

▀ Beyond Discharge: Creating a Continuum of Care for Infants with NAS

Sara Mills-Huffnagle, MS, PhD

**No conflicts of interest to disclose*

“He’s [the baby] gone through opioid withdrawal... he is a normal baby. There is nothing to see here.”

- 10-day NICU stay
- No early intervention or service referrals
- No recommendations or plans in place for follow-up
- Future routine well child visits had no context of child’s medical history



Lenette Serlo, CEO & Founder



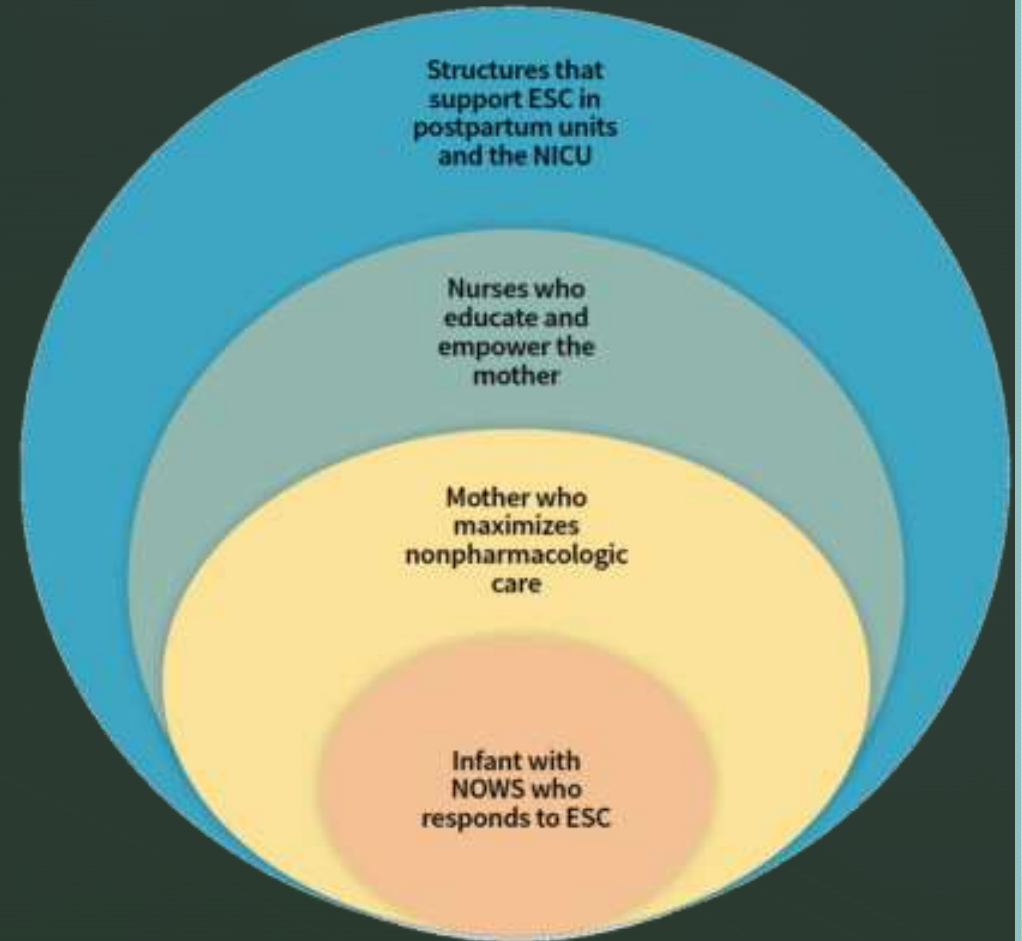
Progress HAS been made!



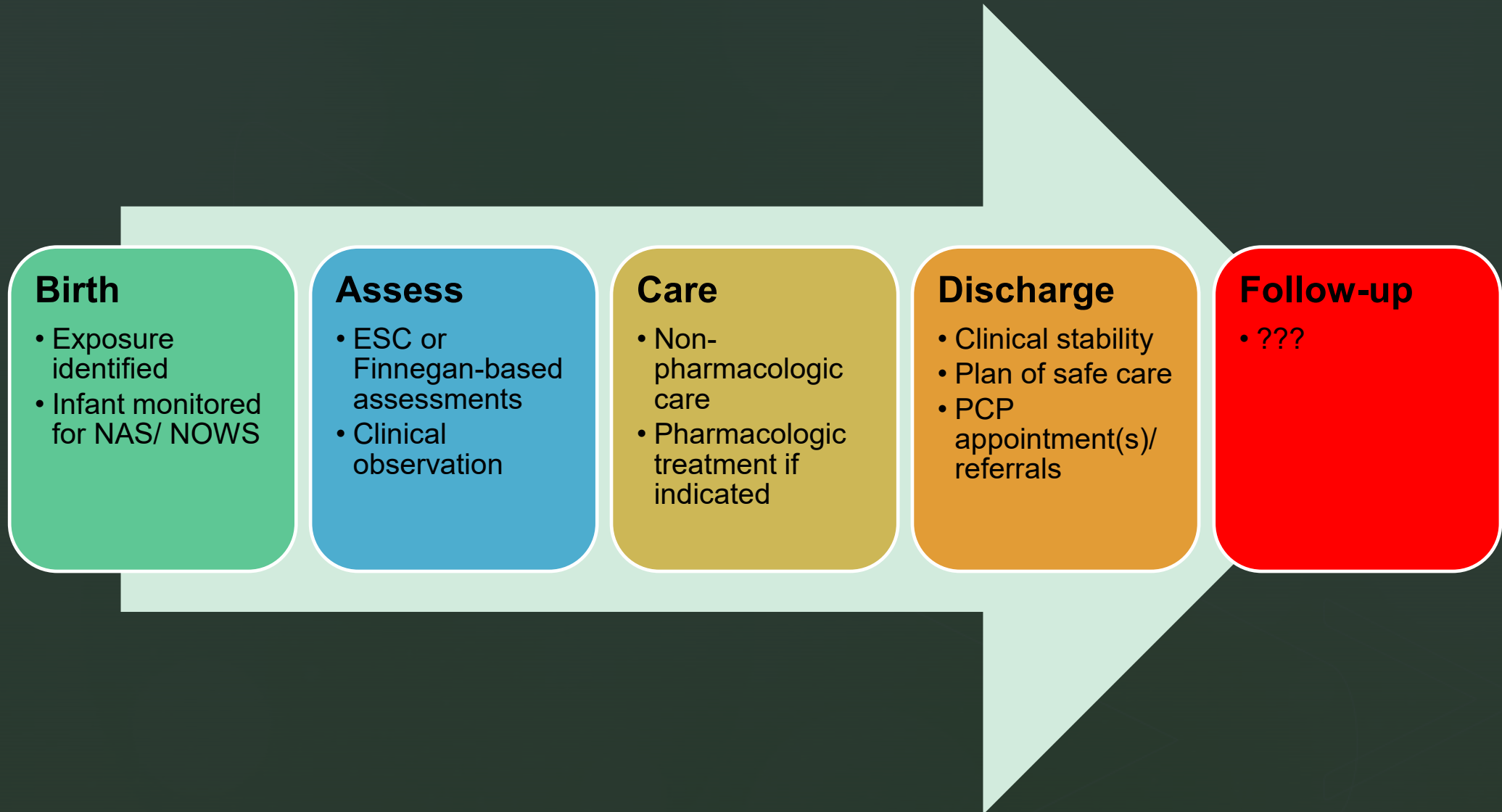
- Eat, Sleep, Console framework
 - Reduce hospital stay
 - Reduce use of medication for treatment
 - Non-pharmacologic treatment prioritization
 - Encourage family-centered care

Progress HAS been made!

- Family-centered care
 - Multidisciplinary teams
 - Address barriers to care (including stigma!)
 - Trauma-informed care
 - Rooming-in
 - Breastfeeding and lactation support
 - Educating mothers and caregivers
 - Empowering/ coaching mothers and caregivers
 - Involving family in care and treatment discussions



▀ The Typical Journey

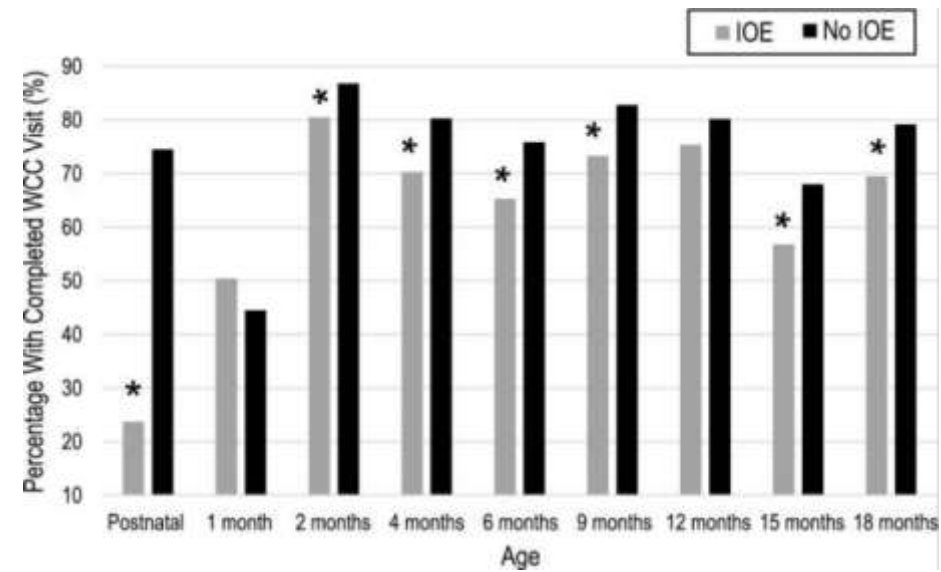


“Once the immediate withdrawal signs of NOWS have passed, there is a clear drop in evidence-based practice and recommendations”

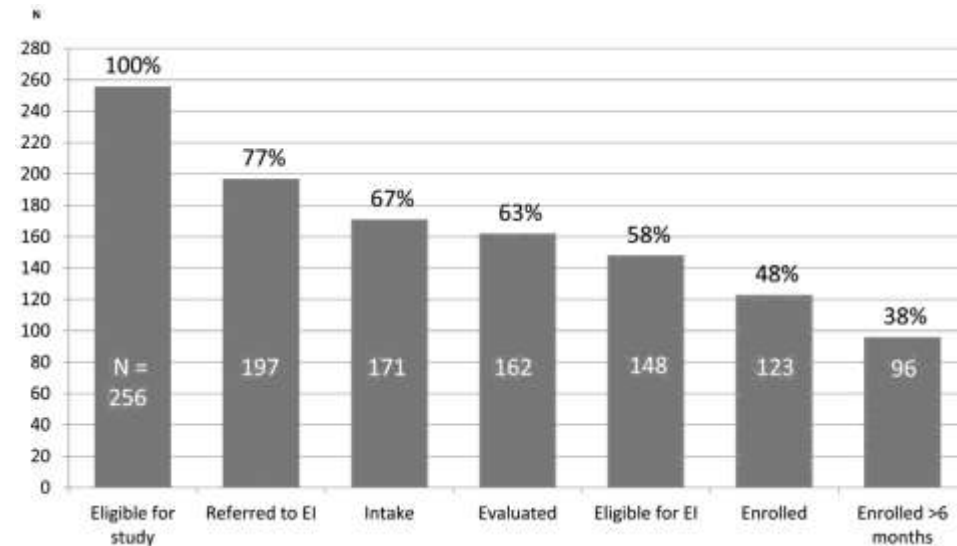
(Mascarenhas et al., 2024, *Pediatrics*)

One year after birth:

- Lower rates of attendance at well-child visits
- Lower rates of attendance at recommended developmental follow-up visits



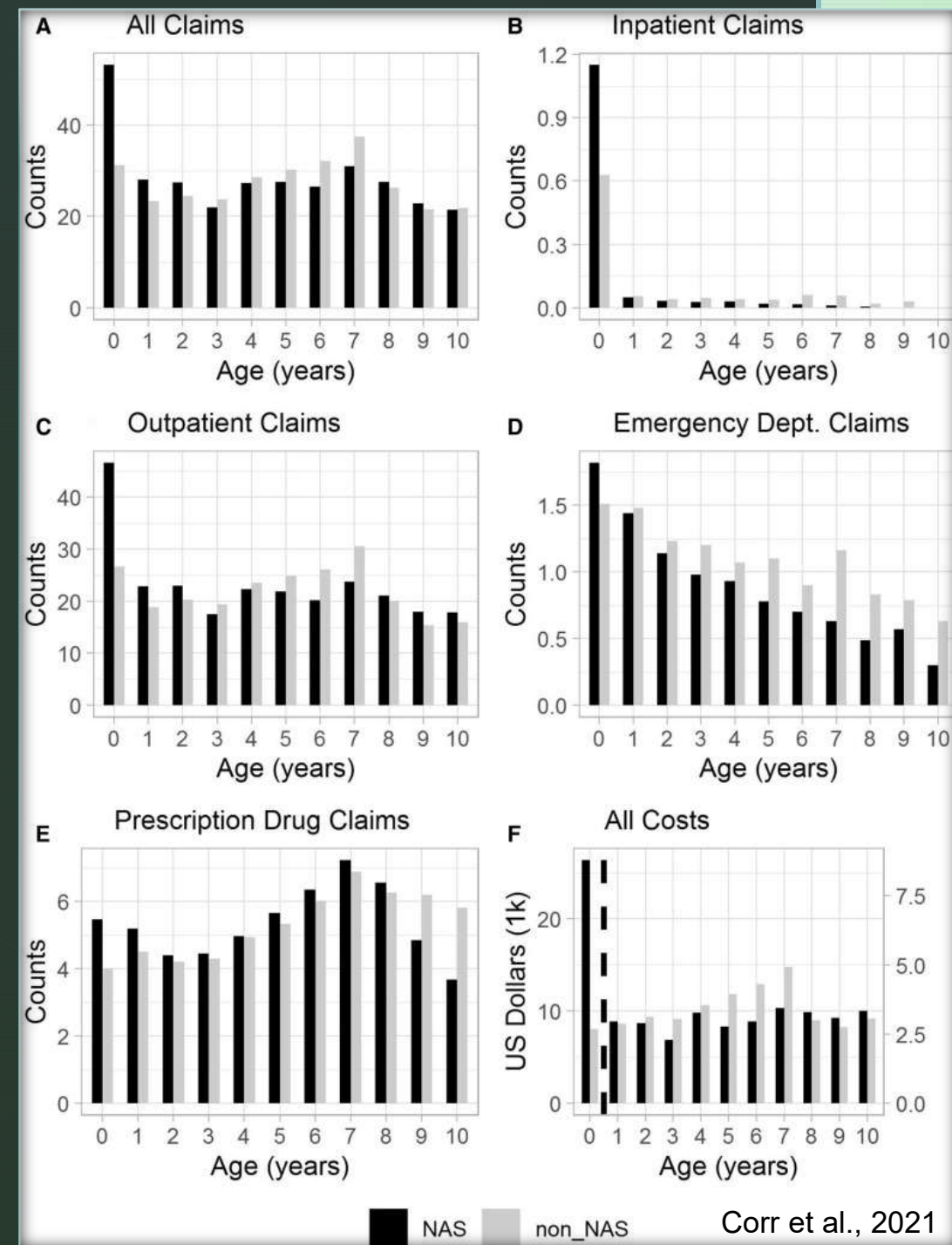
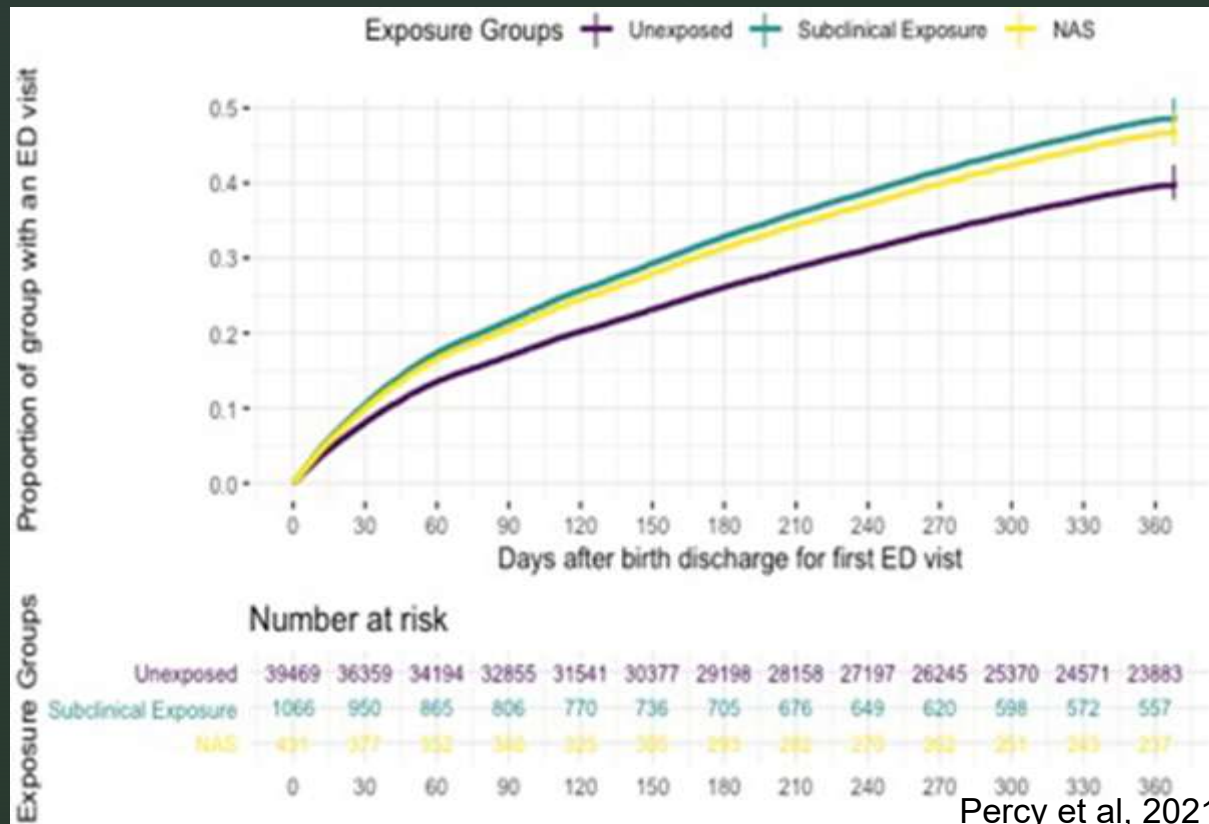
Goyal et al., 2020



Peacock-Chambers et al., 2020

One year after birth:

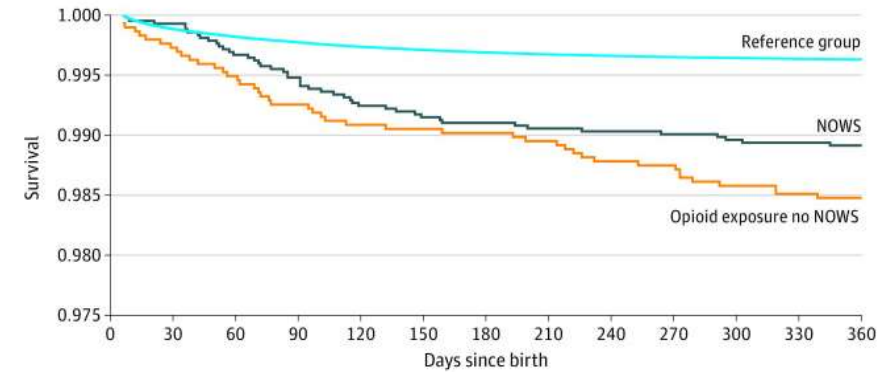
- Higher rate of hospital admissions (Liu et al., 2019; Corr et al., 2021, Percy et al., 2020)
- Higher rate of ED visits (Liu et al., 2019; Corr et al., 2021)



One year after birth:

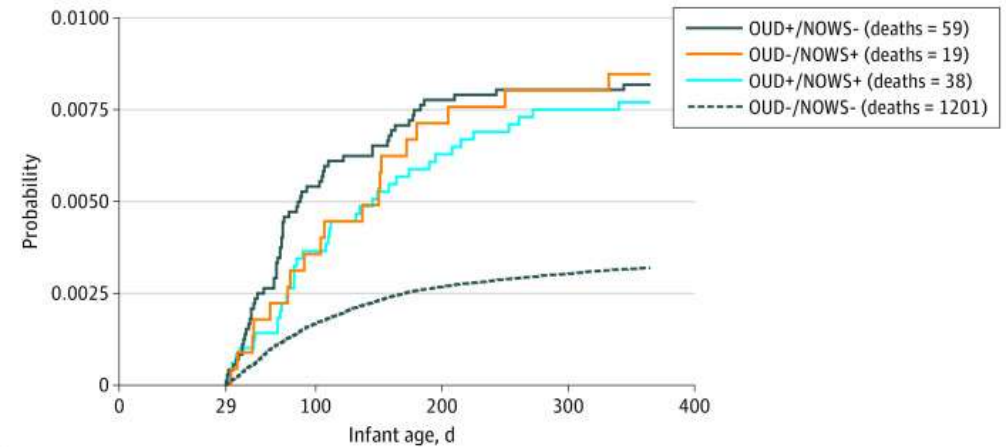
- Increased risk of mortality

B Probability of survival from 5 d



No. at risk			
NOWS	4238		4190
Opioid exposure no NOWS	2969		2910
Reference group	1121825		1115466

Leyenaar et al., 2021



No. at risk						
OUD+/NOWS+	4922	0	4904	4891	4885	0
OUD+/NOWS-	7196	0	7157	7140	7138	0
OUD-/NOWS+	2239	0	2231	2223	2221	0
OUD-/NOWS-	375 718	0	375 090	374 712	374 578	0

Grossarth et al., 2023

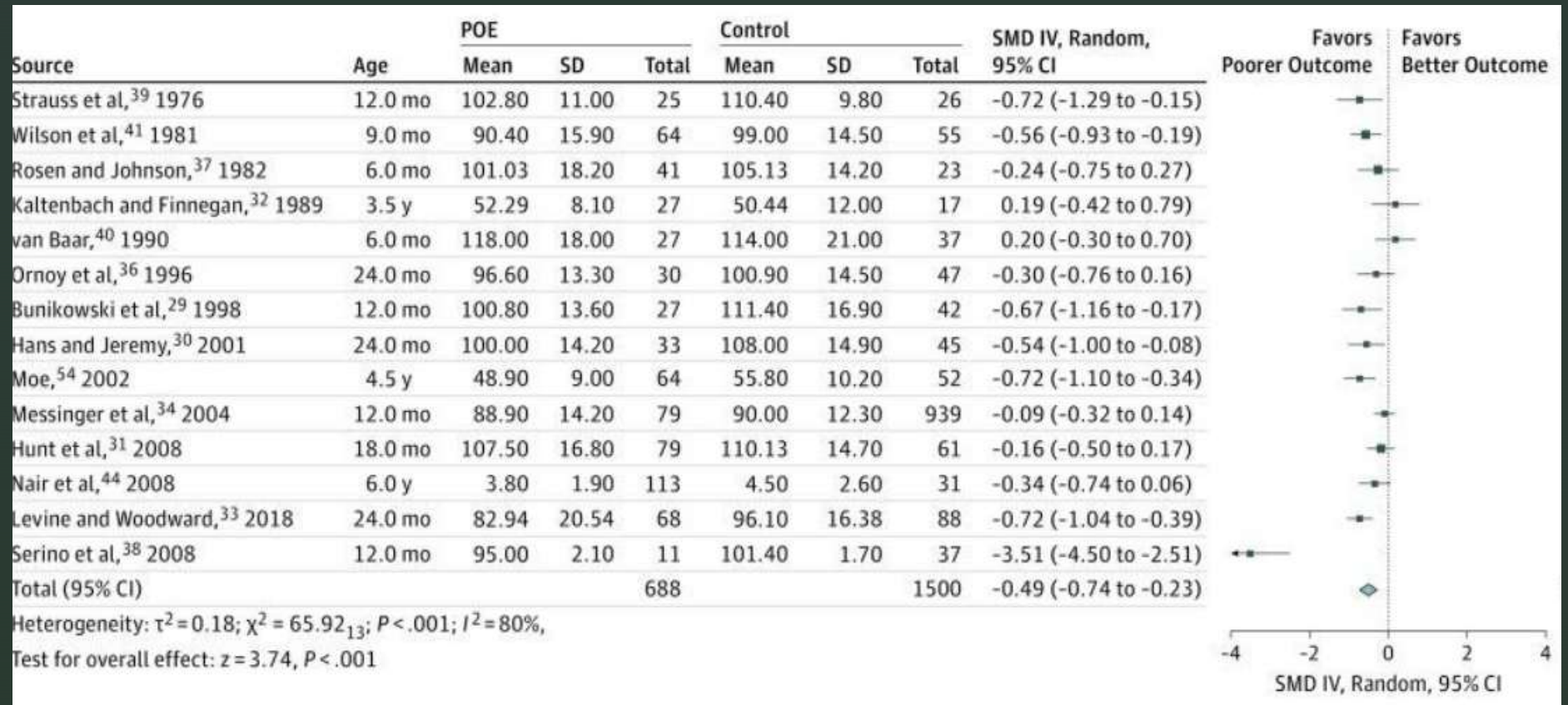
What about long-term outcomes?



- Motor function
- Speech development
- Sensory function
- Ophthalmologic disorders
- Educational/ neurocognitive outcomes
- Mental health outcomes

In many cases, literature is mixed AND other variables must be considered!

Motor function



*Literature is more consistent: Meta analyses by Aslaksen et al., 2024, and Robertson et al., 2025 found similar results

(Yeoh et al., 2019)

Speech development

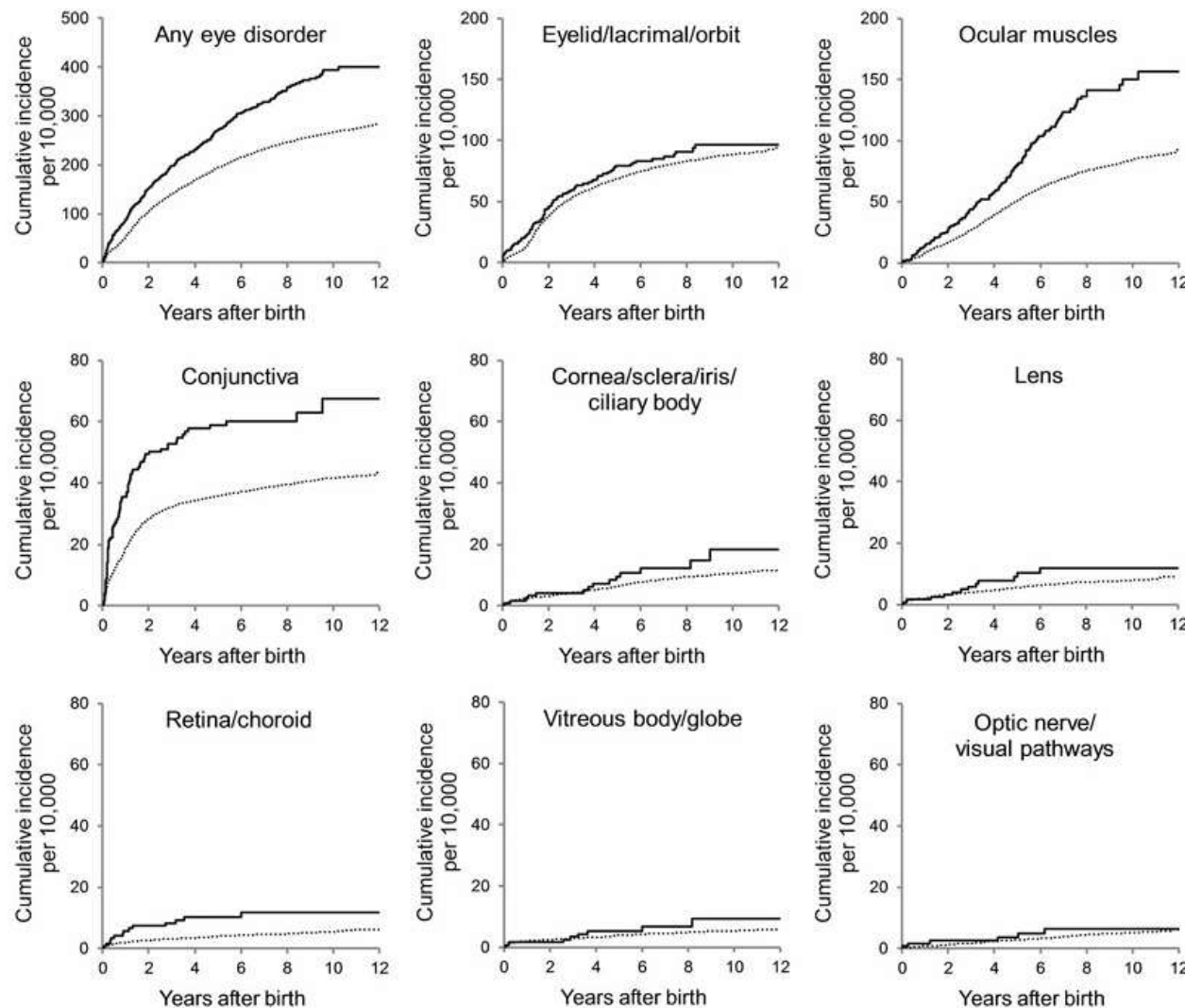
- 201 one-year-old infants exposed to opioids had lower Bayley-III scores for cognitive, language and motor domains compared to normative data (Benninger et al., 2022)
 - 10% of these children received a speech-language pathology referral prior to 2 years of age (Benninger et al., 2022)
 - Parenting/ home quality and participant in early childhood programming – two positive mediators (Benninger et al., 2022)
- By 4.5 years of age, opioid-exposed children had lower language fundamental scores (Clinical Evaluation of Language Fundamentals-Preschool) compared to non-exposed children (Kim et al., 2021)
- Unlikely to be a difference in speech development by age 5 (Benninger et al., 2022; Skovlund et al., 2020)

■ Sensory function

- 39 maternal-infant pairs (total N =78)
 - HC average age: 6.9 months
 - NOWS average age: 6.8 months
- Completion of the Infant / Toddler Sensory Profile (ITSP)
 - Parent completed questionnaire assessing sensation seeking, sensory sensitive, and sensory avoidant behaviors.
- Higher proportion of NOWS infants scored 'more than others' on *sensation seeking*.
 - Actively engaging sensory information via biting/ mouthing and touching.

*Mixed results within the literature

■ Ophthalmologic disorders

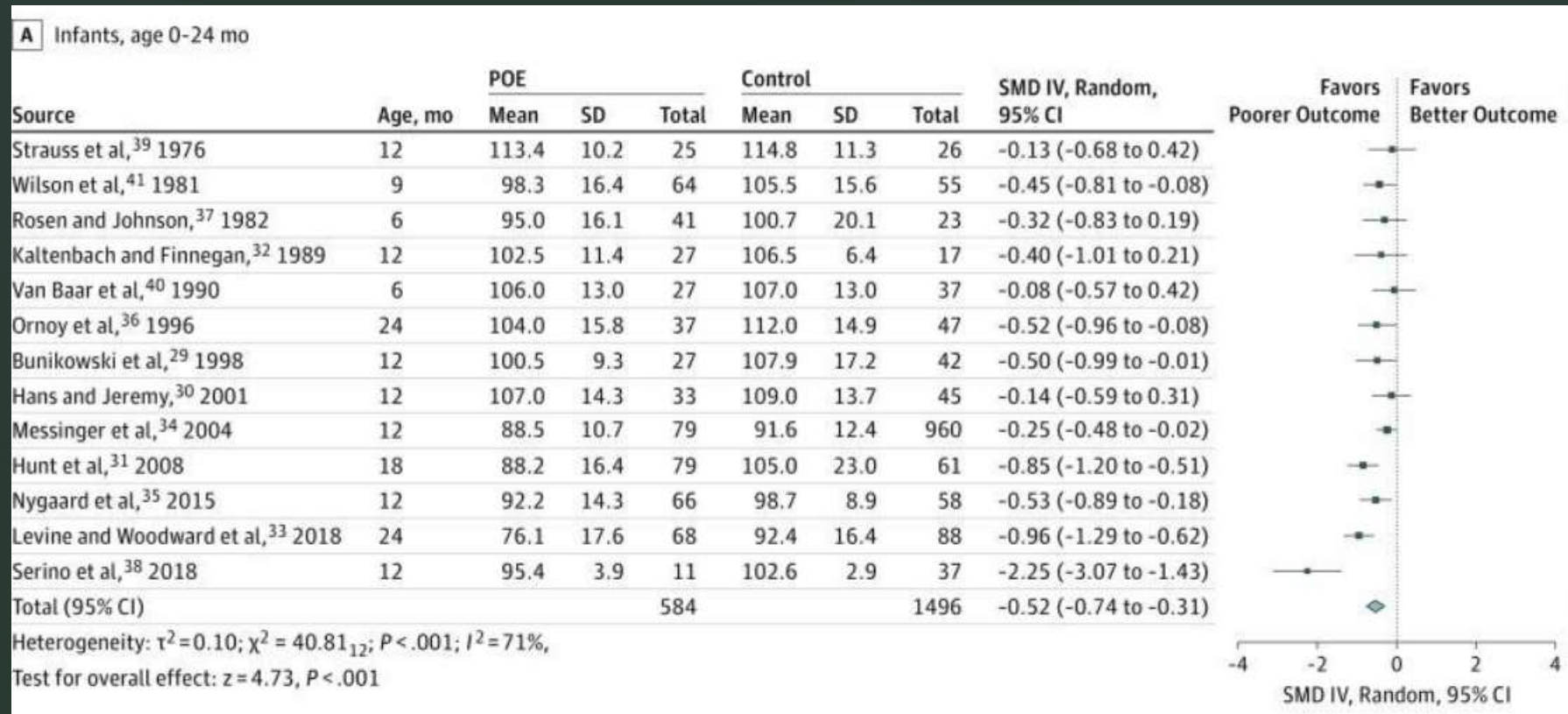


- Longitudinal cohort study of 794,099 infants in Quebec
 - Born between 2006 – 2016
- Infants exposed various substances (e.g., opioids, cocaine, cannabis) compared to controls
- All infants with substance exposure had a higher incidence of hospitalization for eye disorders
 - Strabismus
 - Binocular movement disorders
 - Opioid use was strongly associated with ocular muscle disorders

*Mixed results within the literature

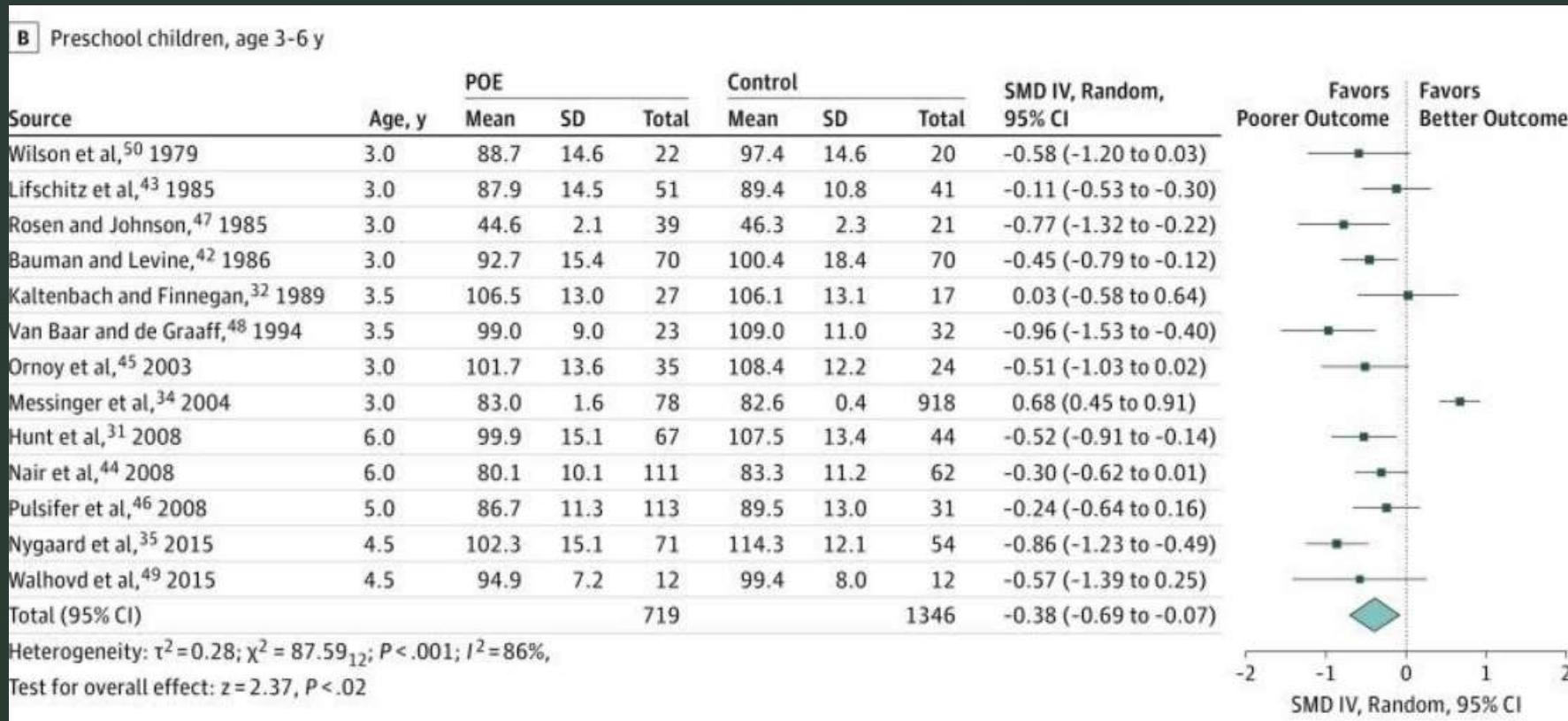
(Auger et al., 2020)

Educational/ cognitive outcomes



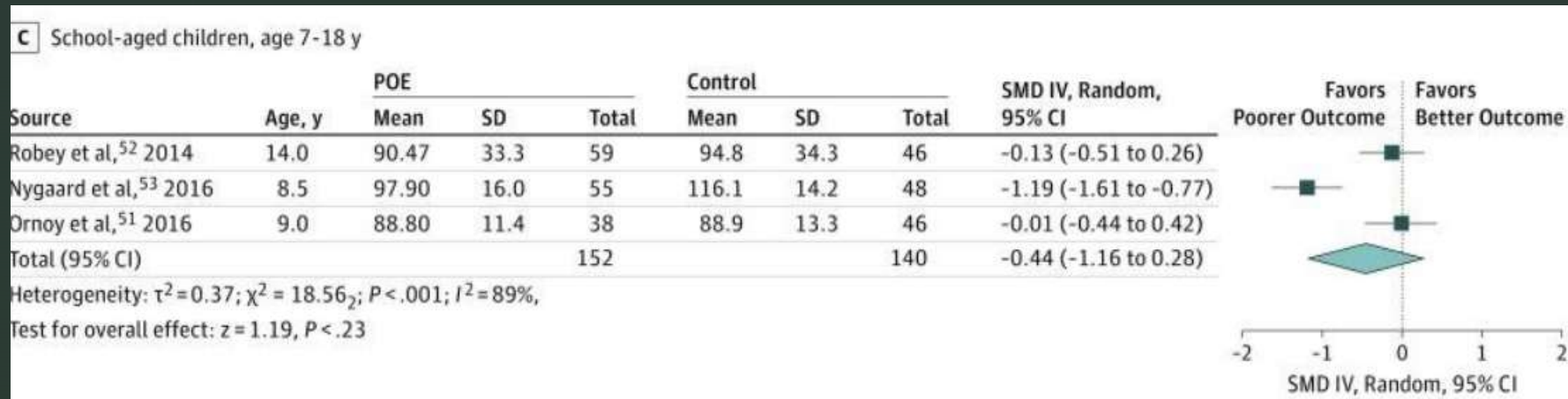
*Highly mixed/ debated results within the literature

Educational/ neurocognitive outcomes



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Educational/ neurocognitive outcomes



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Mental health outcomes

- ICD-9 codes to identify births from January 2008 – September 2010
- Diagnosis of NAS vs. all other births
- Outcomes were mental disorders diagnosed between ages 1 and 5 years of age
- **~50% diagnosed with a mental disorder before age 5, compared to 30% of all other births.
 - ADHD
 - Adjustment reaction
 - Intellectual disabilities

ICD-9 diagnostic category and code group	NAS births (N=1,046)		All other births (N=269,726)		Z score
	N	%	N	%	
Any mental disorder	511	48.9	81,814	30.3	12.996*
Specific delays in development (e.g., language, coordination) (315)	327	31.3	49,591	18.4	10.719*
Disturbance of conduct (312)	113	10.8	10,879	4.0	11.073*
Hyperkinetic syndrome of childhood (e.g., ADHD) (314)	94	9.0	9,372	3.5	9.687*
Adjustment reaction (309)	75	7.2	7,799	2.9	8.220*
Acute reaction to stress (308)	49	4.7	8,123	3.0	3.156*
Neurotic disorders (e.g., anxiety) (300)	43	4.1	7,365	2.7	2.731*
Special symptoms or syndromes (307)	41	3.9	9,672	3.6	.579
Disturbance of emotions specific to childhood and adolescence (313)	39	3.7	5,350	2.0	4.033*
Intellectual disabilities (317–319)	37	3.5	4,074	1.5	5.351*
Psychoses with origin specific to childhood (e.g., autism spectrum, pervasive developmental disorders) (299)	32	3.1	4,752	1.8	3.179*

^a Diagnoses may co-occur. Prevalence of all other diagnostic code groups less than 1%. Source: Truven Health Analytics' Multi-State Medicaid Database.
*p<0.05

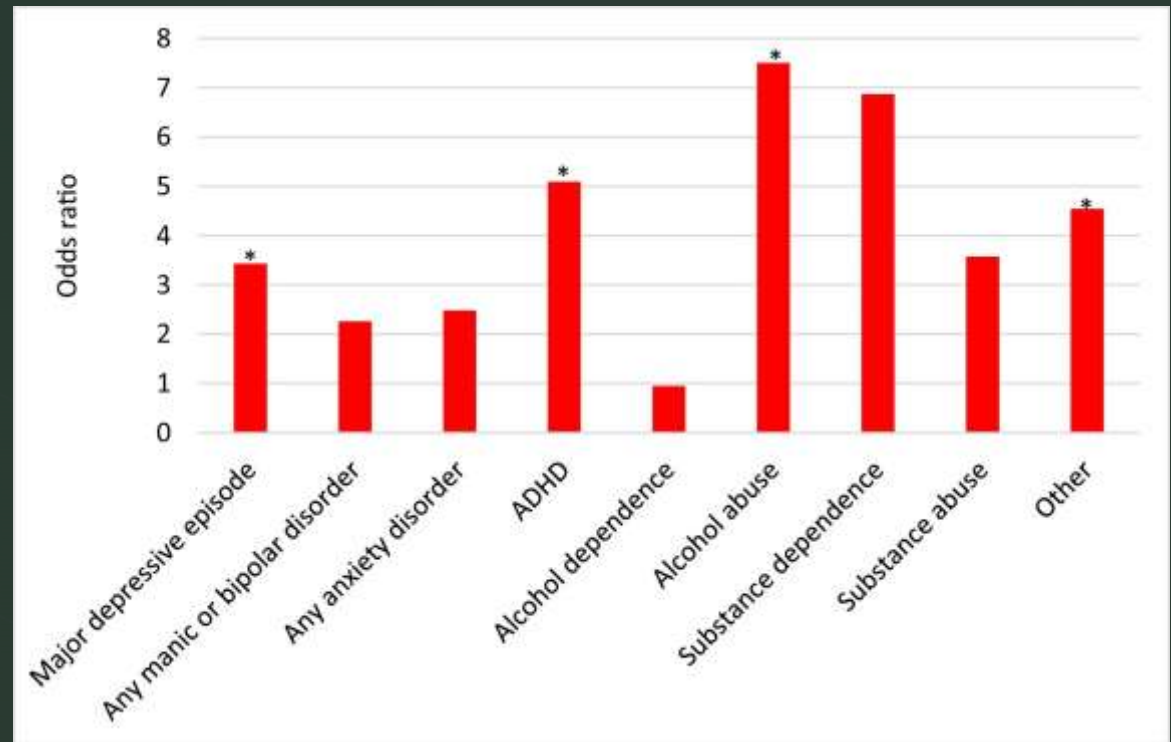
*Mixed results within the literature; need to consider confounding factors (maternal comorbidities; polysubstance exposure; adverse childhood events)

(Sherman et al., 2019)

■ Mental health outcomes

- Prenatally substance-exposed group* vs. group without known prenatal risk factors
- Outcomes were mental disorders in youth between 17 and 22 years of age
- Higher proportion of substance exposed youth diagnosed with:
 - Major depressive episodes
 - ADHD
 - Alcohol abuse
 - Higher scores on aggressive behavioral scale

*Mainly placed in permanent foster or adoptive homes in early infancy



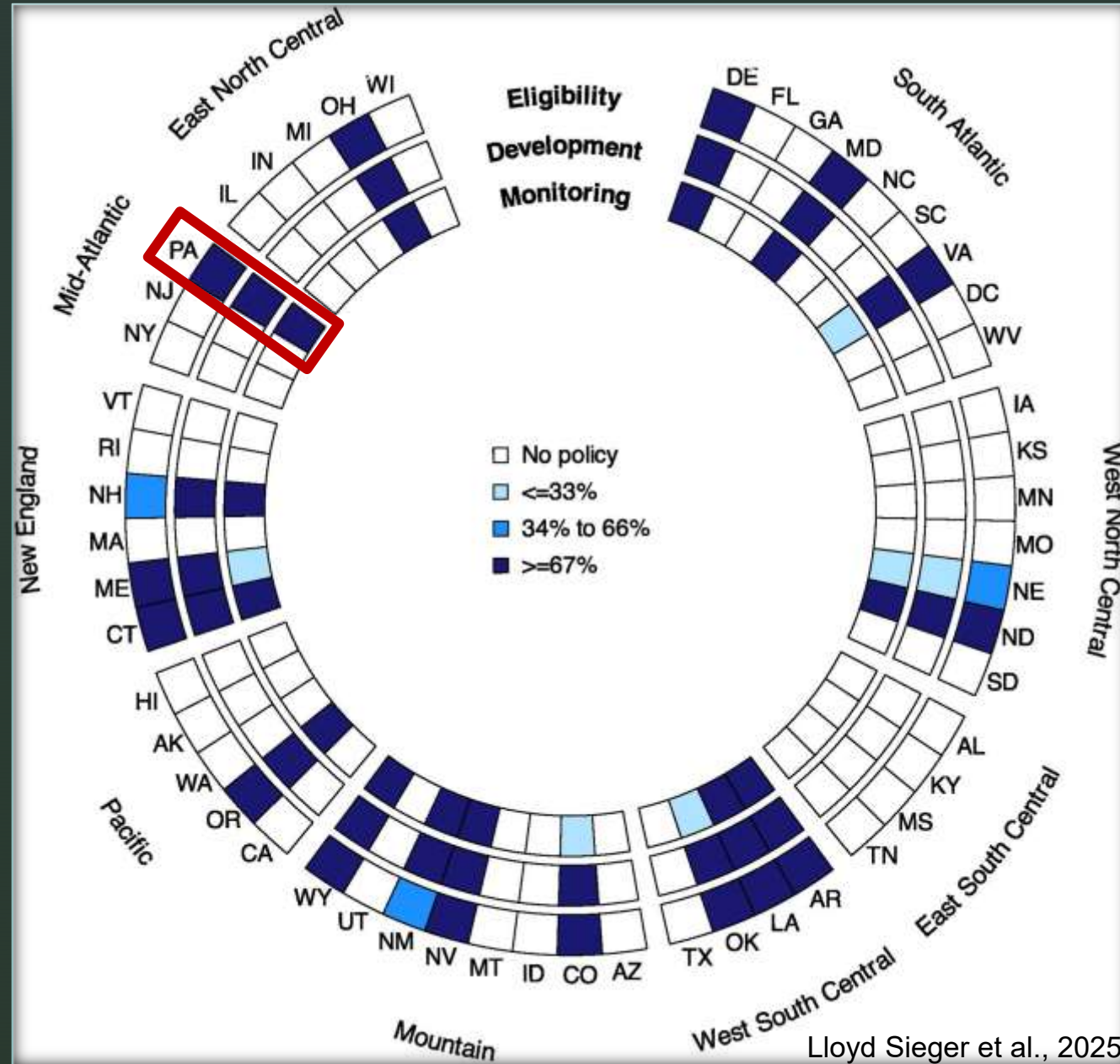
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(Nygaard et al., 2020)

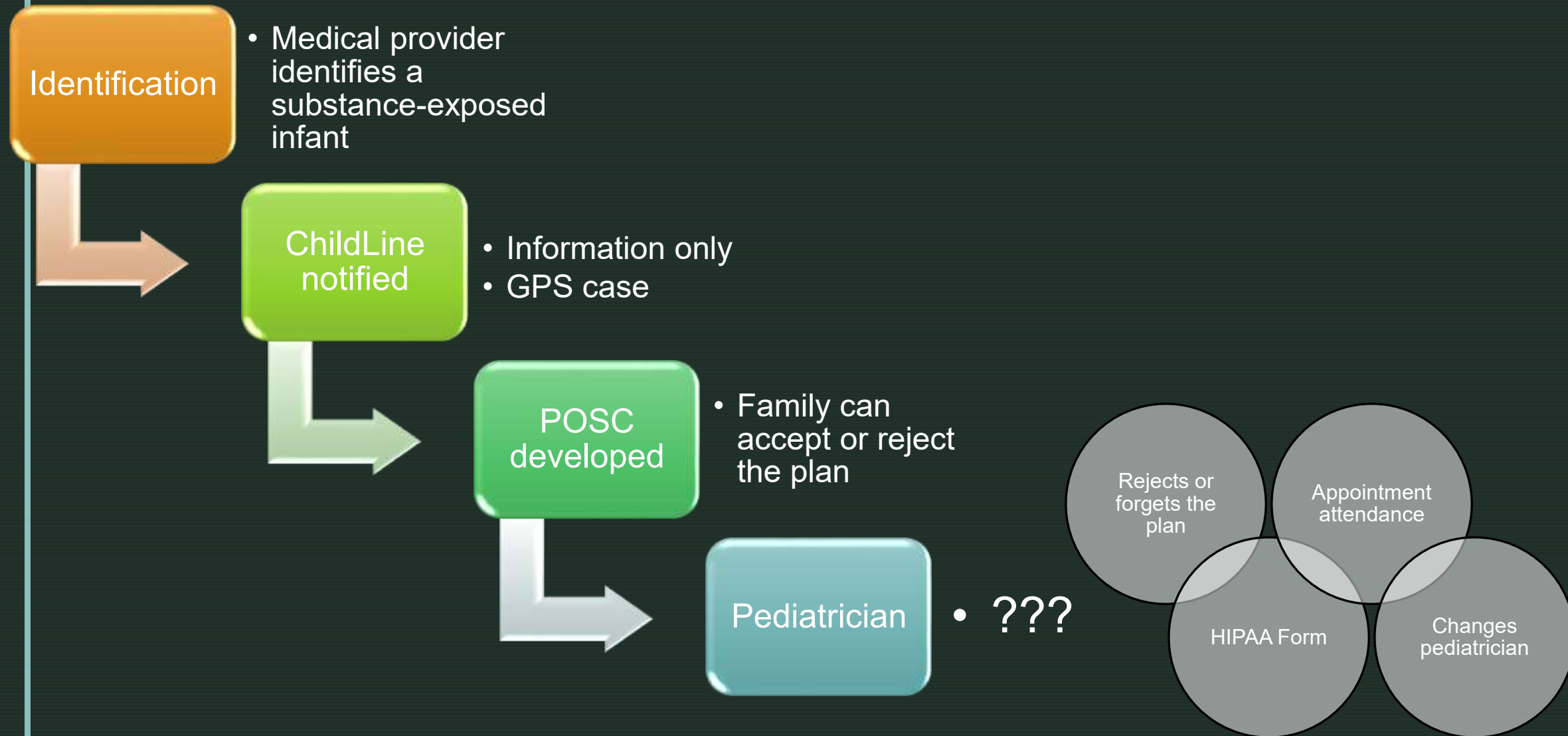
■ Infant Plan of Safe Care

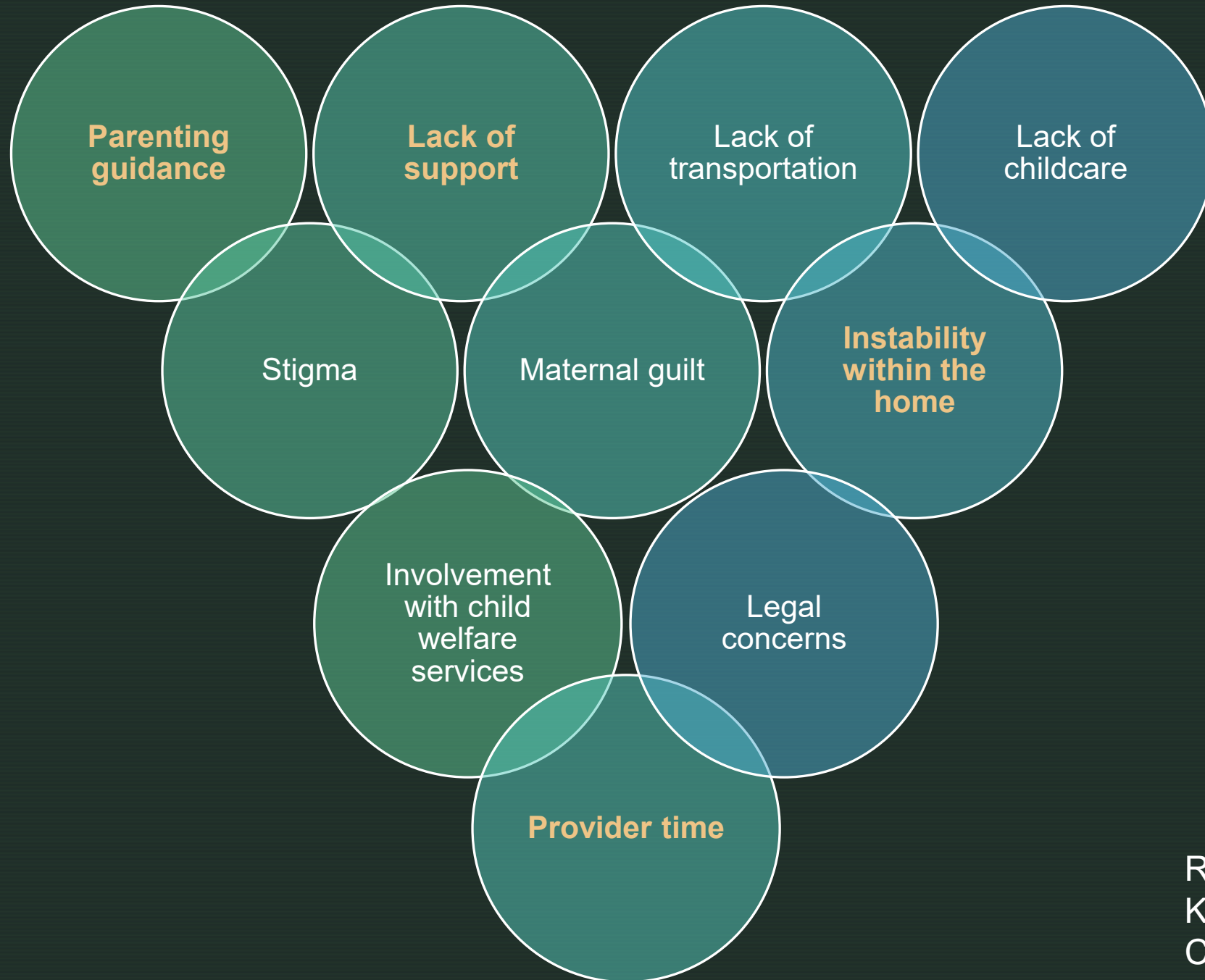
- Part of the Comprehensive Addiction and Recovery Act of 2016
- Designed to ensure safety of infants:
 - Home visitation
 - Early intervention services
 - Parenting supports
 - Maternal monitoring of depression, anxiety, and continued recovered

Infant Plan of Safe Care (POSC)



Pennsylvania and Infant POSCs





Rohde et al., 2024
Kim et al., 2022
Clarke et al., 2022

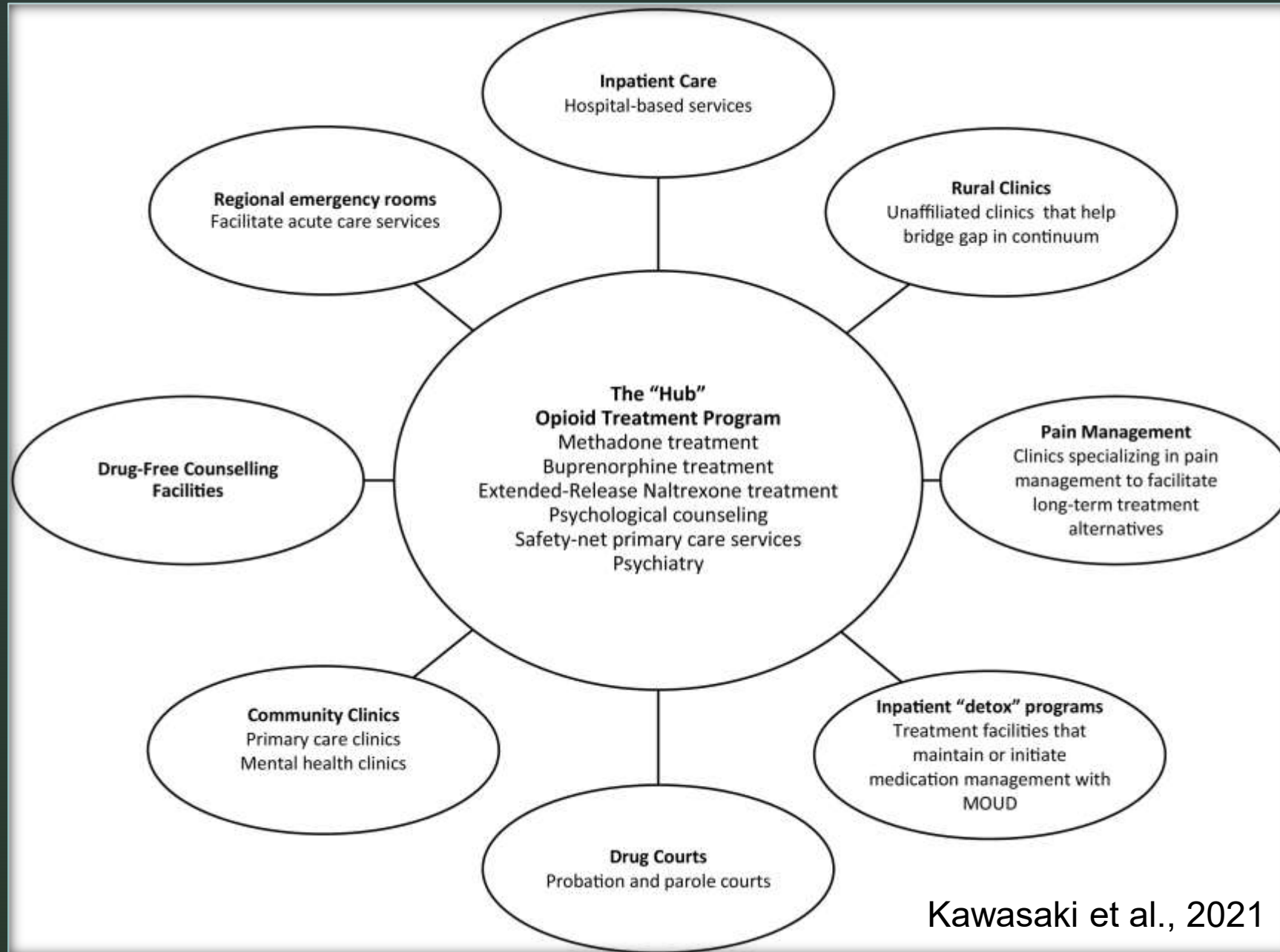
Call-to-Action: Standardizing Long-term Follow-up Care for Infants with NOWS

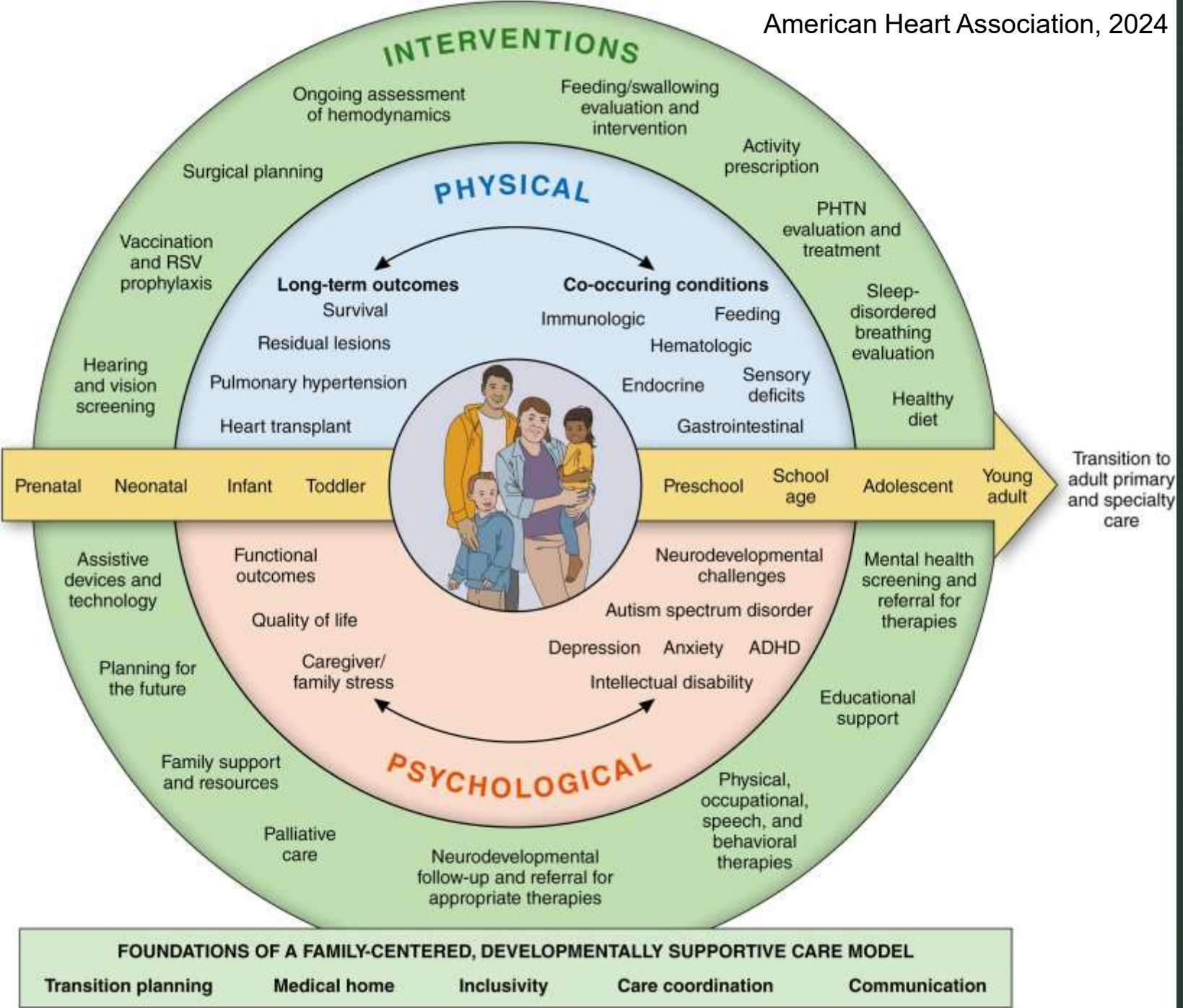
1. Identify and provide solutions to family barriers
2. Identify and provide solutions for provider time
3. Peer recovery support services
4. Education
5. Earlier infant assessment

■ Vermont's CHARM Collaborative

- Multidisciplinary Team:
 - Treat OUD for pregnant and postpartum women
 - Obstetric care
 - Pediatric care (infants up to 18 months)
- Comprehensive Framework + Five Targets:
 - Pre-pregnancy – Identifying risks, optimizing health, engaging individuals
 - Prenatal – Early initiation of prenatal care, MOUD, counseling
 - Birth – Coordinated delivery and immediate acute care management at medical centers
 - Neonatal – Monitoring and treating neonatal opioid withdrawal syndrome (NOWS) and supporting mother-infant dyad
 - Childhood and Adolescence – Extended pediatric care, developmental tracking, and family social support

Hub and Spoke Model of Care





Family Barriers

- Barriers of care have been evaluated from the perspectives of pediatric care providers:
 - Lack of support
 - Instability in the home
 - Need for parenting guidance
 - Stigma
- Barriers of care for affected infants may be similar to maternal experiences of care:
 - Fear of accessing services
 - Disrespectful care
 - Limited health and social services
 - Inconsistencies in care received
 - Transportation issues
 - Childcare issues

Rohde et al., 2024
Kim et al., 2022
Clarke et al., 2022

Provider Time

We recommend scheduling longer visit times with affected infants and families...



- More research needed in this space!
 - What are the provider constraints?
 - What amount of “time” is appropriate for this specific patient population?
 - Quantity vs. quality vs. all the above?
 - Adult chronic disease models, direct correlation between shorter visit lengths (< 15 minutes) and poorer prescribing habits (Dugdale et al., 1999).
 - Studies show that 20-25 minutes on average increases preventative screenings and **patient adherence to complex care regimens** (Dugdale et al., 1999; Roscoe-Nelson & Silvera, 2024)
 - Longer visits increase patient satisfaction and compliance, giving patients more confidence about managing their care at home (Sheridan, 2020, *Liberty University Honors Thesis*).

Peer recovery support services (PRSS)

- PRSS has shown increased attendance for medical appointments associated with OUD care for adults receiving MOUD (Mills-Huffnagle et al., 2022).
- PRSS could focus on substance use care and treatment of mother/ caregiver.
- PRSS could also communicate with other team members involved in the care of the mother/ caregiver and affected infant.
 - Demonstrated previously by the CHARM collaborative (SAMHSA, 2016).



Creative commons license: <https://embarkrecovery.com/the-role-of-peer-pressure-in-cocaine-addiction/>

Education

- Providers / Care teams
 - Education on barriers
 - Education on how to discuss and problem solve with families to ensure follow-up care
 - Education on identifying and addressing stigma
- Families and caregivers caring for affected infants
 - Stressing the importance of follow-up care
 - Expectations before birth or shortly thereafter
 - Contingency management

Earlier infant assessment

- Affected infants are at risk for neurodevelopmental delays starting as early as 6 months
- Current recommendations include AAP Bright Futures Guidelines, where developmental screening begins at 9 months for patients without identified risk for developmental problems.
- Consideration for use of Ages and Stages 6-month questionnaire.
- Diagnostic codes of POE and/or NOWS should be left as “unresolved” through adolescence
 - Allow providers to recall this history over time:
 - School-age to inform later neurodevelopment and cognitive/ behavioral symptoms.
 - Adolescence as this affected patient population is at a higher risk for later substance use disorders.

You are part of the continuum



What can you do?

1. CONNECT the family to the next person
2. COMMUNICATE the history and the plan
3. FOLLOW the child and family beyond discharge
4. ADVOCATE for a system that makes this possible



You may never know the outcome

- The infant you discharged became a child.
- The family you supported kept going.
- The connection you made mattered.
- The appointment you helped them get to mattered.
- The person you encouraged may still be in recovery today.

We don't always get to see the outcome of our work.

▼ Thank you!



Jennifer Nyland, PhD



Tammy Corr, DO



Rhea Sullivan, PhD,
MD Candidate

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