Understanding the Impact of Prenatal Substance Exposure on Children and Families

Bergen B. Nelson, MD, MS
Associate Professor of Pediatrics
Children's Hospital of Richmond at VCU

VA CASA Advo-Chat, 11-17-2025

Many thanks!

Robin Foster, MD, FAAP
Tiffany Kimbrough, MD
Elizabeth Wolf, MD, MPH

Objectives

1. Review epidemiology and clinical considerations for NAS/ NOWS and prenatal substance exposure
2. Understand assessment of substance-exposed infants in the neonatal period and beyond
3. Discuss longer-term developmental outcomes and intervention strategies, with linkages to community resources

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Role of CASA Volunteers

1. Observe and document child development and behavior
2. Understand the importance of the caregiving environment
3. Maintain a trauma-informed, nonjudgmental lens

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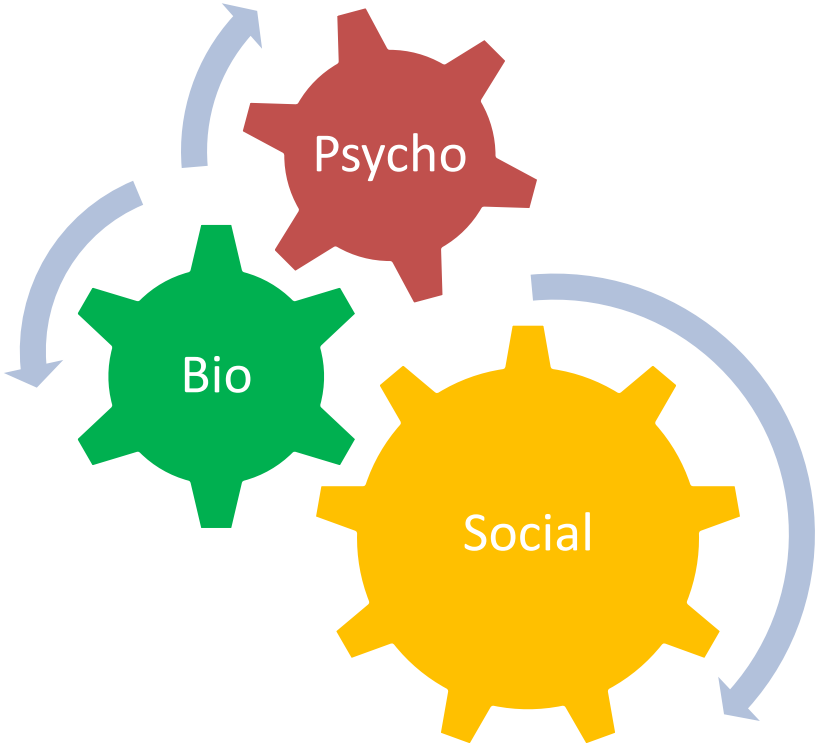

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Parenting = the secret sauce

- Safe
- Stable
- Nurturing
- Responsive

Addiction is an attachment disorder

Drugs used to

- Manage fearful/anxious mental states
- Regulate emotions
- Restore comfort
- Find an alternative to attachment functions that occur through relationships due to disruption of attachment in infancy or childhood

High rates of trauma in people with substance use disorders

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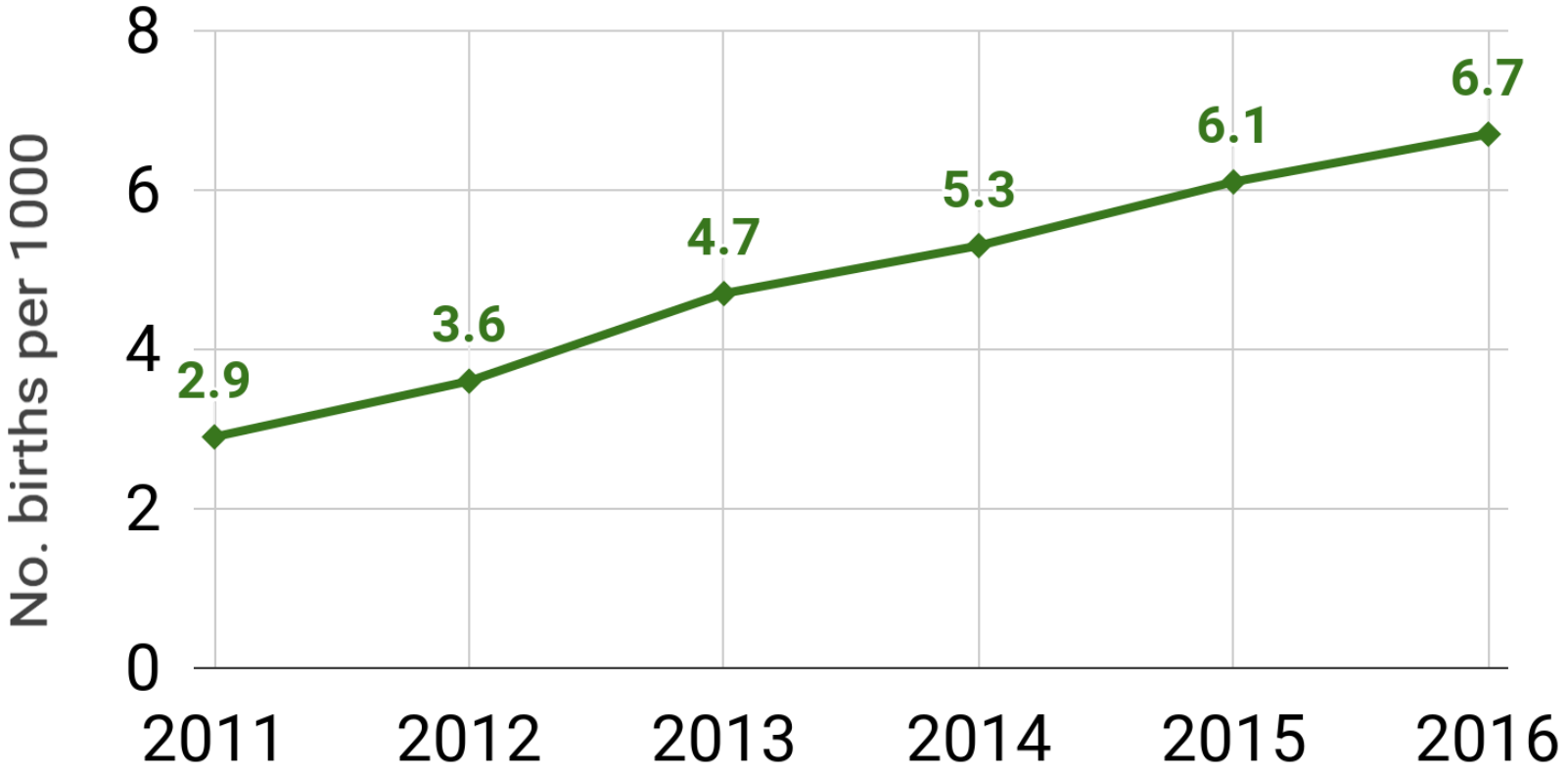
Neonatal Abstinence Syndrome

- Infants exposed to tobacco, alcohol, prescription medications (e.g., benzodiazepines, opioids, SSRIs), and illicit substances in utero may exhibit signs of physiologic withdrawal from these substances.
- NAS is an expected and treatable condition that often follows prenatal exposure to opioids.
- Neonatal opioid withdrawal syndrome (NOWS) is a subset of NAS and refers to withdrawal symptoms associated specifically with opioid exposure.

NOWS Hospitalizations in Virginia



Virginia Department of Health, 2017

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VDH Data on Neonatal Abstinence Syndrome

VA NAS Rates

(per 1,000 births)

2016: 6.7

2017: 7.4

2018: 6.9

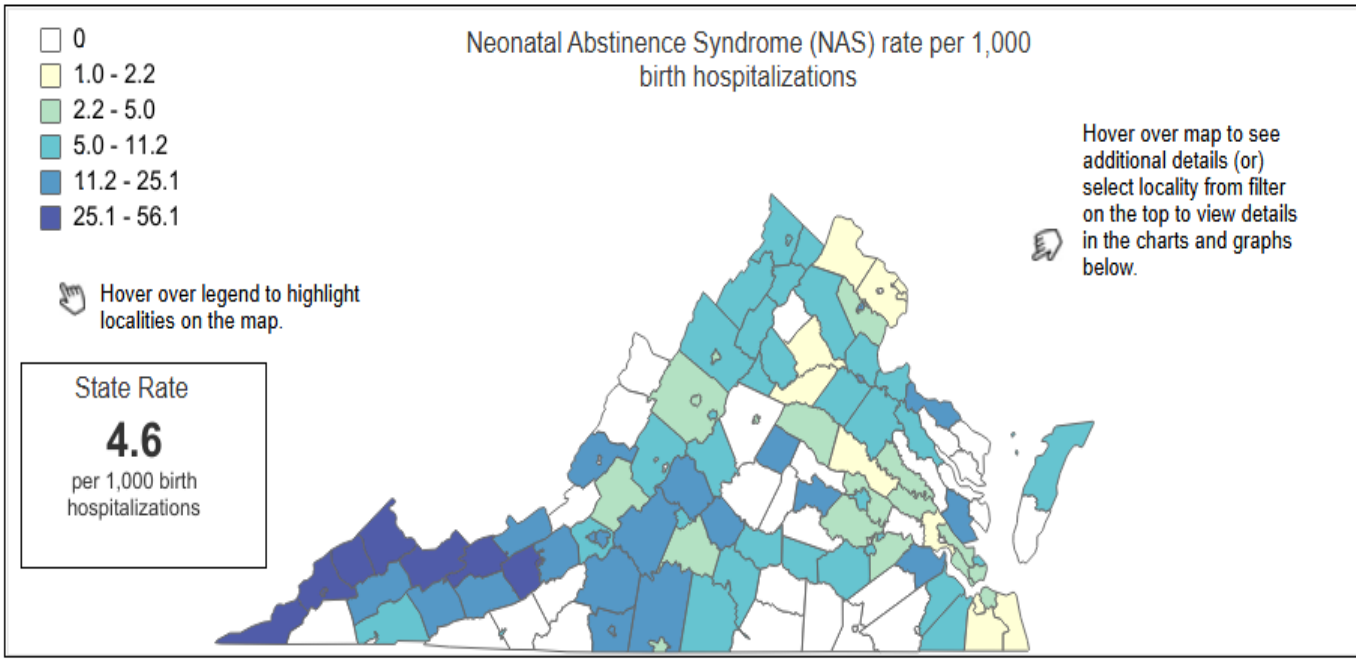
2019: 7.2

2020: 5.8

2021: 5.7

2022: 4.8

2023: 4.6



https://www.vdh.virginia.gov/drug-overdose-data/neonatal-abstinence-syndrome-nas/

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Expenditures

- **Nationwide**, roughly 400,000 pregnancies annually affected by substance use disorder
- **Nationwide**, average NOWS LOS – 16 days
  - Unchanged between 2000-2009
  - **Virginia** LOS: 20 days (range 6 – 55)
- Average hospital cost ~$94,000*

  *For those requiring pharmacotherapy
- Healthcare expenditures – 1.2 billion for Medicaid (2009)

Parick SW, Davis MM, Lehman CU, Cooper WO. Increasing incidence and geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012. J Perinatol. 2015;35:667

Managing NOWS: Traditional Model of Care

Neonatal Assessment and Intervention

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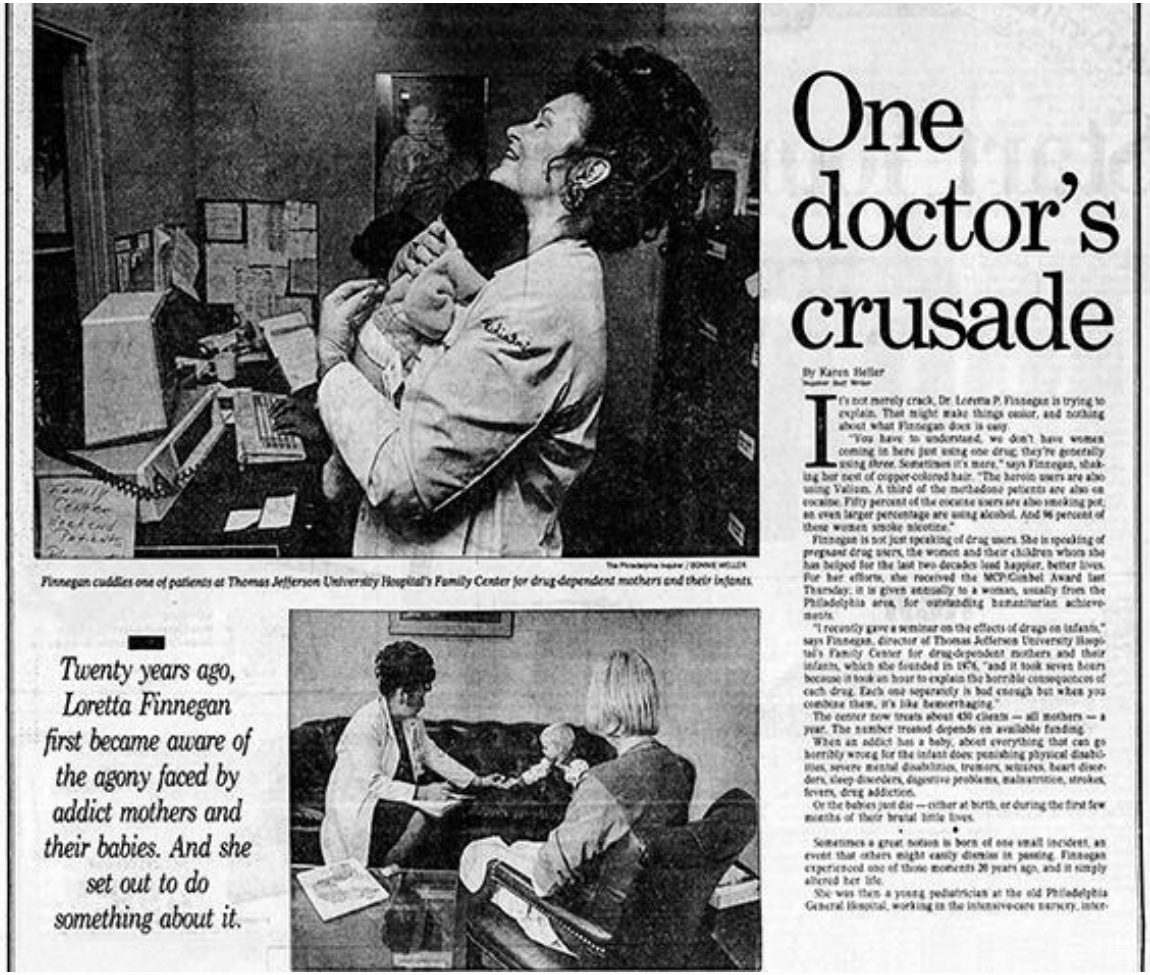
Assessment Tool: Finnegan Scoring

Developed for NAS infants in 1974

- 20 signs in total
  - Various severity assigned
- Most utilized tool across nation (92% 2017)
  - Virginia rate (2019):

    53% Finnegan
    47% Modified



Finnegan cuddles one of patients at Thomas Jefferson University Hospital's Family Center for drug-dependent mothers and their infants.

Twenty years ago, Loretta Finnegan first became aware of the agony faced by addict mothers and their babies. And she set out to do something about it.

One doctor's crusade

By Karen Heller

It's not merely crack. Dr. Loretta P. Finnegan is trying to explain. That might make things easier, and nothing about what Finnegan does is easy.

"You have to understand, we don't have women coming in here just using one drug; they're generally using three. Sometimes it's more," says Finnegan, shaking her nest of copper-colored hair. "The heroin users are also using Valium. A third of the methadone patients are also on cocaine. Fifty percent of the cocaine users are also smoking pot; an even larger percentage are using alcohol. And 96 percent of those women smoke nicotine."

Finnegan is not just speaking of drug users. She is speaking of pregnant drug users, the women and their children whom she has helped for the last two decades lead happier, better lives. For her efforts, she received the MCP/Ginbel Award last Thursday; it is given annually to a woman, usually from the Philadelphia area, for outstanding humanitarian achievements.

"I recently gave a seminar on the effects of drugs on infants," says Finnegan, director of Thomas Jefferson University Hospital's Family Center for drug-dependent mothers and their infants, which she founded in 1974, "and it took seven hours because it took an hour to explain the horrible consequences of each drug. Each one separately is bad enough but when you combine them, it's like hemorrhaging."

The center now treats about 450 clients — all mothers — a year. The number treated depends on available funding.

When an addict has a baby, about everything that can go horribly wrong for the infant does: punishing physical disabilities, severe mental disabilities, tremors, seizures, heart disorders, sleep disorders, digestive problems, malnutrition, strokes, fevers, drug addiction.

Or the babies just die — either at birth, or during the first few months of their brutal little lives.

• • •

Sometimes a great notion is born of one small incident, an event that others might easily dismiss in passing. Finnegan experienced one of those moments 20 years ago, and it simply altered her life.

She was then a young pediatrician at the old Philadelphia General Hospital, working in the intensive-care nursery, inter-

Finnegan LP, Connaughton JF Jr, Kron RE, Emich JP. Neonatal abstinence syndrome: assessment and management. Addict Dis. 1975;2:141–58

Philadelphia Inquirer Nov 19, 1989

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Signs of NOWS

Neurologic

- Excessive or high-pitched crying
- Short and/or irregular sleep patterns
- Tremors or irritability
- Skin breakdown (face/knees)
- Frequent sneezing and/or yawning
- Increased muscle tone
- Myoclonic jerks
- Seizures

Gastrointestinal

- Excessive sucking
- Poor feeding
- Vomiting
- Loose stools and/or diarrhea
- Poor weight gain

Autonomic

- Sweating
- Low-grade fever
- Nasal stuffiness
- Tachypnea
- Mottling of skin

Finnegan Score

NE

SYSTEM	SIGNS AND SYMPTOMS	SCORE	
CENTRAL NERVOUS SYSTEM DISTURBANCES	Continuous High Pitched (or other) Cry	2	
	Continuous High Pitched (or other) Cry	3	
	Sleeps <1 Hour After Feeding	3	
	Sleeps <2 Hours After Feeding	2	
	Sleeps <3 Hours After Feeding	1	
	Hyperactive Moro Reflex	2	
	Markedly Hyperactive Moro Reflex	3	
	Mild Tremors Disturbed	1	
	Moderate-Severe Tremors Disturbed	2	
	Mild Tremors Undisturbed	3	
	Moderate-Severe Tremors Undisturbed	4	
	Increased Muscle Tone	2	
	Excoriation (Specific Area)	1	
	Myoclonic Jerks	3	
	Generalized Convulsions	5	

Finnegan Score

METABOLIC/VASOMOTOR/RESPIRATORY DISTURBANCES	Sweating	1	
	Fever 100.4°-101°F (38°-38.3°C)	1	
	Fever > 101°F (38.3°C)	2	
	Frequent Yawning (>3-4 times/interval)	1	
	Mottling	1	
	Nasal Stuffiness	1	
	Sneezing (>3-4 times/interval)	1	
	Nasal Flaring	2	
	Respiratory Rate >60/min	1	
	Respiratory Rate > 60/min with Retractions	2	
GASTRO-INTESTIONAL DISTURBANCES	Excessive Sucking	1	
	Poor Feeding	2	
	Regurgitation	2	
	Projectile Vomiting	3	
	Loose Stools	2	
	Watery Stools	3	
TOTAL SCORE			
INITIALS OF SCORER			

Pharmacotherapy rates for NOWS

Methadone exposed:

- Roughly 50-80% infants require pharmacotherapy

Buprenorphine exposed:

- 22-63% infants require pharmacotherapy

Chavan NR et al. Buprenorphine for medication-assisted treatment of opioid use disorder in pregnancy: relationship to neonatal opioid withdrawal syndrome. AJP Rep 2017 Oct; 7(4): e215-22.

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Non-Pharmacologic Treatment

- Decreased environmental stimulation
  - Dark room
  - Quiet or white noise

- Room-in with mother, if feasible
- Swaddling
- Kangaroo care
- Rocking/swinging
- Non-nutritive/nutritive sucking*
- Massage
- Music

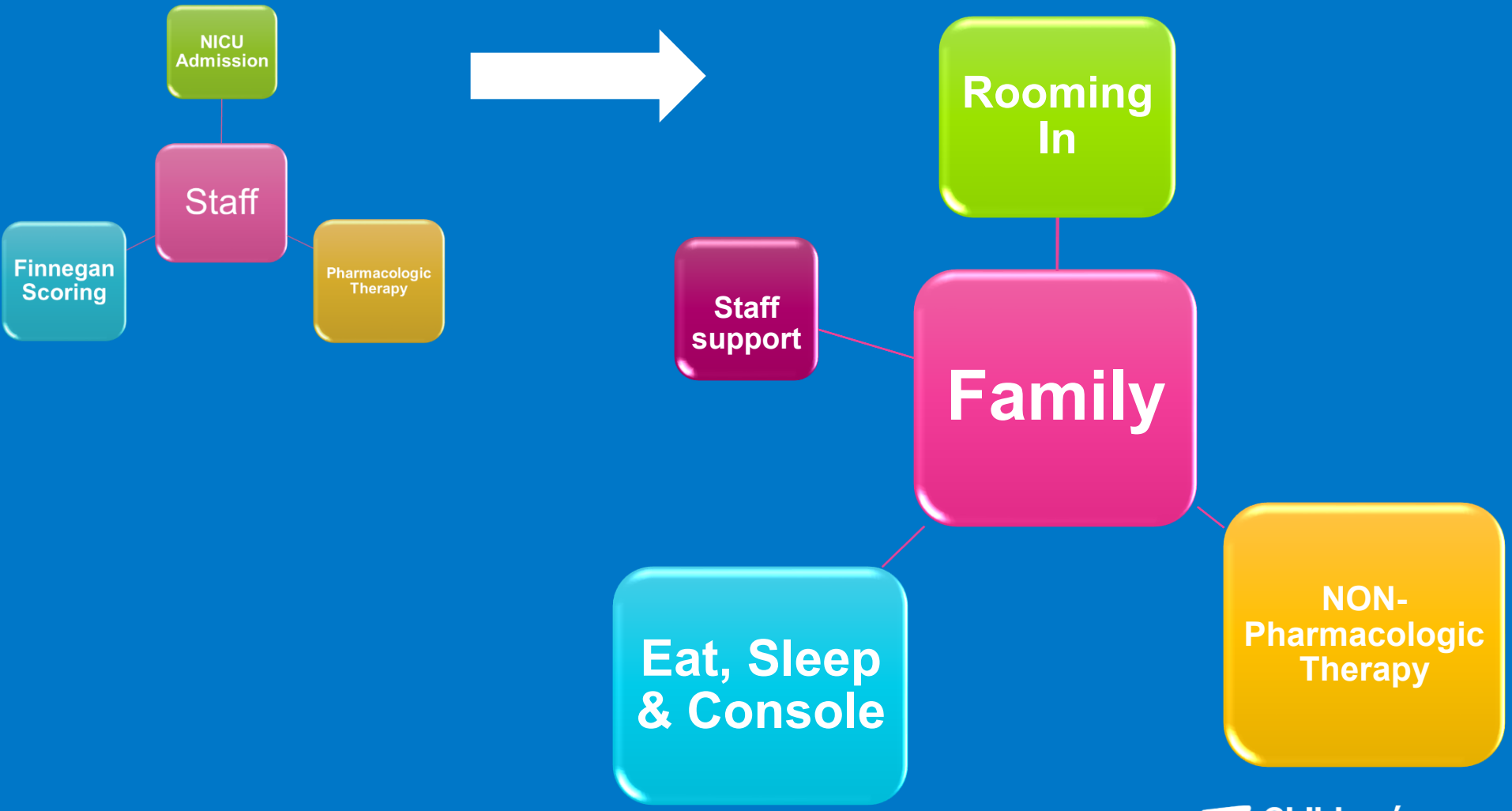
Feeding

- Breastfeeding encouraged *if no illicit drug use or HIV**
- Demand and/or frequent, small feedings
- If formula is used, may need higher calories

Changing Landscape

Eat, Sleep and Console

Challenging our traditional model



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Functional Assessment Tool

Eat **S**leep **C**onsole = **ESC**

1. Can the baby eat?
2. Can the baby sleep?
3. Can the baby be consoled?

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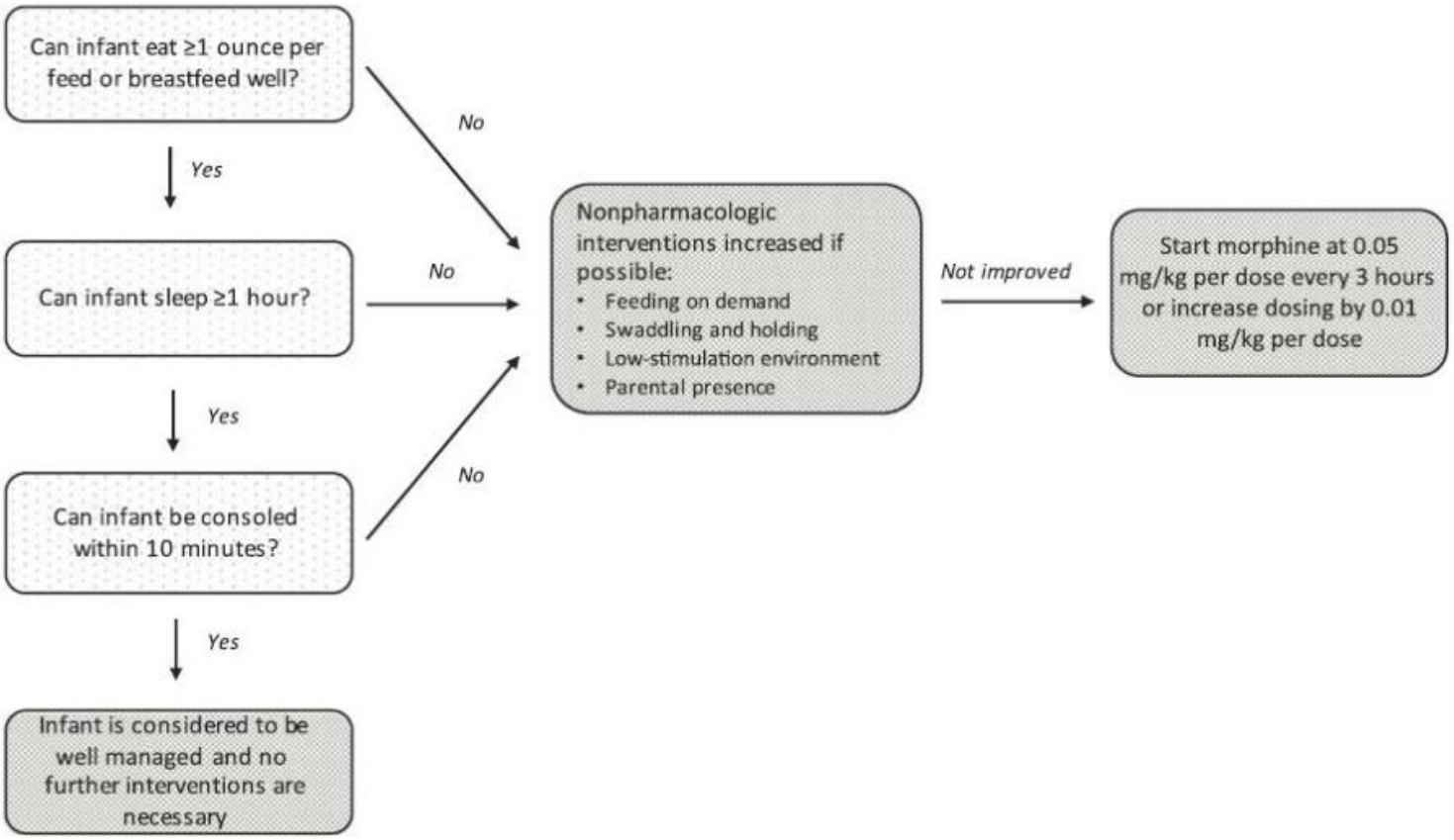
YALE'S ESC APPROACH



Results

- ↓Length of stay from 22.4 to 5.9 days
- ↓cost by >$30,000 per infant
- ↓ morphine treatment from 98% to 14% of exposed infants

- Emphasis on overall clinical picture
  - Feeding, weight loss, stress to infant
- Elevate non-pharmacologic care to primary intervention
- Less medication management → less monitoring → less DISTURBING

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Beyond the nursery

Substance exposure and early childhood—

Assessment and Intervention

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Challenges of Studying PSE Outcomes

- No RCT exists
- Polysubstance use is the norm
- Associated psycho-social issues
- Variability in measures
- Need for long-term studies
- Changing landscape of substance use trends

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Opiate Review/ NAS Outcomes

TABLE 1 ■ Summary of Study Outcomes in Response to Prenatal Exposure

Authors	Sample Size Exposed/Control*	Exposure(s) Identified	Outcomes
Beckwith & Burke, 2015	28	Opiates	Language, motor, cognition
Chasnoff and colleagues, 1984	58/27	Methadone	Growth
Gill and colleagues, 2003	49	Opiates	Strabismus
Hamilton and colleagues, 2010	20	Methadone	Ophthalmic abnormalities
Hunt and colleagues, 2008	133/103	Opiates	Neurodevelopmental
Johnson and colleagues, 1984	61/32	Methadone	Neurobehavioral
Kahila and colleagues, 2007	67	Buprenorphine	SIDS
Kaltenbach and colleagues, 1987	105/63	Methadone	Developmental
McGlone and colleagues, 2014	81/26	Methadone	Nystagmus
Mulvihill and colleagues, 2007	14	Opiates	Nystagmus
Ornoy and colleagues, 2001	65/62	Heroin	Developmental/cognitive
Ornoy, 2003	93/87	Heroin	Developmental, behavioral
Rosen & Johnson, 1982	38/23	Methadone	Neurologic, motor, otitis media, vision/behavioral/cognitive
Sandtorv and colleagues, 2009	15	Polysubstances	SIDS
Spiteri Cornish and colleagues, 2013	301/7,887	Polyoioids	Nystagmus, strabismus
Strauss and colleagues, 1976	60/53	Methadone	Behavioral/motor
Sundelin Wahlsten & Sarman, 2013	28	Buprenorphine	Neurobehavioral/attention
Wachman and colleagues, 2013†	86	Methadone	Hospital stay
Wachman and colleagues, 2014†	86	Methadone	Gene variation
Wachman and colleagues, 2015†	86	Methadone	Gene variation
Walhovd and colleagues, 2015	23/24	Detoxified opioid and polysubstance	Visual acuity
Wilson and colleagues, 1979	22/20	Heroin	Growth/cognitive
Wilson and colleagues, 1981	69/58	Narcotics or methadone	Health, developmental

Maguire, et al. Neonatal Network 2016; 35 (5):277

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Updated Review: Developmental Consequences of Prenatal Substance Use in Children and Adolescents

Guille and Aujla; Journal of Child and Adolescent Psychopharmacology, 2019

- Prenatal tobacco and alcohol use have the most well-established impacts on child development, including increased risk for behavioral problems and deficits in academic performance.

- Prenatal marijuana use associated with deficits in executive and intellectual functioning among school-age children and adolescents.

- Prenatal opioid use and child development findings are conflicting, but treatment with opioid agonist therapy for opioid use disorder (e.g., methadone or buprenorphine) does not appear to have a negative impact on child growth, cognition, language abilities, sensory processing, or temperament.

- Prenatal amphetamine and cocaine use may have a negative impact on child development, but effects are mediated, in part, by childhood environment.

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Let's talk about drugs…

- Alcohol
- Opioids (prescription, methadone, buprenorphine, heroin)
- Cocaine
- Methamphetamines
- Cigarettes, marijuana
- Others?

TABLE 2

Summary of Effects of Prenatal Drug Exposure

	Nicotine	Alcohol	Marijuana	Opiates	Cocaine	Methamphetamine
Short-term effects/birth outcome						
Fetal growth	Effect	Strong effect	No effect	Effect	Effect	Effect
Anomalies	No consensus on effect	Strong effect	No effect	No effect	No effect	No effect
Withdrawal	No effect	No effect	No effect	Strong effect	No effect	*
Neurobehavior	Effect	Effect	Effect	Effect	Effect	Effect
Long-term effects						
Growth	No consensus on effect	Strong effect	No effect	No effect	No consensus on effect	*
Behavior	Effect	Strong effect	Effect	Effect	Effect	*
Cognition	Effect	Strong effect	Effect	No consensus on effect	Effect	*
Language	Effect	Effect	No effect	*	Effect	*
Achievement	Effect	Strong effect	Effect	*	No consensus on effect	*

*Limited or no data available.

Behnke, et al. Prenatal substance abuse: short- and long-term effects on the exposed fetus. Pediatrics 2013 Mar; 131(3):e1009-24. doi: 10.1542/peds.2012-3931.

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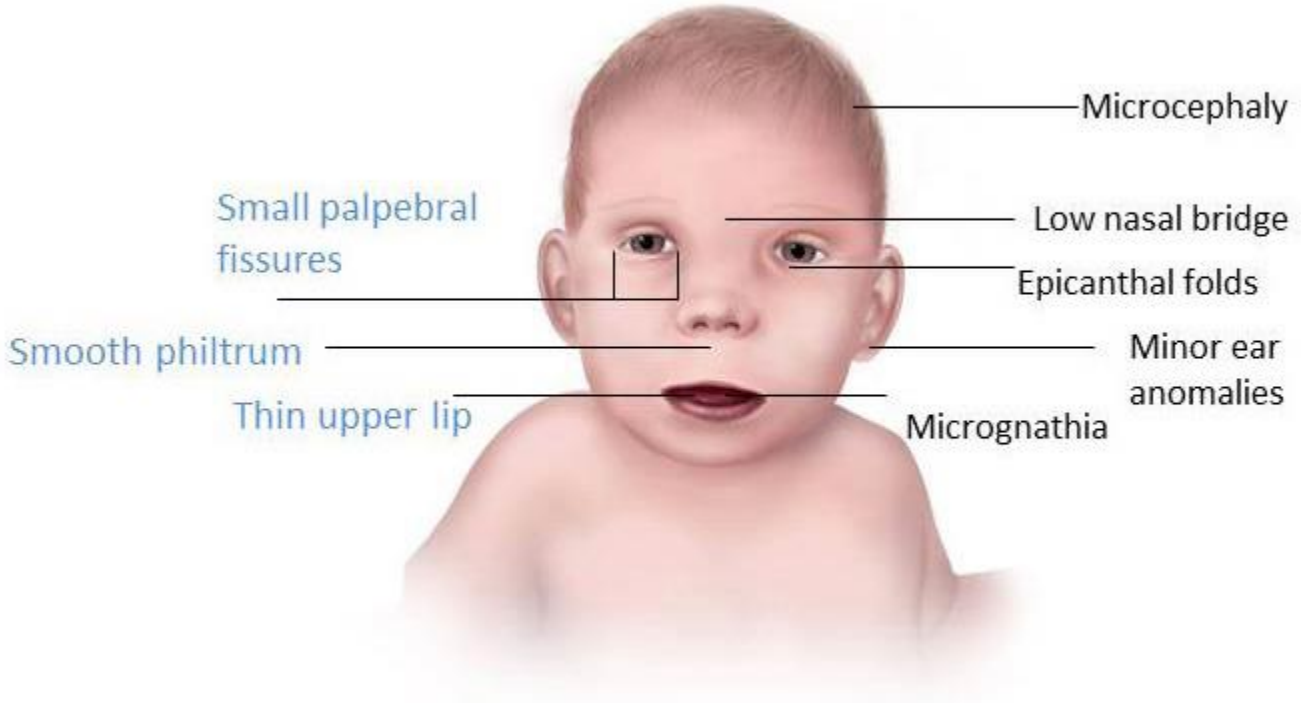
Alcohol



Effects are NOT always obvious and are now part of "Fetal Alcohol Spectrum Disorder"

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Cigarettes

- Preterm birth
- Low BW
- Microcephaly
- Later– associated with behavior and attention problems

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THC in utero exposure

- Third most commonly used drug after alcohol and tobacco
  - 4% of all 15-64 year olds by self report
  - 11% in pregnant and controls by serum testing
- Lipophilic so estimated that 1/3 of the drug crosses the fetoplacental barrier as well as into breast milk
- In the last 20 years the concentration of THC in cannabis has gone from 3% (1990s) to 8% (2008) to up to 30%

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THC in utero exposure

- Fetal growth restriction
- Exaggerated startle response in infants
- Poor sleep patterns in infants
- Diminished short term memory and verbal reasoning on the Stanford Binet in 3-4 year olds
- Hyperactivity in adolescents
- Inattention and impaired executive function in adolescents

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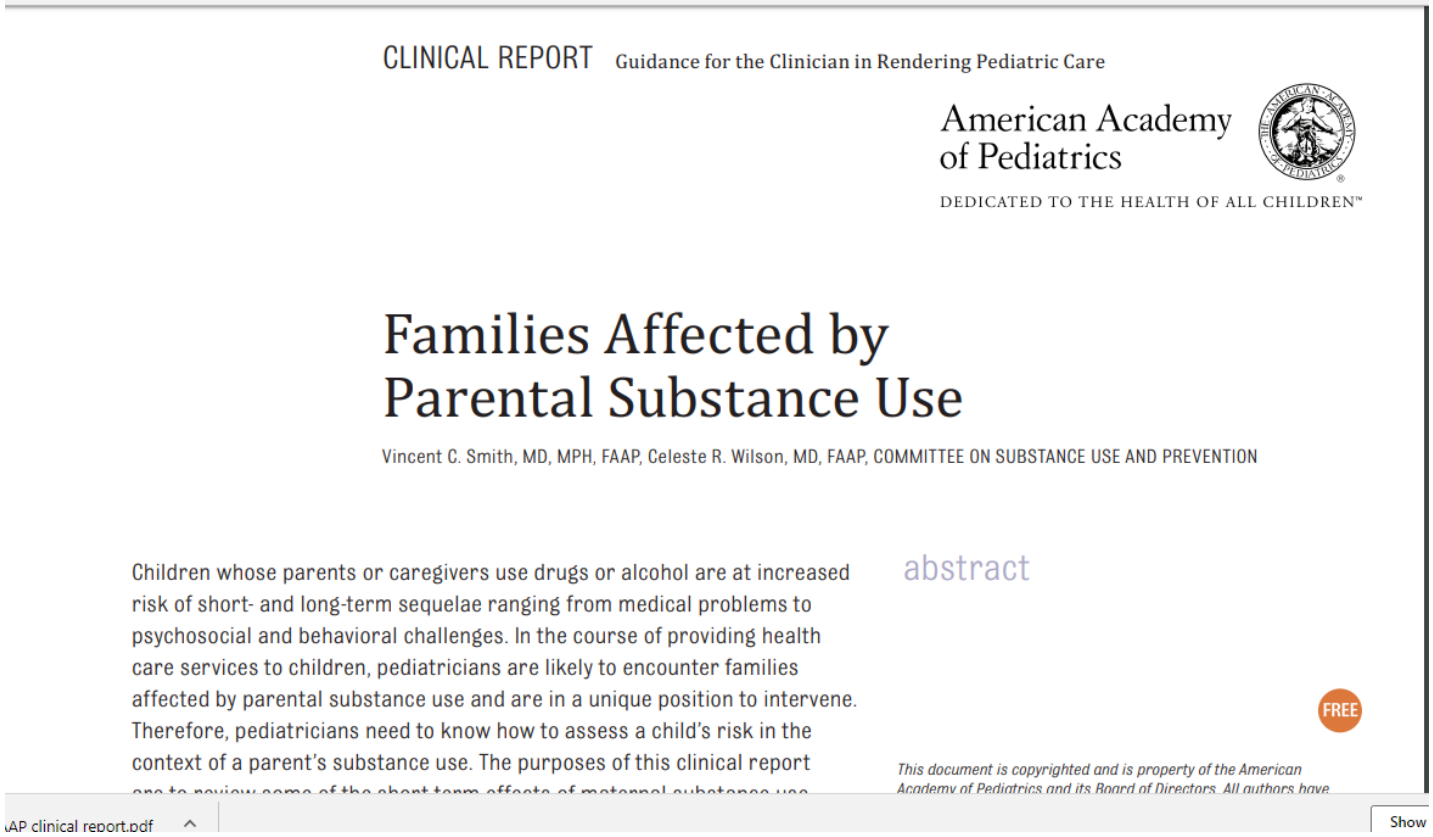
AAP Clinical Report, 2016



CLINICAL REPORT Guidance for the Clinician in Rendering Pediatric Care

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

Families Affected by Parental Substance Use

Vincent C. Smith, MD, MPH, FAAP, Celeste R. Wilson, MD, FAAP, COMMITTEE ON SUBSTANCE USE AND PREVENTION

abstract

Children whose parents or caregivers use drugs or alcohol are at increased risk of short- and long-term sequelae ranging from medical problems to psychosocial and behavioral challenges. In the course of providing health care services to children, pediatricians are likely to encounter families affected by parental substance use and are in a unique position to intervene. Therefore, pediatricians need to know how to assess a child's risk in the context of a parent's substance use. The purposes of this clinical report

FREE

AAP clinical report.pdf Show

Reaffirmed Sept 2022; Recs for screening and connections to resources

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Primary Care

- Parental MH and social screening
- General recommendations for good developmental screening and surveillance:
  - Ask about concerns and document progress at every well child visit
  - Use a structured, validated screening tool at 9 months, 18 months, and 24-30 months

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Specialty Referrals

- Consider, on case-by-case basis, referrals to developmental pediatrics, neurology, genetics…IF formal diagnoses might provide additional resources
- CPS/ child protection team, for any ongoing safety issues or neglect

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Social Issues

- Higher risks of co-sleeping, home safety concerns, child abuse and neglect

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Interventions

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Early Intervention

"Effects of toxic exposure" among eligibility for Part C/ EI services in VA (0-3 years of age)

Established risk condition, +/- developmental delays

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School Supports

Age 2+ years: Part B/ Early Childhood Special Education Services

IEP if meets eligibility and educational impacts seen

504 Plan

Positive Behavior Interventions/ Support

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Parenting = the secret sauce

- Safe
- Stable
- Nurturing
- Responsive

Child Maltreatment
2020, Vol. 25(2) 137-151

DOI: 10.1177/1077559519866272
journals.sagepub.com/home/cmx
SAGE

Systematic Review of Community- and Home-Based Interventions to Support Parenting and Reduce Risk of Child Maltreatment Among Families With Substance-Exposed Newborns

Allison L. West[1], Sarah Dauber[2], Laina Gagliardi[1], Leeya Correll[1], Alexandra Cirillo Lilli[1], and Jane Daniels[1]

Abstract

Substance-exposed newborns (SENs) are at increased risk of child maltreatment, out-of-home placement, and poor health and developmental outcomes. The purpose of this systematic review is to synthesize existing research on community- and home-based interventions designed to improve parenting and reduce risk of maltreatment for families with SENs, applying a program logic framework. The review includes studies that used preexperimental, quasi-experimental, and experimental designs. Twelve interventions were identified. Of the nine studies that used more rigorous experimental or quasi-experimental designs, five showed positive effects on at least one parenting or child maltreatment outcome, although some studies showed high risk of bias. Full coherence among the intended participants, theory of change, and program components was observed for only two interventions. The findings suggest a need for more rigorous research to develop and test interventions that are grounded in theory and prior research and that address the unique needs of families with SENs.

Infant Mental Health Journal: Infancy and Early Childhood; June 2025

RESEARCH ARTICLE

WILEY

Effects of integrated programs for substance-involved mothers on infant and child development outcomes: A systematic review and meta-analysis

Sophie Barriault[1] | **Mary Motz**[2] | **Lamia Firasta**[1,2] | **Hannah McDowell**[1] | **Patrick R. Labelle**[3] | **Nancy Poole**[4] | **Nicole Racine**[1,5]

[1]School of Psychology, University of Ottawa, Ottawa, Ontario, Canada

[2]Breaking the Cycle, Mothercraft, Toronto, Ontario, Canada

[3]Library, University of Ottawa, Ottawa, Ontario, Canada

[4]Centre of Excellence for Women's Health, Vancouver, British Columbia, Canada

[5]Research Institute, Children's Hospital of Eastern Ontario, Ottawa, Ontario, Canada

Correspondence
Nicole Racine, School of Psychology, University of Ottawa, Ottawa, Ontario, Canada.
Email: nracine2@uottawa.ca

Funding information
Faculty of Social Sciences, University of Ottawa; Children's Hospital of Eastern Ontario Research Institute

Abstract

Maternal substance use is a pressing public health issue that confers risk for maternal health, the parent-infant relationship, and child development. Integrated interventions that jointly address maternal substance use and child development have shown promise for enhancing child outcomes. No research to date has focused exclusively on the outcomes of young children or examined potential moderators of the effect sizes of integrated programs. This review evaluates the pooled effect of integrated interventions for substance-involved mothers on the developmental outcomes of their children. A comprehensive search strategy was conducted in seven databases (APA PsycINFO, CINAHL, Cochrane CENTRAL, Embase, MEDLINE, Sociological Abstracts, Web of Science) from January 2011 and May 2023. Studies were included if they reported on an intervention with at least one substance use treatment and one parenting or child treatment service for substance-involved mothers of children under 6 years of age. A total of 21 studies met inclusion criteria, and 14 nonoverlapping studies reported on effect sizes with a pooled effect size of SMD = .470 (95% CI = .35, .59). There was a trend toward treatment duration being a significant moderator (p = .08). Additional high-quality studies are needed to demonstrate the long-term impact of these interventions.

KEYWORDS
child development outcomes, infancy, integrated interventions, maternal substance use

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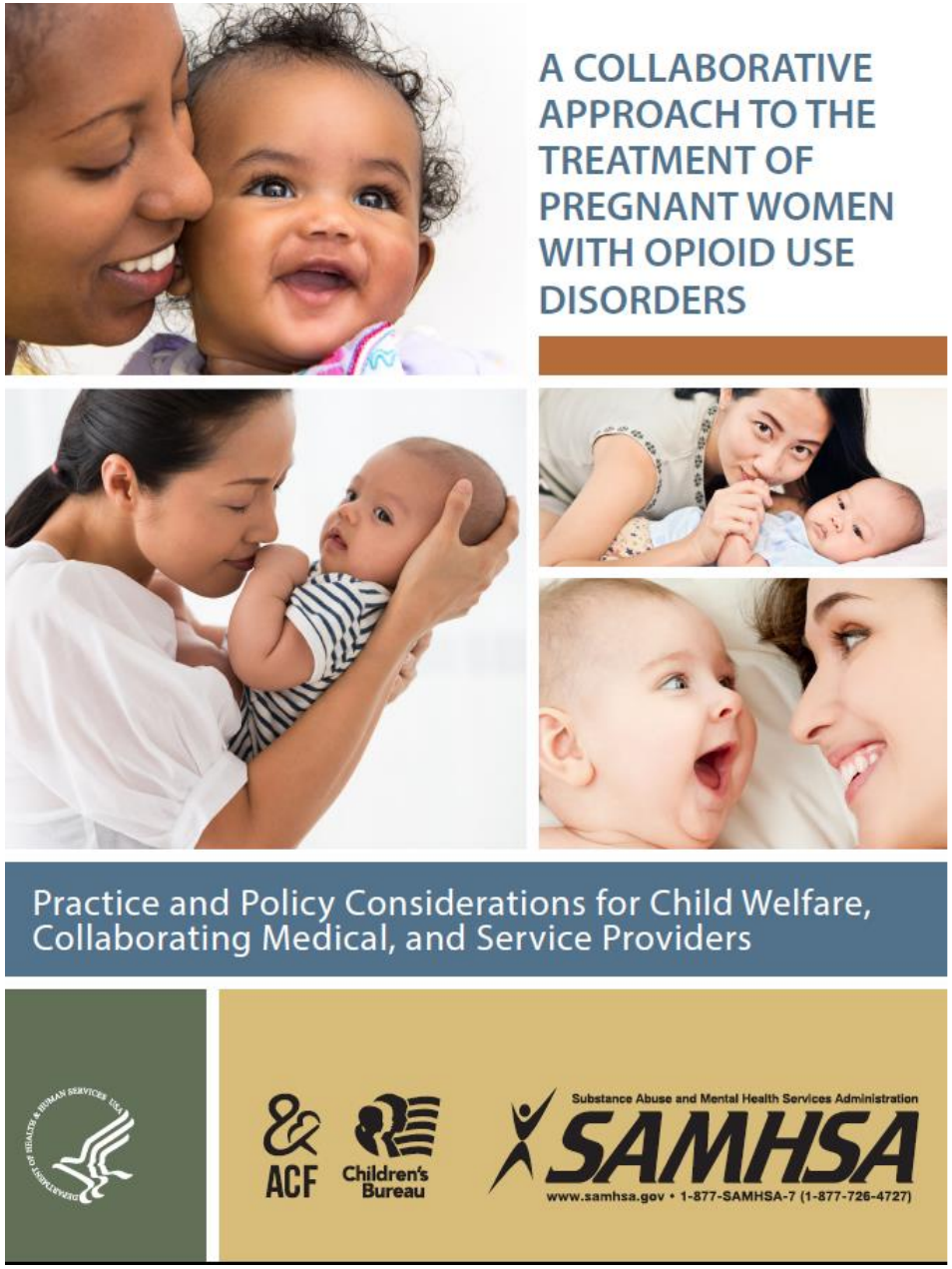

Examples of Collaborative Approaches:

- CHARM (Children and Recovery Mothers) in Burlington, VT

"Cross-system linkages are necessary to ensure services are coordinated across the spectrum of prevention, intervention, and treatment."

- Center for Addiction and Pregnancy (CAP) at Johns Hopkins

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Clinical and Community Interventions to Promote Early Childhood Development

- Help Me Grow
- Reach Out And Read
- Video Interaction Project
- Healthy Steps
- Evidence-based home visitation models (NFP, PAT, etc.)
- Parent training– Triple P, Incredible Years
- Parent/ child psychotherapies (PCIT, CPP, etc.)
- And more…and ever-growing

- **VMAP 0-5 – consultation line, care navigation**

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Maternal, Infant and Early Childhood Home Visiting: Evidence-Based Approaches to Support Early Relational Health

EARLY IMPACT VIRGINIA

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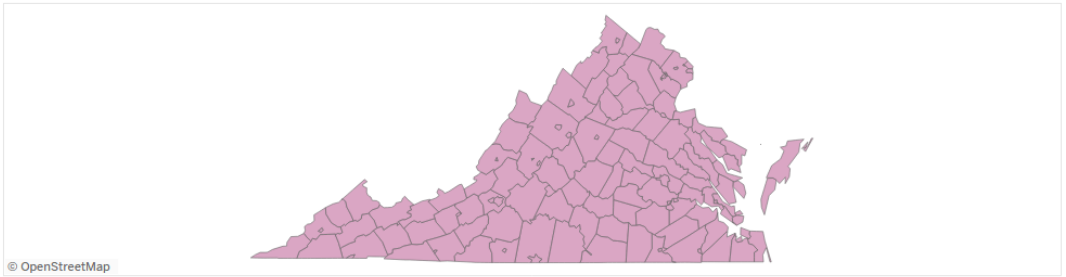
Virginia Home Visiting Program Map Directory

FIND A HOME VISITING PROGRAM

Select a Locality (or click on the map)

(All)



Locality	Agency	Model	Phone	Website	Details
Accomack County	Eastern Shore Health District	Nurse Family Partnership	(757) 787-5880	https://www.vdh.virginia.gov/eastern-sh..	
Albemarle County	Child Health Parternship	CHIP	(434) 964-4700	https://www.childhealthpartnership.org/	
	ReadyKids	Healthy Families	(434) 296-4118	https://readykidscville.org/family-suppor..	
Alexandria city	Alexandria Health District	BabyCare	(703) 746-4940	https://www.alexandriava.gov/health-de..	
	Northern Virginia Family Services	Healthy Families, Early Head S..	(571)748-2743	https://www.nvfs.org/our-services/early-..	
Alleghany County	Alleghany Health District	BabyCare	(540) 473-8240	https://www.vdh.virginia.gov/alleghany/..	
Amelia County	No Home Visiting Program Available				
Amherst County	HumanKind	Healthy Families	(434) 384-3131	https://www.humankind.org/healthy-fam..	
Appomattox County	HumanKind	Healthy Families	(434) 384-3131	https://www.humankind.org/healthy-fam..	
Arlington County	Northern Virginia Family Services	Healthy Families, Early Head S..	(571) 748-2743	https://www.nvfs.org/our-services/early-..	
Augusta County	Sentara RMH Medical Center	Healthy Families, Resource Mo..	(540) 564-5661	https://www.sentara.com/healthwellnes..	
Bath County	Sentara RMH Medical Center	Healthy Families, Resource Mo..	(540) 564-5661	https://www.sentara.com/healthwellnes..	
Bedford County	CHIP of Roanoke Valley	CHIP	(540) 857-6993	https://chiprv.org/	

https://www.earlyimpactva.org/directory

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Pathways for Support

- Tier 3:
  Tier 1 + Tier 2 + Early Intervention, Early Childhood Special Ed.; Specific behavioral therapies targeted at concerns
- Tier 2:
  Tier 1 + address social needs + connect with targeted, evidence-based support through home visiting, parent training, other interventions to improve developmental outcomes
- Tier 1:
  Ongoing screening and surveillance
  Developmental promotion and guidance
  Reach Out And Read, The Basics (www.thebasics.org)
  www.rvabasics.org
  High quality early care and education

Conclusions

1. Prenatal substance exposure is an important risk factor for developmental and behavioral issues
2. As with any developmental risks– early identification and high-quality, evidence-based interventions benefit children and families
3. Safe, stable, nurturing and responsive caregiving environments are key to optimizing child well-being

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Thank you!

Questions?

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