

Promoting Responsive Bottle-Feeding

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Overview

- 1 The Importance of Responsive Feeding 
- 2 Breasts vs Bottles for Infant Feeding: What's the Difference? 
- 3 Promoting Responsive Bottle-Feeding 



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The first 1000 days are a sensitive period of development

Experiences and exposures during this period have **disproportionate** and **lasting** effects on later health outcomes

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Rapid weight gain is a strong predictor of later obesity

Zheng et al (2018). Rapid weight gain during infancy and subsequent adiposity: a systematic review and meta-analysis of evidence. *Obes Rev* 19:321-332.

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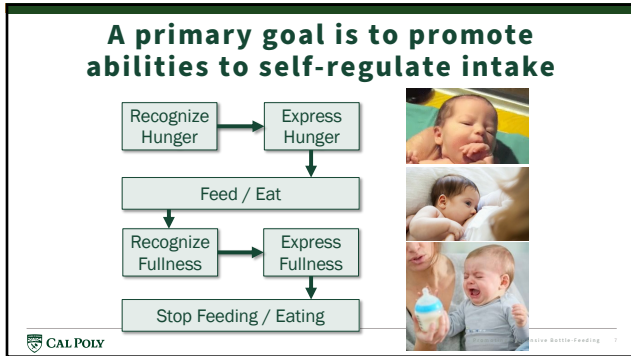
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Early feeding interactions are an important target for prevention efforts

DiSantis et al. (2011). The role of responsive feeding in overweight during infancy and toddlerhood: A Systematic Review. *Int J Obes* 35:480-492.

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Young infants have the capacity self-regulate intake

In general, infants can down-regulate breast milk or formula intake in response to:

- Increased caloric density of formula (Fomon et al 1969, 1975)
- Addition of free glutamate to formula (Ventura & Mennella 2012)
- Increased supply of breast milk (Dewey & Lonnerdal 1986)
- Introduction of solid foods (for BF infants)(Heinig et al 1993)

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Responsive feeding supports the development and maintenance of self-regulatory abilities

Infant signals hunger, fullness, and needs for breaks

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Responsive feeding supports the development and maintenance of self-regulatory abilities

Caregiver initiates, pauses, or terminates feeding in response to cues

Infant signals hunger, fullness, and needs for breaks

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Responsive feeding supports the development and maintenance of self-regulatory abilities

Responsive Feeding	Not Responsive Feeding
Demand-feeding	Feeding on a schedule
Initiates feeding in response to infant hunger cues	Initiates feeding in response to non-infant cues (e.g., time)
Engages with child during feeding	Is distracted or does not engage with child during feeding
Paces the feeding according to signals from the child	Continues with feeding even though the child is showing signs of refusal
Gently prompts child to eat but withdraws if the child refuses	Forces food into child's mouth
Suggests child tries foods without coercion	Not sensitive to child's preferences and autonomy

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Mini-Summary

1 The Importance of Responsive Feeding

- Early infancy is a sensitive period for obesity risk
- Early feeding interactions are an important target for prevention efforts
- During *responsive feeding*, the caregiver is sensitive and contingently responsive to infant feeding cues
- Responsive feeding supports infants' developing abilities to self-regulate intake

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Breastfeeding is a demand and supply system

Infant Demand
Communicated to brain by frequency, duration, and intensity of infant sucking

Milk Supply
Increases or decreases in response to infant demand

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Breastfeeding and responsive feeding are complementary

Responsive Feeding

Responsive Feeding

Important features:

- Mother cannot easily assess how much infant consumes
- Mother must rely on infant cues to assess feeding adequacy


Ventura (2017). Associations between breastfeeding and maternal responsiveness: A systematic review of the literature. *Adv Nutr* 8:495-510.

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Breastfeeding and responsive feeding are complementary



Longer breastfeeding durations are predicted by:


- Better bonding during the first 12-90 hours postpartum (Brandt et al 1998, Cernadas et al 2003)
- Higher sensitivity during the first 28-90 hours and at 3 months postpartum (Britton et al 2006)

Ventura (2017). Associations between breastfeeding and maternal responsiveness: A systematic review of the literature. Adv Nutr 8:495-510.

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Breastfeeding and responsive feeding are complementary



Longer breastfeeding durations predict:

- Greater levels of responsive feeding at 12-24 mo postpartum (Farrow & Blisset 2006, Disantis et al 2013, Hodges et al 2013, Jansen et al 2015)
- Less controlling feeding practices at 12-24 mo postpartum (Fisher et al 2000, Taveras et al 2004, Blisset & Farrow 2007, Jansen et al 2015)

Ventura (2017). Associations between breastfeeding and maternal responsiveness: A systematic review of the literature. Adv Nutr 8:495-510.

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Formula/bottle-fed infants are at higher risk for overfeeding & rapid weight gain

- Compared to breastfed infants, formula/bottle-fed infants:
 - consume greater volumes (Heinig et al 1993)
 - are more likely to exhibit rapid weight gain (Mihirshahi et al 2011)
 - gain more weight during the first 2 y (Dewey et al 1993; Ventura 2017)
 - exhibit poorer satiety responsiveness later in childhood (Disantis et al 2011; Brown & Lee 2012)



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What's the problem? Milk Type vs Feed Mode

Compositional differences are important

- Benefits of Breast Milk:
 - Bioactive components (Fields et al 2016)
 - Lower protein content (Koletzko et al 2009)
 - Higher free amino acid content (Mennella et al 2011; Ventura et al 2012)


VS




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What's the problem? Milk Type vs Feed Mode

Behavioral differences are important, too

- Benefits of the Breast:
 - Both mother and baby contribute to feeding outcomes (Wright et al 1980)
 - Mother has less information and control (Ventura & Hernandez 2018)
 - Fewer opportunities for less desirable practices (e.g., encouraging bottle-emptying)


VS


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Many "features" of bottle-feeding may increase risk for overfeeding

- Infant can be a passive recipient of bottle (Crow et al 1980)
- Feeding is predominantly nutritive sucking (Lucas et al 1979)
- Infant can suck at a slower rate (Sakalidis et al 2013)
- Infant experiences more efficient breast milk or formula transfer (Taki et al 2010)
- Caregiver has more information and control over the feeding (Ventura & Golen 2014; Ventura & Hernandez 2019)






Photo courtesy of: <http://inf.international.org/blog/2014/05/bottle-feeding-start/>

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**Breastfeeding promotion is the ideal...
but bottle-feeding is often the reality**

-  70% of breastfed infants regularly receive expressed breast milk in bottles (Labiner-Wolfe et al 2008)
-  75% of breastfed infants also receive formula by 6 mo (CDC, 2020)
-  16% of infants are exclusively formula fed from birth (CDC, 2020)

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Mini-Summary

2 Breasts vs Bottles for Infant Feeding: What's the Difference?









- Both what and how the infant is fed matters
- Unique properties of breast milk support healthy growth trajectories
- “Features” of bottles that make them an attractive alternative to breastfeeding may facilitate overfeeding
- Promotion of breastfeeding is ideal, but bottle-feeding is a ubiquitous part of infant feeding

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Can we promote responsive bottle-feeding as a secondary prevention strategy?

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Many formula/bottle-feeding mothers do not feel supported

- 1 in 5 formula-feeding mothers receive no advice or support (Appleton et al 2018)
- Bottle-feeding advice and education is often inadequate (Lakshman et al 2009)
 - Due, in part, to greater emphasis on breastfeeding
- Caregivers must rely on judgement or non-professionals (Lakshman et al 2009)
 - Especially low-income Hispanic mothers in WIC (Gross et al 2014; Heinig et al 2009; Almeida et al 2020)

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WIC mothers report feeling stigmatized for formula-feeding

What is the experience of formula-feeding mothers at WIC?

Judged for not BF

Perceive WIC as a Formula Provider

Difficulties obtaining desired amount of formula

"With my son...I felt judged once I had to switch over to formula...and they would be like 'well have you tried this?' I tried everything...I was just like 'I can't, I stopped' and because WIC is very big on breastfeeding, that it made me feel like I wasn't doing my job...during those times, I felt very judged."

"The staff is reluctant to give formula...although we know the goodness of the breastmilk, we still choose to formula-feed, it's our option. Maybe WIC can support our personal opinion if we chose to formula feed."

"I think the breastfeeding people get more and formula get less so they just don't want to continue with the whole process."

Almeida et al. (2020). A Qualitative Study of Breastfeeding and Formula-Feeding Mothers' Perceptions of and Experiences in WIC. *J Nutr Educ Behav*, 52(6), 615-625.

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What types of support are given for breastfeeding vs formula/bottle-feeding?

Breastfeeding	Formula/Bottle-feeding
Positioning & latching Recognizing hunger cues Recognizing fullness cues Signs of a good feeding Common breastfeeding problems Paced bottle-feeding Interaction with lactation consultants	How much to feed How often to feed Safe preparation of formula Choosing the right formula

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What types of support are given for breastfeeding vs formula/bottle-feeding?

Breastfeeding	Formula/Bottle-feeding
Positioning & latching Recognizing hunger cues Recognizing fullness cues Signs of a good feeding Common breastfeeding problems Paced bottle-feeding Interaction with lactation consultants	Positioning Recognizing hunger cues Recognizing fullness cues Signs of a good feeding Common signs of overfeeding Paced bottle-feeding Interaction with infant feeding consultants

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What are some promising strategies for promoting responsive bottle-feeding?



Conventional
Clear

Opaque
Weighted

N= 76 bottle-feeding dyads

Maternal sensitivity can be improved by removing bottle-based cues

- When using opaque bottles, mothers:
 - ✓ Exhibited greater sensitivity to infant cues
 - ✓ Fed their infants less
 - ✓ Fed their infants at a slower pace

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Ventura & Hernandez (2019). Effects of opaque, weighted bottles on maternal sensitivity and infant intake. *Matern Child Nutr*.15:e12737

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What are some promising strategies for promoting responsive bottle-feeding?



Ensure families are using developmentally appropriate bottle sizes

- Use of **larger bottles (≥6oz)** at 2 months associated with:
 - ✓ Greater intake per feed and per day
 - ✓ increased intake and weight gain at 2 months
 - ✓ greater weight gain between 2- and 6-months

CAL POLY Wood CJ et al. (2016). Bottle Size and Weight Gain in Formula-Fed Infants. Pediatrics. 138(1):e20154538.

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What are some promising strategies for promoting responsive bottle-feeding?

Aim to make bottle-feeding more like breastfeeding, e.g. Paced Bottle-Feeding



- Position infant upright
- Hold infant during the entire feeding
- Position bottle horizontally to encourage infant to work to extract milk
- To start feeding, gently brush infant's lip with nipple
- Wait for infant to actively accept nipple
- Take breaks and watch for infant cues to pace the feeding

CAL POLY Kassing (2003). Bottle feeding as a tool to reinforce breastfeeding. JHum Lact 18:56-60.

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We recently developed an intervention to support responsive bottle-feeding



RESEARCH Original Research

Promoting Responsive Bottle-Feeding Within WIC: Evaluation of a Policy, Systems, and Environmental Change Approach

Alison K. Ventura, PhD, Karina Silva Garcia, PhD, Martha Meza, Elizabeth Rodriguez, Catherine E. Martinez, MPH, Shannon E. Whaley, PhD

ARTICLE INFORMATION
 Article history:
 Submitted 13 January 2021
 Accepted 3 May 2021

ABSTRACT
 Background Bottle-fed infants are at greater risk for overfeeding and rapid weight gain (RWG); evidence-based strategies for promoting healthy bottle-feeding practices are needed.
 Objective Our aim was to assess whether policy, systems, and environmental (PSE) strategies for promoting responsive bottle-feeding practices within the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) were associated with lower risk for RWG.


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We employed 2 PSE Strategies to support WIC mothers:

1

Enhanced resources to support *both* breast and bottle-feeding, including educational materials about responsive bottle-feeding



The flyer features the WIC logo and lists topics such as infant feeding, formula preparation, and infant crying and sleep. It provides the phone number (826) 955-6818 and a website URL. A blue callout box contains a tip: 'A helpful tip from your friends at WIC: Do you run out of formula quickly? Responsive bottle-feeding may help! Learn more here. Questions? Call our Infant Feeding Line 888-278-6455 for more info and support.'

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We employed 2 PSE Strategies to support WIC mothers:

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Enhanced resources to support *both* breast and bottle-feeding, including educational materials about responsive bottle-feeding



The flyer shows a woman feeding her baby and includes text: 'Let's talk about Responsive Bottle Feeding' and 'Responsive bottle-feeding means that a parent feeds in response to the baby's hunger and fullness cues. We know this is the best way to feed babies because babies are really good at knowing how much they need to eat. Responsive bottle-feeding can help prevent overfeeding and is important for promoting healthy weight gain.' It also asks 'What do you notice about how this mother is feeding her baby?'.

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We employed 2 PSE Strategies to support WIC mothers:

2

More inclusive assessment of early infant feeding decisions (not just breastfeeding) as a foundation for tailored intervention

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Original Newborn Enrollment Assessment Form:

NICHD Enrollment (30 days) Parent Interview

Mom's Name: _____ Baby's Name: _____ Family ID: _____
 Baby's Due Date: _____ Baby's Birth Date: _____ Self-estimate Baby's Age Now: _____ days
 Birth Weight: _____ lbs _____ oz Birth Length: _____ inches

1. "Tell me about your delivery?" *PROBE: "tell me more about that" if nature of counseling is needed.*

2. "How long is your baby's longest stretch of sleep?" *Record number of hours of sleep.*

3. "Let's talk about how your baby's feelings are going. How are you feeling your baby now?"
 Breastfeeding only Breastfeeding and Formula Formula only (Skip to #9)

4. "On a scale of 1-10, with 1 being no pain and 10 being terrible pain, how much pain do you have..."
 a. "...when latching your baby or caused by sore nipples?" 1 2 3 4 5 6 7 8 9 10
 b. "...caused by very full hand-squeezed breasts?" 1 2 3 4 5 6 7 8 9 10
 c. "Does your discomfort while breastfeeding your baby influence how often you breastfeed your baby?"
 1 2 3 4 5 6 7 8 9 10

5. "Confidence in your ability to breastfeed is important. How confident are you about..."
PROBE: "tell me more about that" if Not Confident
 a. "...getting your baby to the breast without pain or discomfort?" Confident Not Confident
 b. "...knowing how much to feed your baby?" Confident Not Confident
 c. "...knowing that you can make enough breastmilk for your baby?" Confident Not Confident
 d. "...knowing how much to feed your baby?" Confident Not Confident

6. "How often do finish breastfeeding and immediately give a bottle to your baby? Would you say this is never, sometimes, or often?" Never Sometimes Often

7. "A month from now, do you want to be exclusively breastfeeding, mostly breastfeeding, some breastfeeding, or not breastfeeding?" Fully Breastfeeding Mostly Breastfeeding Some Breastfeeding Not Breastfeeding

8. "Next I would like to talk to you about your pumping routine. Are you currently pumping?" Yes No

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Revised Newborn Enrollment Assessment Forms:

Started with a screening question:

WIC is an infant feeding program and there are lots of ways you may be feeding your baby. How are you feeding your baby now?

- Breastfeeding only (no pumping) - Blue form
- Breastfeeding only (with pumping) - Purple form
- Breastfeeding and formula - Green form
- Formula only - Yellow form

*PROBE: "How do you feel about your decision?" - to confirm feeding choice is accurate

Go to corresponding interview form

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Revised Newborn Enrollment Assessment Forms:

Followed by targeted assessment:

NICHD Enrollment (30 days) Interview Questions: Breastfeeding, No pumping

NICHD Enrollment (30 days) Interview Questions: Breastfeeding and Pumping

NICHD Enrollment (30 days) Interview Questions: Breastfeeding and Formula

NICHD Enrollment (30 days) Interview Questions: Formula Only

Mom's Name: _____ Baby's Name: _____ Family ID: _____

1. "Tell me more about your delivery?"
PROBE: "tell me more about that" if nature of counseling is needed.
 Possible Responses (Click Check):
 No responding needed: No responding needed
 Screen: Screen
 Counseling: Counseling
 Noted: Noted
 Resources: See responses in Section 2 & 3 below.

2. "Let's talk about how your baby's feelings are going. How would you describe your infant feeding experience so far?"
PROBE: "tell me more about that" if not sure whether experience is mixed.
 Possible Responses (Click Check):
 No responding needed: No responding needed
 Counseling: Counseling
 Screen: Screen
 Noted: Noted
 Resources: If more than 2 ways to BF, attach to Breastfeeding and Formula form.

3. "How long is your baby's longest stretch of sleep?"
Record number of hours of sleep.
 Possible Responses (Click Check):
 No responding needed: No responding needed
 Screen: Screen
 Counseling: Counseling
 Noted: Noted
 Resources: Getting to know your baby page.

4. "I would like to talk to you about how much formula you are feeding your baby."
 a. "How often did your baby receive a bottle in the past 24 hours?" (Skip if Nighty)
 Number of feedings: _____
 b. "About how many ounces were in each bottle?"
 Number of oz: _____
 Possible Responses (Click Check):
 No responding needed: No responding needed
 Counseling: Counseling
 Screen: Screen
 Noted: Noted
 Resources: Look like if since Baby is in green zone. Find the BIK in 4 months (Baby's BIK). When you feed the formula, check your Breastfeeding and Formula page to help with BIK.

5. Now, I would like to talk to you about how you mix your formula.
 a. "What brand of formula do you give your baby?"
 Possible Responses (Click Check):
 No responding needed: No responding needed
 Counseling: Counseling
 Screen: Screen
 Noted: Noted
 Resources: WIC authorized formula. See WIC authorized formula. See WIC - STEP Page - Form 1 (Form 1) Type of Formula. Ask if this probe. Probe to Counseling and Formula form.

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Each form was designed to guide counseling and education

Question	Response Options	Reference
1. "After baby's behavior, do you ever give your baby any snack or juice when you know he or she often has to feed. Let's ask more about the signs that your baby is getting enough to eat."	No existing need Counseling/Need	Getting to know your baby Page 12 Feed on Birth to 6 months Inside Cover
2. "What does your baby do that lets you know he or she is hungry?"	Keeps hands near mouth Moves sucking reflex Peebles lips	Getting to know your baby Page 12 Feed on Birth to 6 months Inside Cover
3. "Do you feed your baby on a schedule? Would you ever overfeed, or underfeed?"	Never Sometimes Usually	Getting to know your baby Page 12, 16 & 17
4. "Do you feed your baby whenever he or she cries? Would you ever overfeed, or underfeed?"	Never Sometimes Usually	Getting to know your baby Page 12 Feed on Birth to 6 months Inside Cover
5. "What does your baby do that lets you know he or she is full?"	Shows signs of being full Relaxes hands and arms Turns away from nipple Falls asleep Pushes nipple/her/his out	Getting to know your baby Page 12 Feed on Birth to 6 months Inside Cover
6. "Do you stop feeding when enough time has passed? Would you ever overfeed, or underfeed?"	Never Sometimes Usually	Getting to know your baby Page 12
10. "I am not going to read you some statements, I would like you to tell me if you agree or disagree."	No existing need Counseling/Need	Getting to know your baby Page 8
a. "My baby wakes up when I lay his/her down after he/she has been fed."	Sometimes Never Usually	Getting to know your baby Page 8
b. "My baby seems satisfied after he/she has been fed."	Sometimes Never Usually	Getting to know your baby Page 12 When you find the formula label cover
c. "My baby cries more than I thought he/she would."	Sometimes Never Usually	Getting to know your baby Page 16 & 17

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We employed 2 PSE Strategies to support WIC mothers:

For both breastfeeding and bottle-feeding, assessed:

- Feeding patterns
- Signs of under- or overfeeding
- Positioning
- Recognizing hunger and fullness cues
- Signs of a good feeding
- Common feeding problems
- Knowledge of paced bottle-feeding

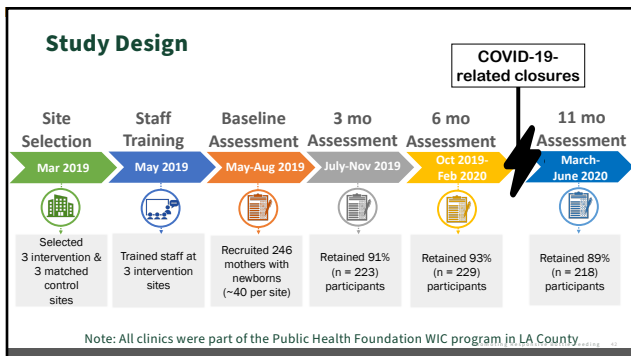
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More inclusive assessment of early infant feeding decisions (not just breastfeeding) as a foundation for tailored intervention

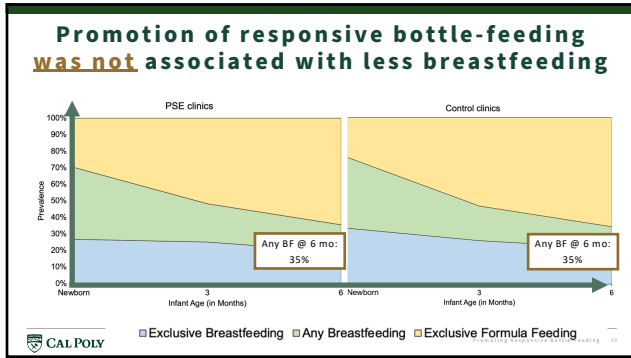
For both breastfeeding and bottle-feeding, ensured staff:

- Had all the questions and resources needed to support responsive feeding
- Could provide unbiased support that met mothers' needs

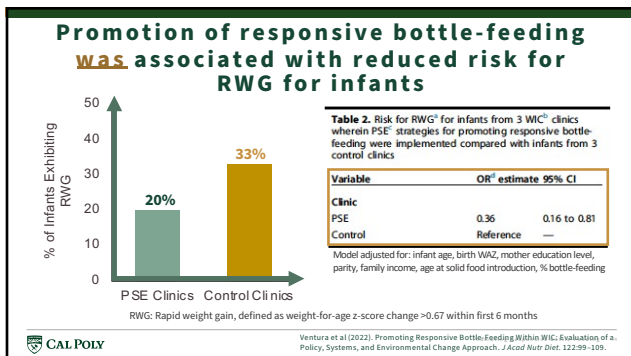
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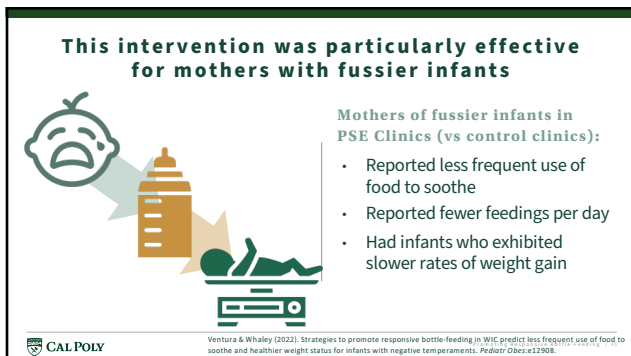
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Mini-Summary


3 Promoting Responsive Bottle-Feeding



- Bottle-feeding families report feeling underserved
- There is a need to complement breastfeeding support with support for healthy bottle-feeding
- Responsive bottle-feeding is possible and can be promoted by targeted strategies

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Conclusions

- Infancy is a sensitive period for obesity prevention efforts
- Promotion of responsive feeding is an important target for intervention efforts
- Breastfeeding and responsive feeding are complementary
- But responsive feeding during bottle-feeding is possible!

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Conclusions

- Promising strategies include:
 - Teaching families about feeding cues, regardless of feeding mode
 - Making bottle-feeding more like breastfeeding
 - Providing targeted support to reduce risk for rapid weight gain for formula/bottle-fed infants



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Resources: Responsive Bottle-Feeding Intervention Materials

<https://healthykids.calpoly.edu/ResponsiveBottleFeeding>



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Released August 2022

For more info:
alisonkventura.com

Promoting Responsive Feeding During Breastfeeding, Bottle-Feeding, and the Introduction to Solid Foods

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Questions?

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