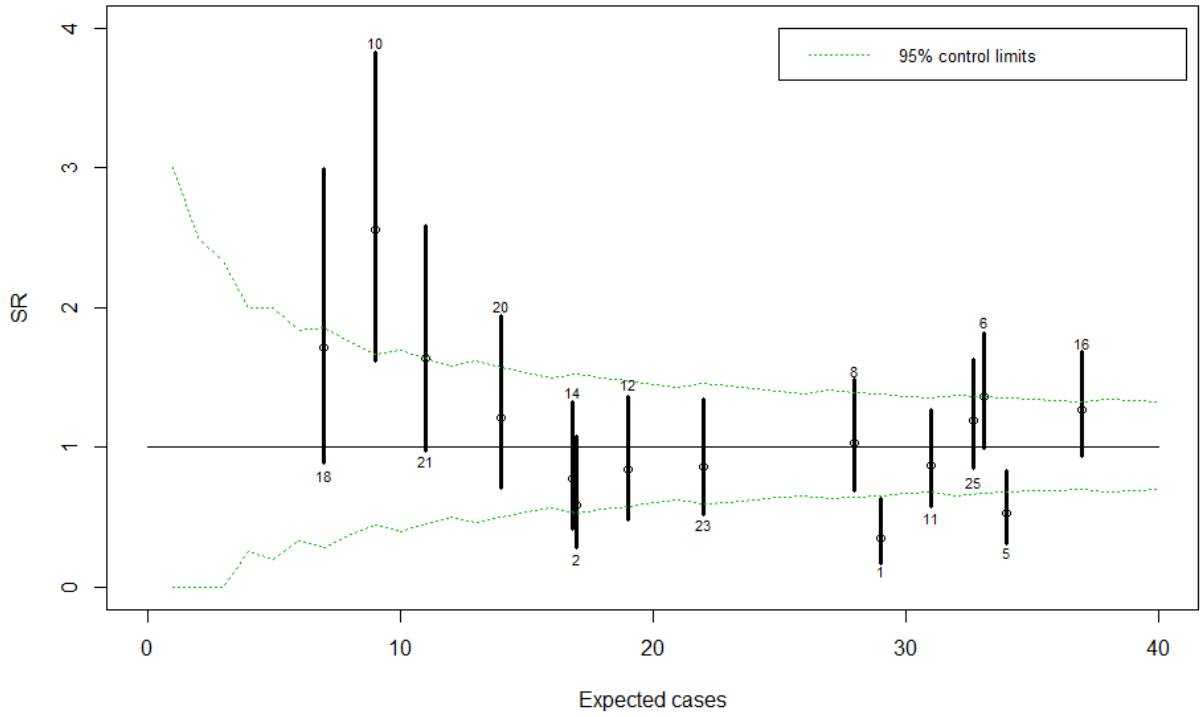

**COMMENTS:**

Sites with points outside the green "funnel" represent higher or lower adjusted NDI rates than expected. When the 95% confidence interval does not cross 1, the results are statistically significant. Therefore, 3 sites (1, 10 and 23) have statistically higher or lower NDI rates.

## Presentation No 33: Adjusted standardized ratios by site
## Significant neurodevelopmental impairment for Epoch 1 cohort
## (Births April 1, 2009 – September 30, 2011)

| **Site** | **Children** (n) | **Follow-up rate** (%) | **Included** (Yes/No) | **sNDI** (n) | **Adjusted expected sNDI** (n) | **Adjusted standardized ratio** (95%CI) |
|---|---|---|---|---|---|---|
| 1 | 168 | 76.6 | Y | 10 | 29 | 0.34 (0.17, 0.63) |
| 2 | 115 | 87.8 | Y | 10 | 17 | 0.59 (0.28, 1.08) |
| 3 | 10 | 84.6 | N | 3 | | |
| 4 | 13 | 76.5 | N | 0 | | |
| 5 | 205 | 80.1 | Y | 18 | 34 | 0.53 (0.31, 0.84) |
| 6 | 212 | 85.5 | Y | 45 | 33 | 1.36 (0.99, 1.82) |
| 7 | 27 | 56.6 | N | 4 | | |
| 8 | 145 | 71.4 | Y | 29 | 28 | 1.04 (0.69, 1.49) |
| 9 | 53 | 48.2 | N | 8 | | |
| 10 | 56 | 81.2 | Y | 23 | 9 | 2.56 (1.62, 3.83) |
| 11 | 178 | 79.8 | Y | 27 | 31 | 0.87 (0.57, 1.27) |
| 12 | 84 | 82.4 | Y | 16 | 19 | 0.84 (0.48, 1.37) |
| 13 | 21 | 56.8 | N | 5 | | |
| 14 | 103 | 76.3 | Y | 13 | 17 | 0.76 (0.41, 1.31) |
| 15 | 30 | 60.8 | N | 8 | | |
| 16 | 250 | 83.1 | Y | 47 | 37 | 1.27 (0.93, 1.69) |
| 17 | 64 | 39.3 | N | 14 | | |
| 18 | 43 | 91.5 | Y | 12 | 7 | 1.71 (0.88, 2.99) |
| 19 | 17 | 25.8 | N | 0 | | |
| 20 | 79 | 78.2 | Y | 17 | 14 | 1.21 (0.71, 1.94) |
| 21 | 55 | 93.2 | Y | 18 | 11 | 1.64 (0.97, 2.59) |
| 22 | 13 | 65 | N | 1 | | |
| 23 | 132 | 79.5 | Y | 19 | 22 | 0.86 (0.52, 1.35) |
| 24 | 7 | 53.8 | N | 1 | | |
| 25 | 238 | 78.2 | Y | 39 | 33 | 1.18 (0.84, 1.62) |
| 26 | 18 | 81.8 | N | 4 | | |

1. Sites with <20 participants for the 2.5 year Epoch 1 cohort period and/or <70% follow-up rates are excluded.
2. Model is adjusted for gestational age, sex, antenatal steroids, severity of illness (SNAP>20), severe retinopathy of prematurity defined as stage 3 or greater in either eye or treatment with laser or injections of anti-vascular endothelial growth factor, nosocomial infection and brain injury, defined as any grade 3 or 4 intraventricular hemorrhage, ventricular dilatation ≥10 mm, intraparenchymal hemorrhage or periventricular leukomalacia.



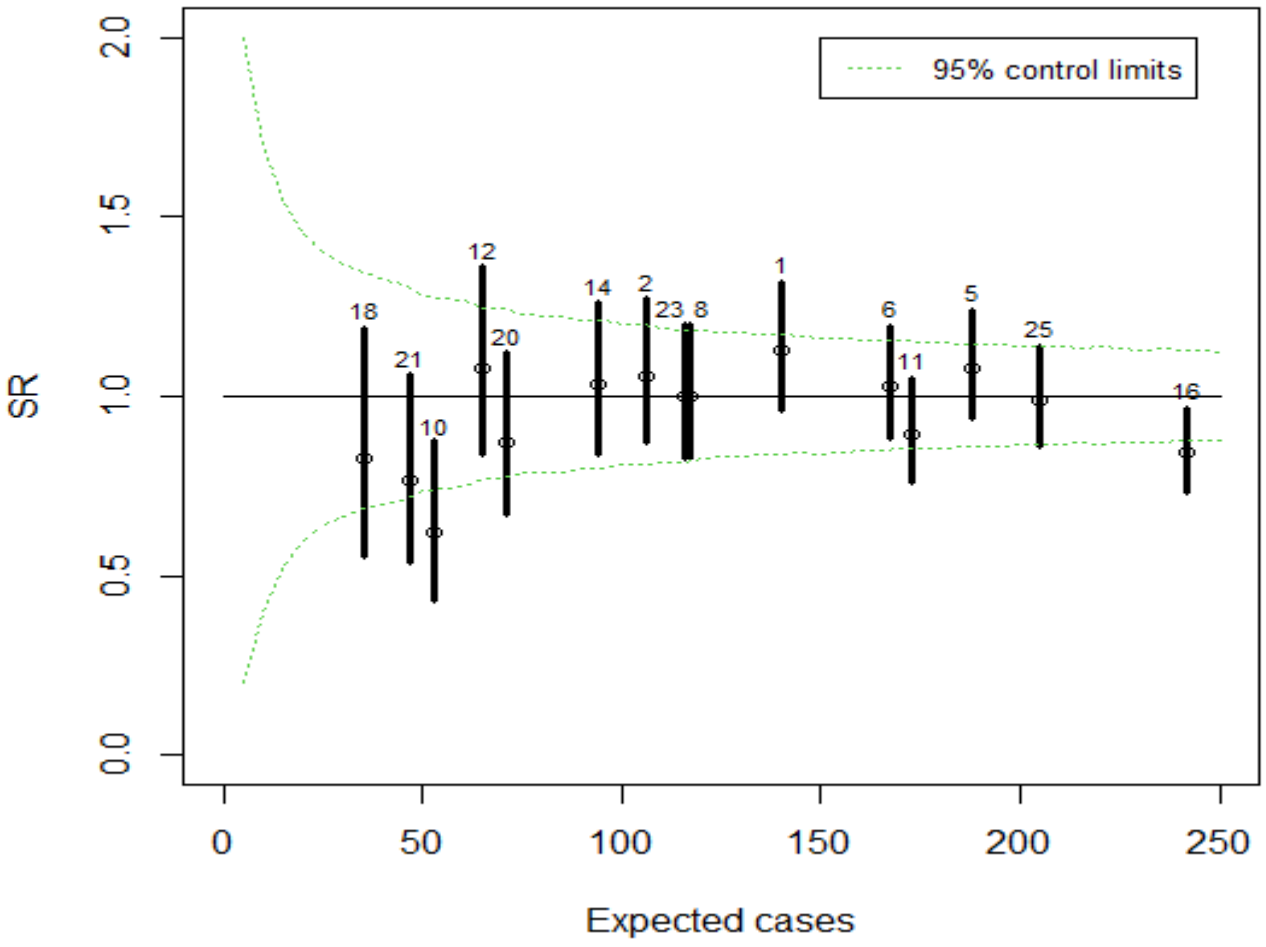

**COMMENTS:**

Sites with points outside the green "funnel" represent higher or lower adjusted sNDI rates than expected. When the 95% confidence interval does not cross 1, the results are statistically significant. Therefore, 3 sites (1, 5, and 10) have statistically higher or lower sNDI rates.

## Presentation No 34: Adjusted standardized ratios by site
## Survival without significant neurodevelopmental impairment for Epoch 1 cohort
## (Births April 1, 2009 – September 30, 2011)

| Site | Children (n) | Follow-up rate (%) | Included (Yes/No) | Survival without sNDI (n) | Adjusted expected outcome (n) | Adjusted standardized ratio (95%CI) |
|---|---|---|---|---|---|---|
| 1 | 205 | 76.6 | Y | 158 | 140 | 1.13 (0.96, 1.32) |
| 2 | 143 | 87.8 | Y | 112 | 106 | 1.06 (0.87, 1.27) |
| 3 | 11 | 84.6 | N | 8 | | |
| 4 | 16 | 76.5 | N | 13 | | |
| 5 | 268 | 80.1 | Y | 203 | 188 | 1.08 (0.94, 1.24) |
| 6 | 233 | 85.5 | Y | 172 | 167 | 1.03 (0.88, 1.20) |
| 7 | 33 | 56.6 | N | 26 | | |
| 8 | 181 | 71.4 | Y | 117 | 117 | 1.00 (0.83, 1.20) |
| 9 | 80 | 48.2 | N | 45 | | |
| 10 | 74 | 81.2 | Y | 33 | 53 | 0.62 (0.43, 0.87) |
| 11 | 254 | 79.8 | Y | 155 | 173 | 0.90 (0.76, 1.05) |
| 12 | 105 | 82.4 | Y | 70 | 65 | 1.08 (0.84, 1.36) |
| 13 | 30 | 56.8 | N | 16 | | |
| 14 | 130 | 76.3 | Y | 97 | 94 | 1.03 (0.84, 1.26) |
| 15 | 44 | 60.8 | N | 23 | | |
| 16 | 342 | 83.1 | Y | 204 | 242 | 0.84 (0.73, 0.97) |
| 17 | 115 | 39.3 | N | 50 | | |
| 18 | 50 | 91.5 | Y | 29 | 35 | 0.83 (0.55, 1.19) |
| 19 | 28 | 25.8 | N | 17 | | |
| 20 | 114 | 78.2 | Y | 62 | 71 | 0.87 (0.67, 1.12) |
| 21 | 71 | 93.2 | Y | 36 | 47 | 0.77 (0.54, 1.06) |
| 22 | 15 | 65 | N | 12 | | |
| 23 | 168 | 79.5 | Y | 116 | 116 | 1.00 (0.83, 1.20) |
| 24 | 13 | 53.8 | N | 6 | | |
| 25 | 283 | 78.2 | Y | 203 | 205 | 0.99 (0.86, 1.14) |
| 26 | 19 | 81.8 | N | 14 | | |

1. Sites with <20 participants for the 2.5 year Epoch 1 cohort period and/or <70% follow-up rates are excluded.
2. Model is adjusted for gestational age, sex, antenatal steroids, Apgar <7, multiples, outborn, severity of illness (SNAP>20), necrotizing enterocolitis Bell's stage 2 or greater and severe brain injury, defined as any grade 3 or 4 intraventricular hemorrhage, ventricular dilatation ≥10 mm, intraparenchymal hemorrhage or periventricular leukomalacia.




**COMMENTS:**

Sites with points outside the green "funnel" represent higher or lower adjusted survival without significant NDI rates than expected. When the 95% confidence interval does not cross 1, the results are statistically significant. Therefore, 2 sites (10 and 16) have statistically lower survival without significant NDI rates.