
Bunker Babies: The effects of Covid 19 on young children's development
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We Can't Wait 9/16/22
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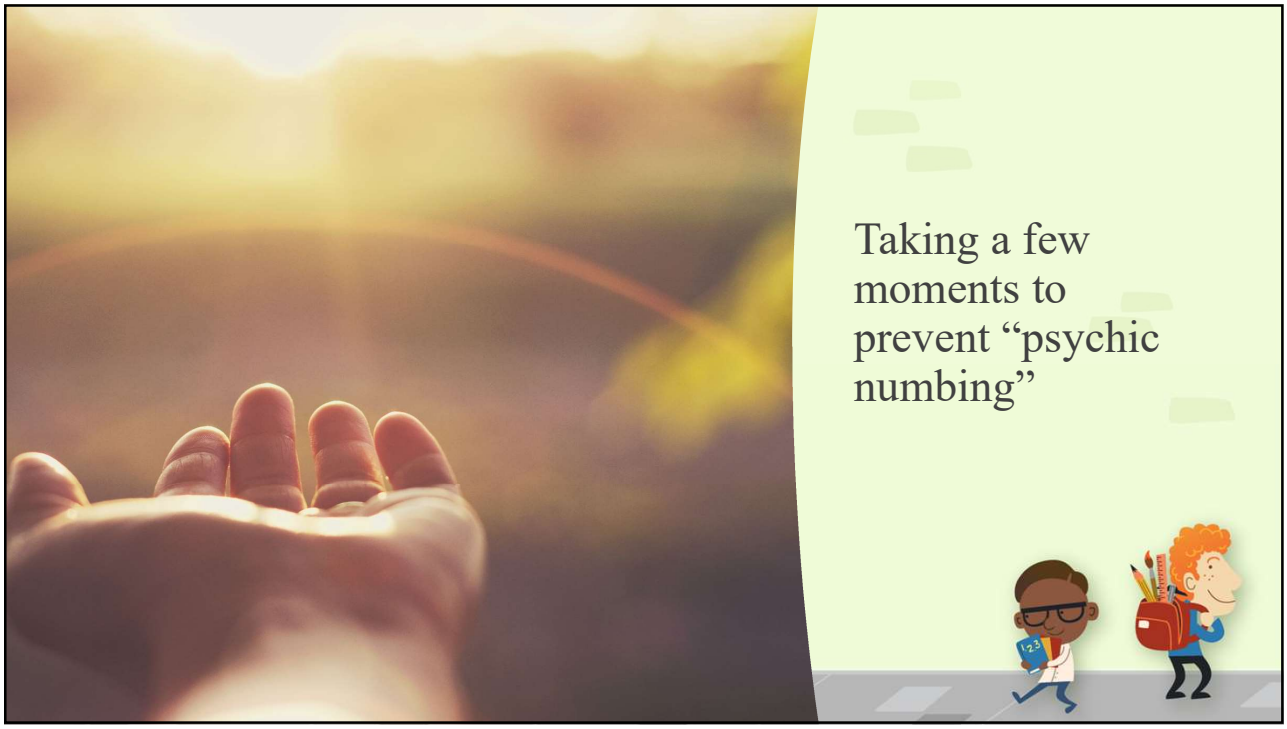
Taking a few moments to prevent "psychic numbing"

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Were the kids okay before the pandemic started?

- On average, five-year-old American children when compared to children in England and Estonia:
  - Lower literacy scores
  - Lower numeracy scores
  - Poorer self-regulation skills
  - Engaged in fewer acts of cooperation, kindness, and other prosocial behaviors

Source: OECD (Organisation for Economic Cooperation and Development), March 2020

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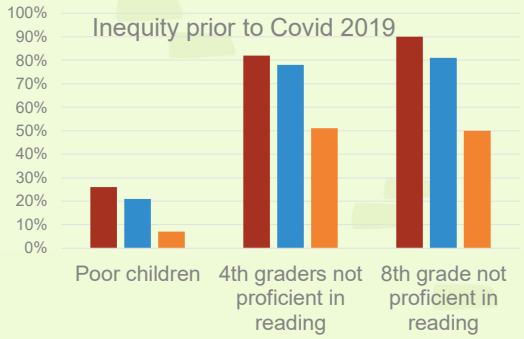
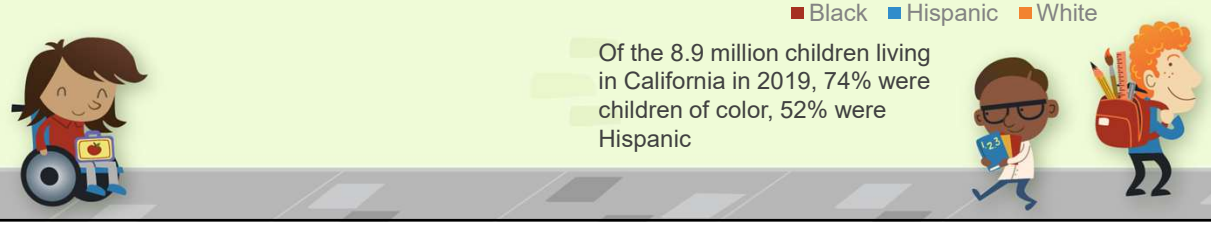
We're the kids in California okay before the pandemic?

- 16% of all children in California were poor
- 16% of children under 6 were poor
- 15% of children lived in food-insecure households in 2018
  - 21% relied on SNAP (Supplemental Nutrition Assistance Program) in 2018
  - 4.9 million children were enrolled in Medi-Cal in 2019



Of the 8.9 million children living in California in 2019, 74% were children of color, 52% were Hispanic



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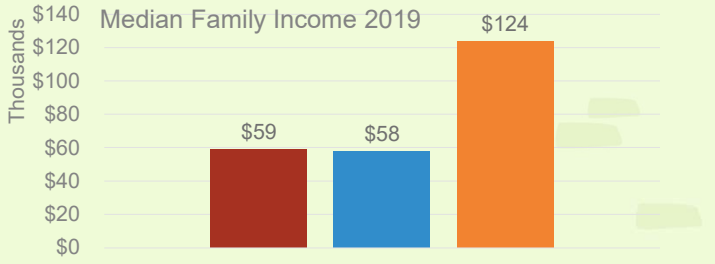
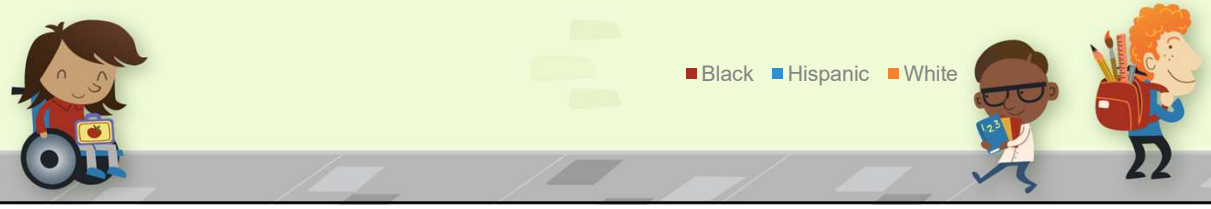
Cost of Housing and Childcare – the perfect storm for financial hardship before, during and after the pandemic

- 2.8 full-time jobs at minimum wage were needed for a family to afford a two-bedroom rental unit (2020)
  - At $12 to $13 an hour that equates to $70,000 to $75,000
- $17,384 was the average annual cost for an infant in center-based care in 2019





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California's youngest learners

- In 2017 to 2018 it was estimated that California provided early intervention to 4% of eligible toddlers, however researchers estimated that approximately 20% are eligible under the state's eligibility criteria.
- Children served by Part C (preschool special education) are 5.4% of eligible children whereas only 1.8% of children exiting early intervention continue in Part C
- Only 7% of California's first graders with IEPs were participating in early intervention at age 2 (Petek 2019)

2016 data	Calfornia Avg	National Avg
Receive EI	2.9%	3.1%
Exit EI and are Part B eligible	1.8%	36.4%
Receive initial IFSP in timely manner	78.45%	94%
Timely transition from Part C to B	79.12	96%
Comply in meeting federal service deadlines (2014)	82.1%	95%
Develop IFSP	82.1%	95%
Timely transition to preschool	74.5%	94%

Sources: Kasari et al. 2020, Petek 2019

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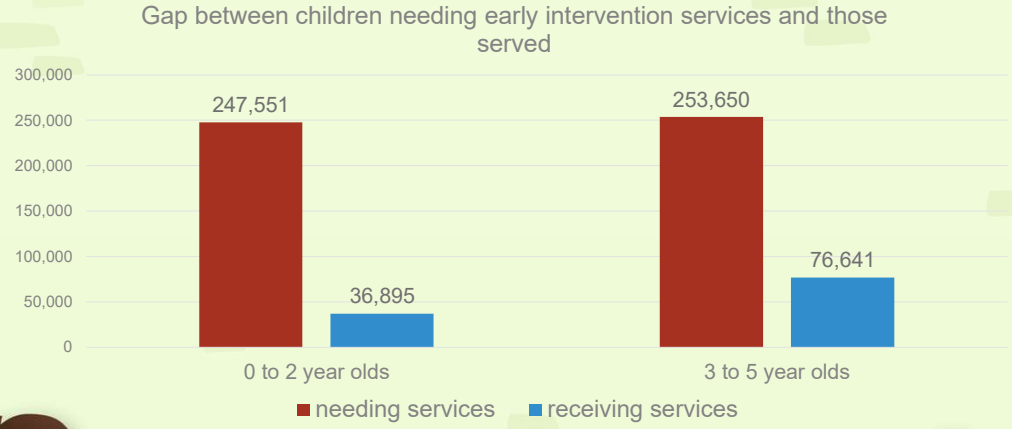
Children Now gave California a D on their 2020 Children's Report Card for Early Intervention and Special Education



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Developmental Delays

- Columbia University Irving Medical Center study of 255 infants born between March and December 2020, parents completed a 6-month ASQ-3 assessment (Shuffrey et al. 2022)
  - Exposure to maternal SARS-CoV-2 infection was not associated with differences on any ASQ subdomain at 6 months
  - **Both exposed and unexposed infants born during this period had significantly lower scores on gross motor, fine motor, and person-social subdomains compared with infants born before the pandemic**.
- Southern Illinois University, assessed (6, 12,18, 24, and 36-month intervals) pre-pandemic and post-pandemic ASQ3 scores for 1,024 children distributed among 2 pediatric practices (Imboden et al. 2021)
  - There were no significant differences in aggregate scores for the overall sample
  - There were statistically significant differences in domain scores by age
  - Postpandemic problem-solving scores decreased among 6-month-olds while increasing among 24-month-olds
  - **Slight decrease in post-pandemic scores in the communication domain among 6- and 12-month olds**

"If our data were to generalize to all the babies born during the pandemic, that could mean something like a triple increase in babies that need to be referred for intervention"
Dani Dumitriu, Columbia University

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Developmental Delays

- Brown University study of 39 children enrolled in longitudinal study prior to the pandemic (January 2019) to 188 children born after July 2020 using Mullen Scales. (Deoni et al. 2021)
  - Cognitive scores were significantly reduced during the pandemic by 27 to 37 points (almost 2 standard deviations)
    - Significantly reduced verbal, motor, and overall cognitive performance
    - Follow up research recorded parent-child interactions at home and found the **number of words spoken by parents to their children, and vice versa (child vocalizations) and overall conversational turn taking in the past 2 years has been lower than in previous years**
    - *The differences in vocalizations and turns were greatest among children from families in the lowest SES quartile. For example, child vocalizations among the lowest SES group decreased from the 49th to 25th percentile.*

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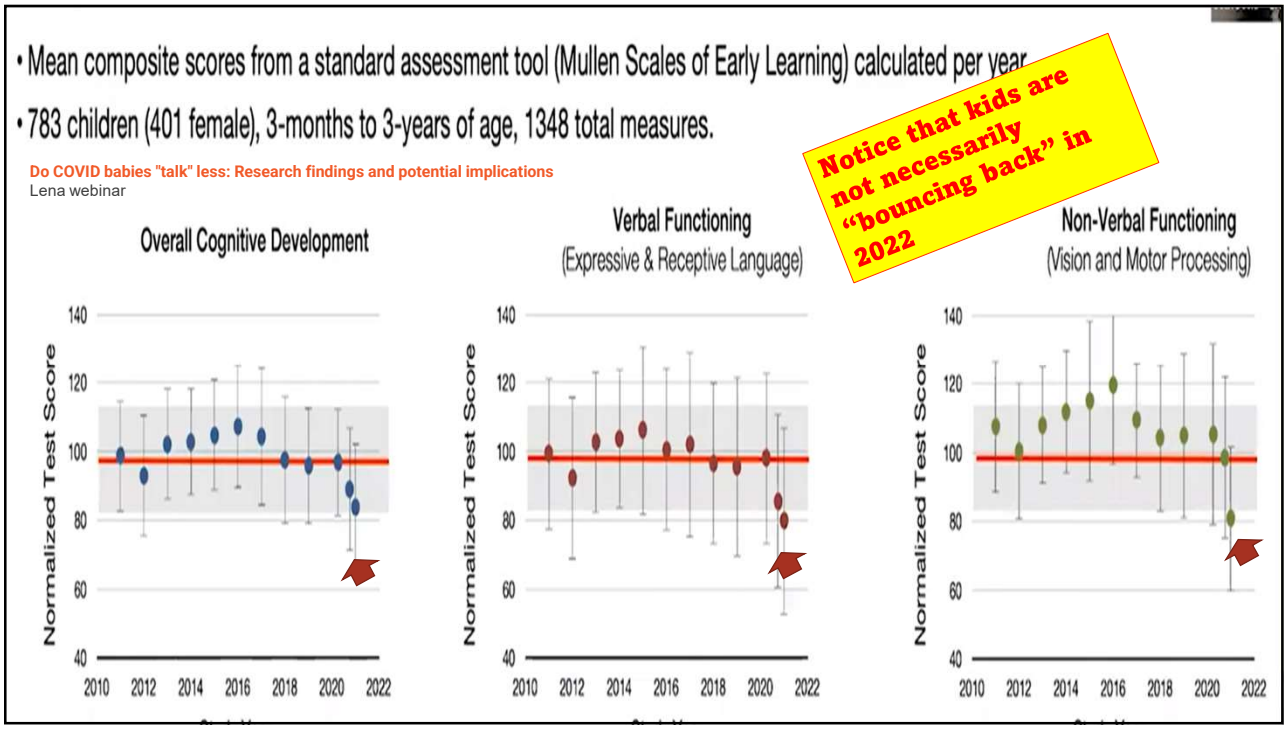
• Mean composite scores from a standard assessment tool (Mullen Scales of Early Learning) calculated per year
• 783 children (401 female), 3-months to 3-years of age, 1348 total measures.
Do COVID babies "talk" less: Research findings and potential implications
Lena webinar
Notice that kids are not necessarily "bouncing back" in 2022
Overall Cognitive Development
Verbal Functioning
(Expressive & Receptive Language)
Non-Verbal Functioning
(Vision and Motor Processing)
Normalized Test Score
140
120
100
80
60
40
2010
2012
2014
2016
2018
2020
2022

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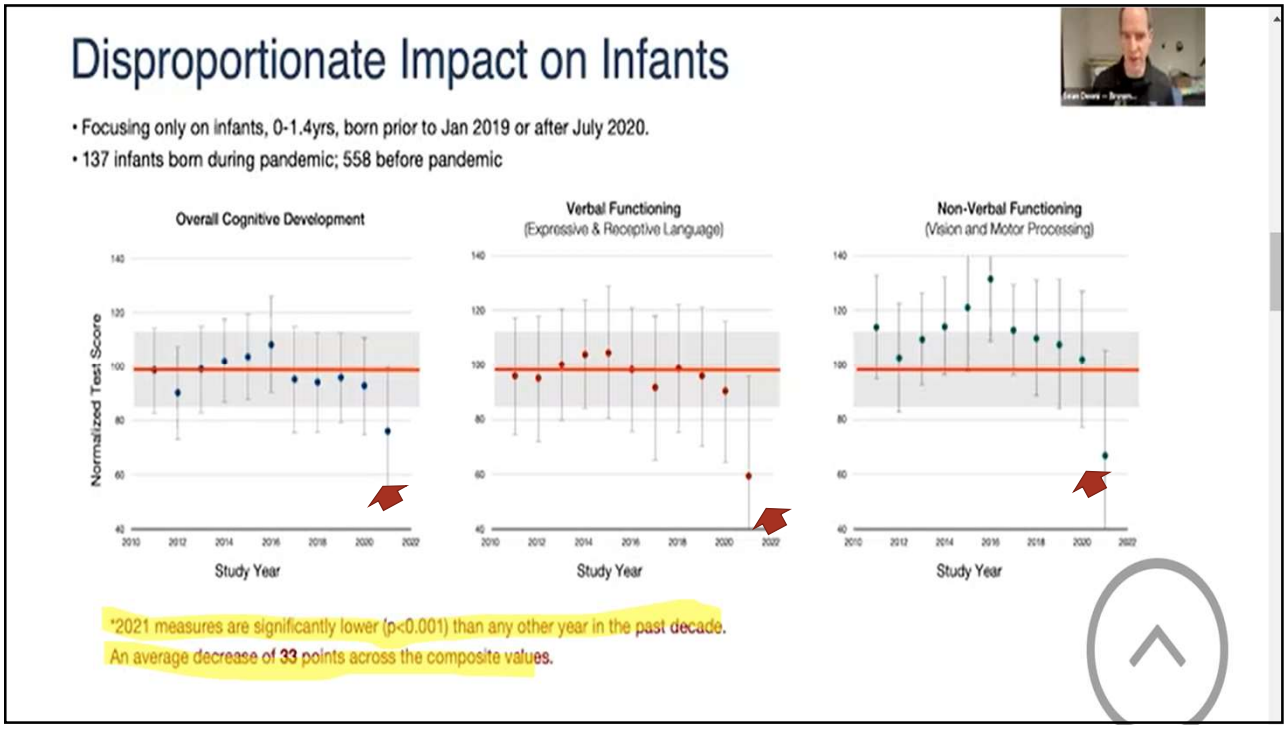
Disproportionate Impact on Infants
• Focusing only on infants, 0-1.4yrs, born prior to Jan 2019 or after July 2020.
• 137 infants born during pandemic; 558 before pandemic
Overall Cognitive Development
Verbal Functioning
(Expressive & Receptive Language)
Non-Verbal Functioning
(Vision and Motor Processing)
Normalized Test Score
Study Year
*2021 measures are significantly lower (p<0.001) than any other year in the past decade.
An average decrease of 33 points across the composite values.

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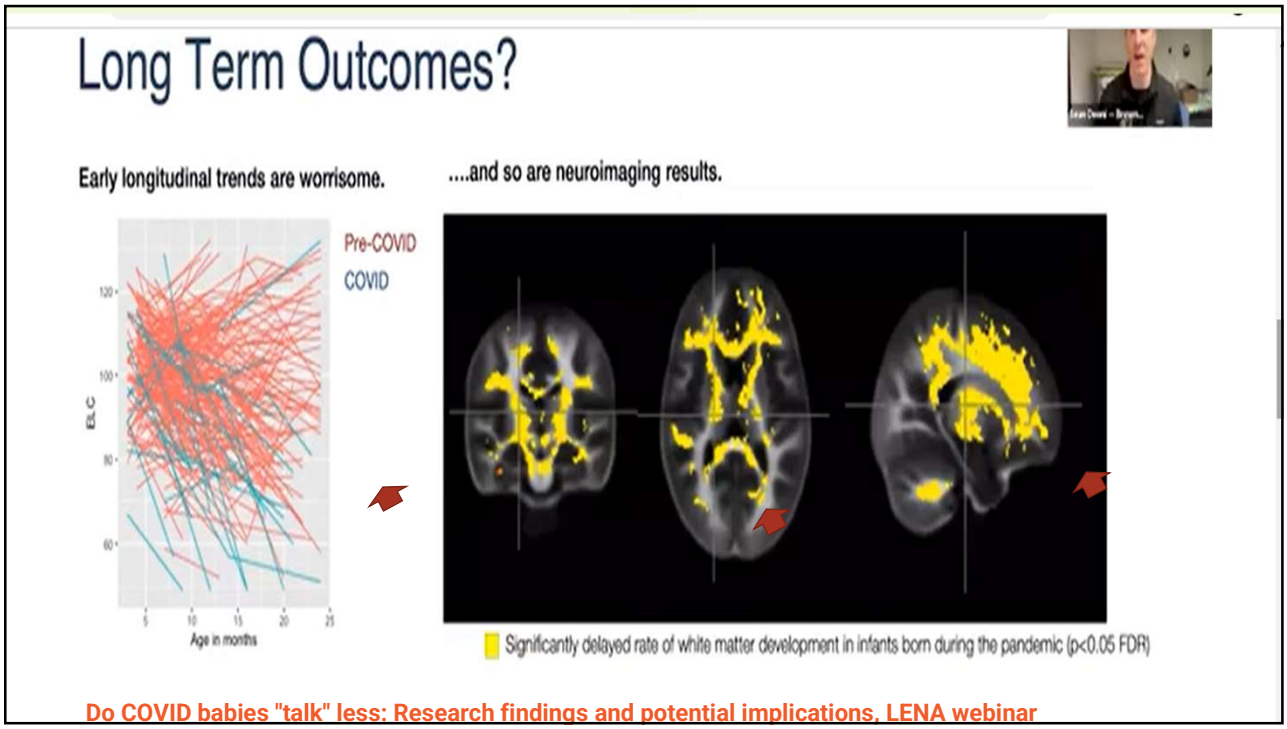
Long Term Outcomes?
Early longitudinal trends are worrisome.
....and so are neuroimaging results.
Pre-COVID
COVID
ELC
Age in months
Significantly delayed rate of white matter development in infants born during the pandemic (p<0.05 FDR)
Do COVID babies "talk" less: Research findings and potential implications, LENA webinar

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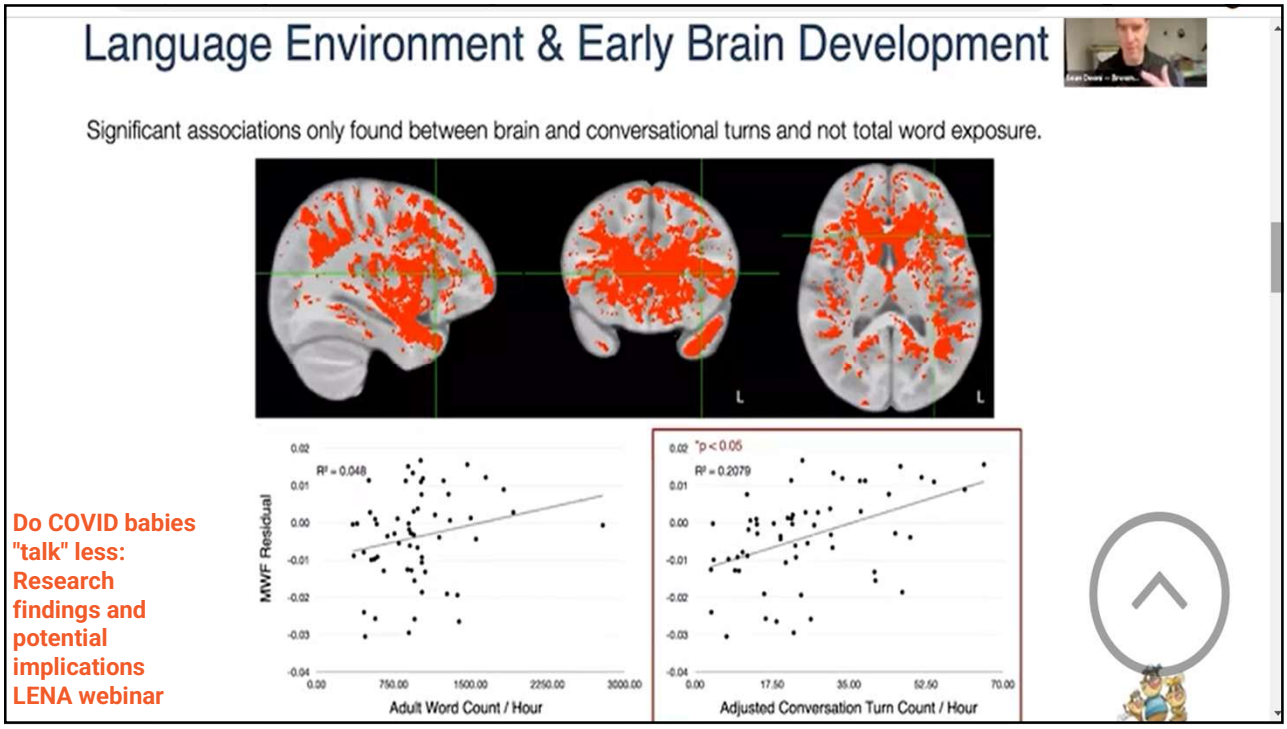
Language Environment & Early Brain Development
Significant associations only found between brain and conversational turns and not total word exposure.
L
L
MWF Residual
R² = 0.048
Adult Word Count / Hour
*p < 0.05
R² = 0.2079
Adjusted Conversation Turn Count / Hour
Do COVID babies "talk" less: Research findings and potential implications LENA webinar

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- This study found that, controlling for prior socioemotional competence, the number of turns in infants' language environment predicted their socioemotional skills at 30 months.
  - ***Emotional regulation***: in the final model, 7.0% of the variance is explained by conversational turns above child vocalizations, controls (**maternal warmth and cumulative social risk**), and emotional regulation at 18 months (change in F = 4.039, gl = 1 and 37, p = 0.052).
  - ***Attachment and relationships***: in the final model, 7.7% of the variance is explained by conversational turns, above child vocalizations, controls, and attachment at 18 months (change in F = 4.705, gl = 1 and 37, p = 0.037).
  - ***Emotional communication***: in the final model, 11.4% of the variance is explained by conversational turns above child vocalizations, controls, and emotional communication at 18 months (change in F = 6.413, gl = 1 and 37, p = 0.016).
- A cross-lagged analysis showed that paths from turns to socioemotional competence were significant but NOT the reverse.
- Results suggest that non-semantic aspects of the linguistic environment can contribute to children's socioemotional development.

Source: LENA webinar, Esteban Gomez, April 201

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Language Development across the globe during lockdown

- Vocabularies of 1,742 children between 8 to 36 months(68% of the sample were below 24 months of age) across 13 countries and 12 languages were evaluated at the beginning and end of the first lockdown period (in each country) from March to September 2020 using the MacArthur Bates CDI (Kartushina et al. 2022)
  - Children who had **less passive screen exposure** and **whose caregivers read more to them** showed **larger gains in vocabulary development** during the lockdown, after controlling for SES and other caregiver-child activities.
    - Children with no exposure to screens were reported to have the largest vocabulary gains relative to norms
    - Children with **less passive screen exposure showed greater gains in expressive, but not receptive vocabulary**
    - The ***time spent on shared book reading significantly correlated with gains in receptive vocabulary***, but not expressive vocabulary
  - Children gained more words than expected (norms) during the lockdown, which authors attribute to "faucet" moments when shared aspects of the child's environment are removed and the home environment is particularly important for development.

33.9% of parents in California read to their baby every day, which is lower than the national average of 36.8% (State of Babies 2022, Zero to Three)

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International data on delays

- University of Calgary in Canada compared developmental screening using ASQ3 of 1,623 1-year-old infants born between April 2020 to November 2020 to infants born pre-pandemic (Giesbrecht et al. 2022)
  - Infants born during the pandemic had lower mean scores relative to pre-pandemic infants in all domains except problem-solving.
  - Infants had a significantly higher risk for developmental delay in the communication and person-social domains for scoring 2 standard deviations below the mean.
- UK Government education inspectorate Ofsted based on a small sample of 70 early year providers reported
  - Delays in speech and language with limited vocabulary and adverse social skills
  - Regressions in independence and self-care skills
  - Delays in crawling and walking
  - Toddlers and preschool children needed extra support with sharing and taking turns


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Proxemics

- Social distancing between staff and parents resulted in distance from the children as children perceived the distance between parents and staff as a sign of distrust and consequently this negatively impacted the child-staff relationship (source: Lund University, Sweden online survey among 382 preschool staff between January to March 2021 (Andersson et al. 2022)
- 31% of 1,000 UK parents of children under 5 reported their children experienced anxiety when saying goodbye and 74% believed that this was made worse by the pandemic (source: Fisher-Price Play Lab and Family Action UK)
- Children don't really start to understand social distancing until about 3 years old.
  - Children younger than 3 need physical contact for healthy development (Source: Dr. Mike Gaffrey, Duke University Early Experience and Developing Brain Lab, Family Interview 3/27/20)



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Stranger Danger

- Stranger fear emerges at about 6 months of age (Field 2008)
  - However, there is significant individual differences in stranger fear across early infancy and toddlerhood (Brooker et al. 2013)
- Extreme stranger fear is a precursor to the development of social anxiety (Kagan 2000)
- Maternal depression predicts steeper increases in fearfulness between 4 to 12 months (Garstein et al., 2010)
- Research has found that the development of stranger fear during infancy is most closely linked to anxiety-related characteristics in mothers (Brooker et al. 2013)
- The development of stranger fear coincides with social referencing, where a child references a parent in a novel situation, so parent behaviors become particularly important cues for the development of social anxiety (Murray et al 2008)

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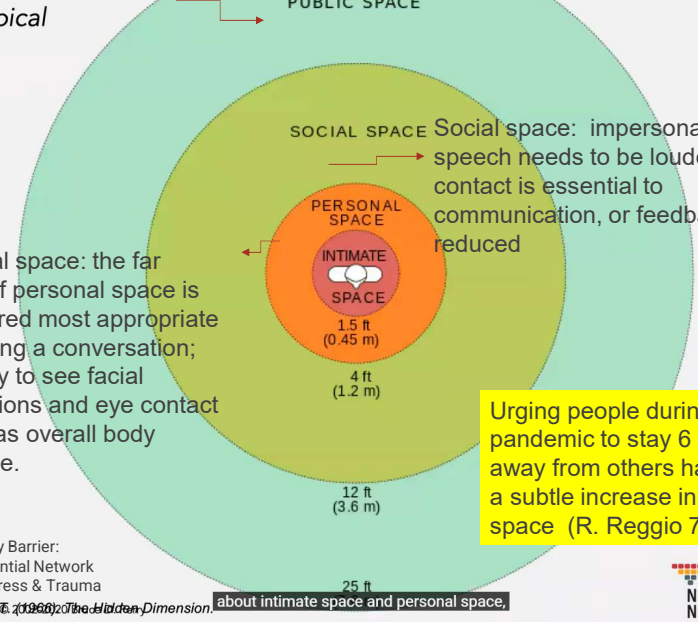
Proxemics
Typical

Public space: Teachers and public speakers, subtle facial expressions and eye contact are lost at this distance



Social space: impersonal business, speech needs to be louder and eye contact is essential to communication, or feedback will be reduced

Personal space: the far phase of personal space is considered most appropriate for holding a conversation; It is easy to see facial expressions and eye contact as well as overall body language.

Urging people during the pandemic to stay 6 feet away from others has led to a subtle increase in personal space (R. Reggio 7/22)

The Intimacy Barrier: Neurosequential Network Series on Stress & Trauma

Hall, Edward T. (1966). *The Hidden Dimension.*

about intimate space and personal space,

NEUROSEQUENTIAL NETWORK

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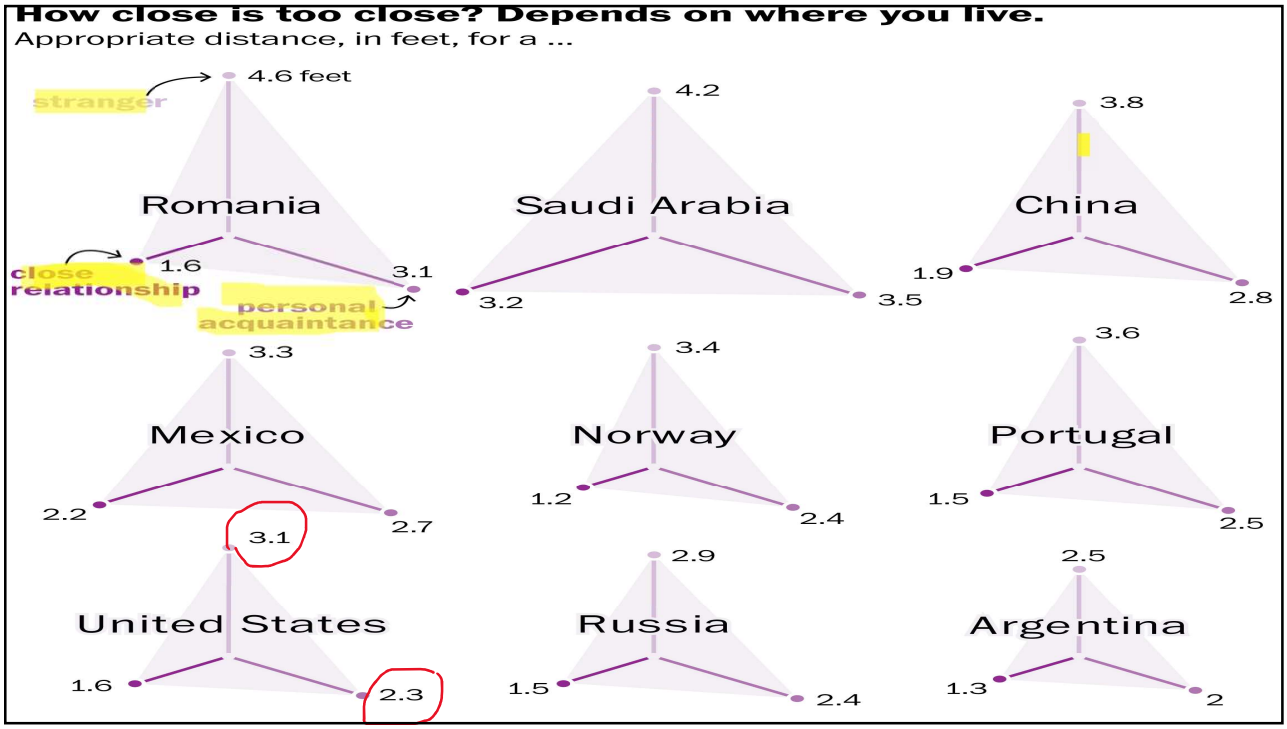
How close is too close? Depends on where you live.
Appropriate distance, in feet, for a ...
stranger
4.6 feet
Romania
close relationship
1.6
3.1
personal acquaintance
4.2
Saudi Arabia
3.2
3.5
3.8
China
1.9
2.8
3.3
Mexico
2.2
2.7
3.1
3.4
Norway
1.2
2.4
3.6
Portugal
1.5
2.5
United States
1.6
2.3
2.9
Russia
1.5
2.4
2.5
Argentina
1.3
2

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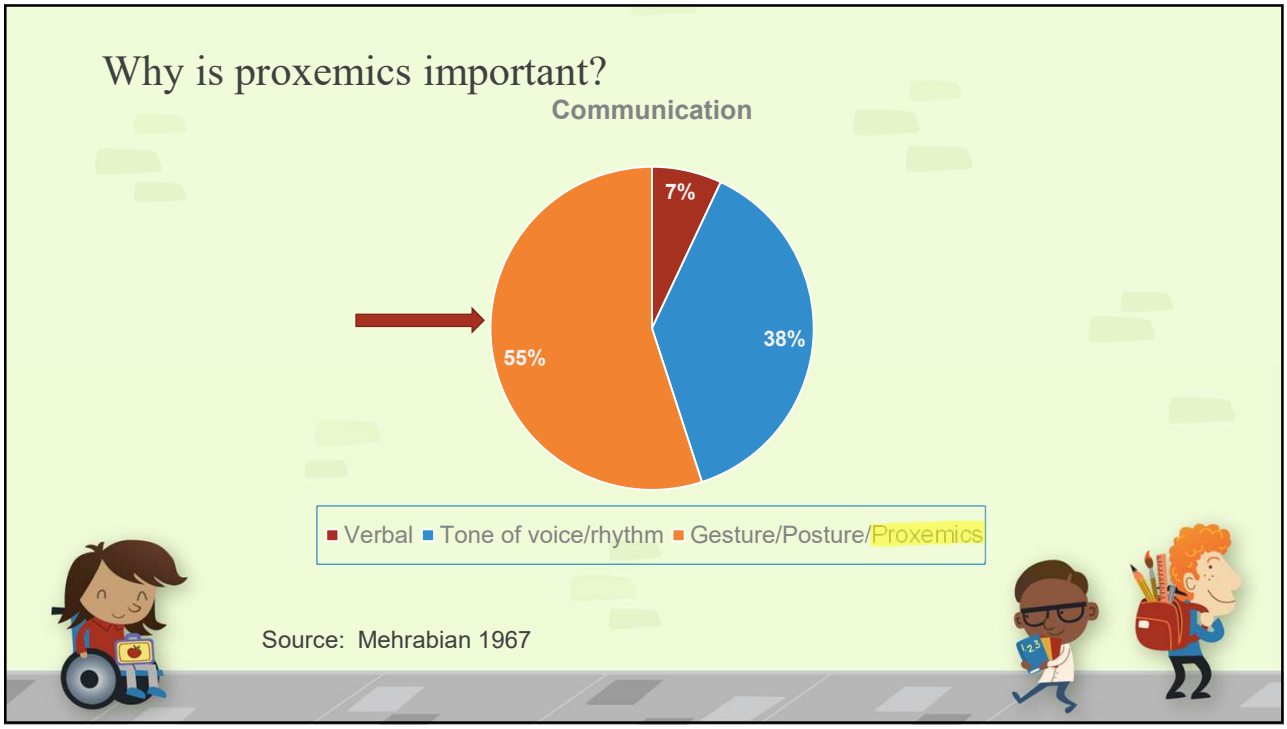
Why is proxemics important?
Communication
7%
38%
55%
Verbal
Tone of voice/rhythm
Gesture/Posture/Proxemics
Source: Mehrabian 1967

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Photo: Lionel Top, BFM TV news, nursery school re-opening France (via Twitter)

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Typical development of personal space

- Children increase their distance from adult caregivers with age, while they decrease their distance to playmates (Wesley 1982, Burgess &McMurphy 1982)
  - Infants 6 to 18 months stayed close to caregivers while toddlers and preschoolers moved closer to peers.
  - Research shows that preschoolers (4-to-5-year-olds) proxemic behavior is affected by their need to belong (Marinovic et al. 2017) and they understand that close distance means friendly (Melson 1976)
  - By the time children reach preschool they understand that close distance means "friendly" and they make predictions of other's behavior, they also expect people to keep a closer distance than adults (Paulus 2018)

"If children haven't had (social) experience when they enter into preschool, they need some extra scaffolding from their teachers and peers to learn.. about taking turns and sharing and solving conflicts for children who have interacted very little with others, it may take a little more time." Nancy Close, Yale Child Study Center"

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Potential problems with masks

- Three possible problems with mask wearing with respect to young children's development identified by Kang Lee, applies psychologist who studies facial recognition in kids (NYTimes, Klass, 9/14/20)
  - Facial processing/recognition skills
  - Emotional recognition and social interaction
  - Speech recognition

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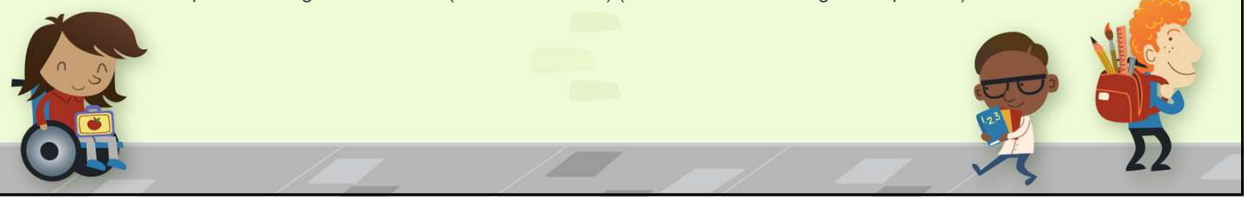
Facial processing

- For infants to track a human face in the first few hours of life, the aspects of the features themselves are important, although this preferential tracking decreases in the second month, i.e. timing is important (Johnson et al. 1991)
- Exposure to a variety of facial features and emotional expression during sensitive periods of development is crucial for the specialization of brain networks (Johnson 2005)
- Between 4 and 10 months babies make a perceptual shift from processing individual features in the face independently (featural processing) to configured processing where they process the face holistically (Schwarzer et al. 2007) (which masks would prevent)
- The variety and number of full unfamiliar faces a child is exposed to help refine facial processing skills
  - Exposure to multiple different faces provides more opportunities to practice detecting changes in spaces among facial features (Galati et al. 2016) (which social distancing would prevent)



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Social referencing and Emotion Recognition

- Social referencing: for infants and young children to feel safe there is a heavy dependence on facial expressions as they rely on their parents' emotional cues via facial expressions to regulate their responses to novel people and environments (Kurz and Hadani 2020)
- The research on emotional recognition based on facial features is highly contradictory
  - Some research claims that children as young as 4 to 5 have similar facial perception skills as adults (McKone et al. 2009) whereas other studies report that face processing skills develop up until 12 to 14 years (Mondloch et al. 2002, Schwarzer 2006)
  - Some studies found that happiness and sadness are mostly expressed by the lower part of the face (Fishcer et al.; Kret & de Gelder 2021) whereas other studies found that children can identify emotions based on the eye regions alone (Ruba & Pollak, 2020)

We need to consider that social distancing could have made social referencing and emotion recognition more difficult from "a distance."

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Speech perception and language development

- At 4 months old, infants look longer at the eyes then a shift takes place at 8 months old, they look longer at the mouth, then another shift takes place at 12 months where they look equally at both the eyes and mouth, coinciding with competence in their native language
  - **Research found that infants who looked more at their mother's talking mouth at 6 months scored higher on expressive language, size of vocabulary and socialization at 24 months of age**
- **Bilingual infants** rely more on audiovisual speech cues (look longer at the speaker's mouth) than monolingual infants who shift their attention from the mouth at 8 months to both the eyes and mouth at 12 months *
  - ***Nearly sixty percent of children five and under in California live in homes where a language other than English is spoken.**
- Autistic children studied at 2 years old tended to look more at a speaker's mouth than the eyes unlike typically developing toddlers
- Autistic children tend to focus more on the mouth and less than the eyes than typically developing children in recognizing expressions of happiness and anger (Tanaka et al. 2012)
  - ***DDS has about 133,000 autism cases, a phenomenon that has overwhelmed the state's regional centers, which report that about 70% of all intakes are now autism cases.**

Source: Lekowicz & Hensen-Tift 2012)

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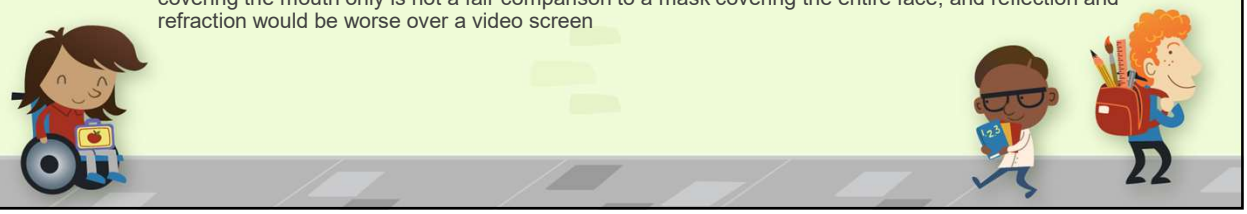
Research on masks and infants

- 23 mother-infant dyads (5 to 19-month-olds) filmed themselves playing without a mask, putting a mask on, and then again without the mask. (Tronick and Snidman 2021)
  - In all but 2 of the interactions children showed no change in affect or quality of social engagement
    - Tronick himself states that these infants and mothers know each other and have routines that underlay their interactions."
    - Tronick in earlier research noted that a mother wearing a mask elicits laughter whereas a stranger wearing the same mask elicits distress and fear" (Tronick 2/89 citing Sroufe, 1979)
- 24 infant-mother dyads (average age of 22 months) in Singapore were shown a video of a woman speaking words with no mask, a cloth mask, and a face shield (Singh et al. 2020)
  - Infants were able to recognize familiar words when hearing words through opaque masks but struggled when hearing words with a face shield
    - Note: children were shown an unfamiliar speaker through a video, the clear mask was a large face shield covering the entire face including the eyes.
    - Authors attributed distortion due to refraction and reflection of the plastic surface, however, a face mask covering the mouth only is not a fair comparison to a mask covering the entire face, and reflection and refraction would be worse over a video screen



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Impact of face mask on word recognition in young children with hearing loss during Covid

- Thirteen children (3 to 7 years old) watched a recording of words spoken with no mask, a surgical mask, a face shield, and a clear mask (Lipps et al. 2021)
  - Word recognition was significantly poorer for surgical masks and transparent face shields (apron masks)
  - The ClearMask condition was not significantly worse than the no mask condition for words in a quiet environment
  - This study replicated an earlier study (Lalande et al. 2021) with older children (7 to 18-year-olds) who found that children who are DHH (Deaf/Hard of Hearing) benefitted more from visual cues with clear masks, and audiovisual speech perception was the least affected by transparent masks.

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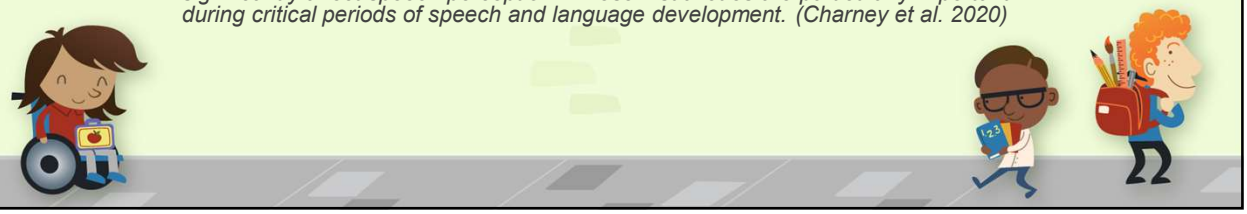
Additional impacts of Covid to DHH children and families

- University of Kentucky study of parents of DHH preschool-aged children (Anschultz 2021)
  - Parents of DHH children interviewed reported trouble accessing services during the pandemic and the difficulty was often correlated with socio-economic status and educational attainment
    - Parents had difficulty maintaining hearing devices with some children not wearing their hearing aids for up to a year
  - *Children lost access to ASL for programming and as young DHH children cannot read closed captioning does not meet their needs. Virtual schooling platforms such as Zoom are normed to spoken language spotlighting speakers who make noise. (Whitney & Whitney 2021)*
  - *The change of attenuation from 4dB increases from a basic medical mask increase to 12 dB for N95 masks, this small change can be significant for speech understanding for a DHH child. The attenuation combined with the loss of audiovisual cues (lip reading) can significantly affect speech perception. These visual cues are particularly important during critical periods of speech and language development. (Charney et al. 2020)*



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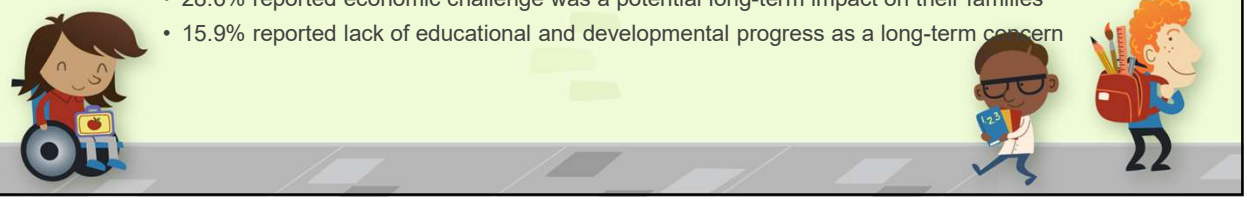
Impacts of Covid to Families with Autistic Children

- Globally, literature review found excess stress worsened the mental health of caregivers
  - As their stress increased they reported higher rates of social harm, depression, and anxiety that affected daily functioning and prevented them from providing optimal care (Aarabi et al. 2021)
- Families revealed higher levels of stress in caregivers of younger children with ASD and those with greater severity of ASD symptoms. (Manning et al. 2021, 471 parents in Michigan)
  - Families reported greatest areas of stress were **isolation,** illness, and finances
- The most frequently reported parent challenge among 77 families with young children with intellectual and developmental disabilities, at 55.8%, **was being stuck at home and unable to leave** (Loma Linda, Cal State Fullerton, and Univ. of Oregon (Neece et al 2020))
  - Sample was predominately Latinx, male and 62.34% had comorbid ASD
  - 10.4% reported child behavior problems
  - 28.6% reported economic challenge was a potential long-term impact on their families
  - 15.9% reported lack of educational and developmental progress as a long-term concern



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Covid 19 and Autism

- Parents (254) of young children (2.5-6 yrs) reported a significant increase in stereotypic, self-injurious, compulsive, and ritualistic behavior, and restricted interests after Covid restrictions (Belgium, Boterberg et al. 2022)
  - Co-occurrence of language impairment or intellectual disability was associated with more behaviors
- Most parents (122) of children (3 to 18)reported their child experienced negative behavioral changes, including regression in skills, increased or new maladaptive behaviors, and increased mood symptoms (Arizona, Staidheim, et al. 2022)
- Children under the age of 5 had the most severely disrupted services and the lowest reported benefit of telehealth adaptation. (Casey White et al. 2021, 3,502 caregivers)
  - Caregivers reported worsening ASD symptoms and family distress

Psychological Distress	US Parents	Parents of autistic child
Anxious	45%	65%
Depressed	22%	33%
Lonely	15%	28%
Hyperarousal	9%	25%
Overall psychological distress	25%	48%

March – April 2020, 3,556 parents, Kalb et al. 2021

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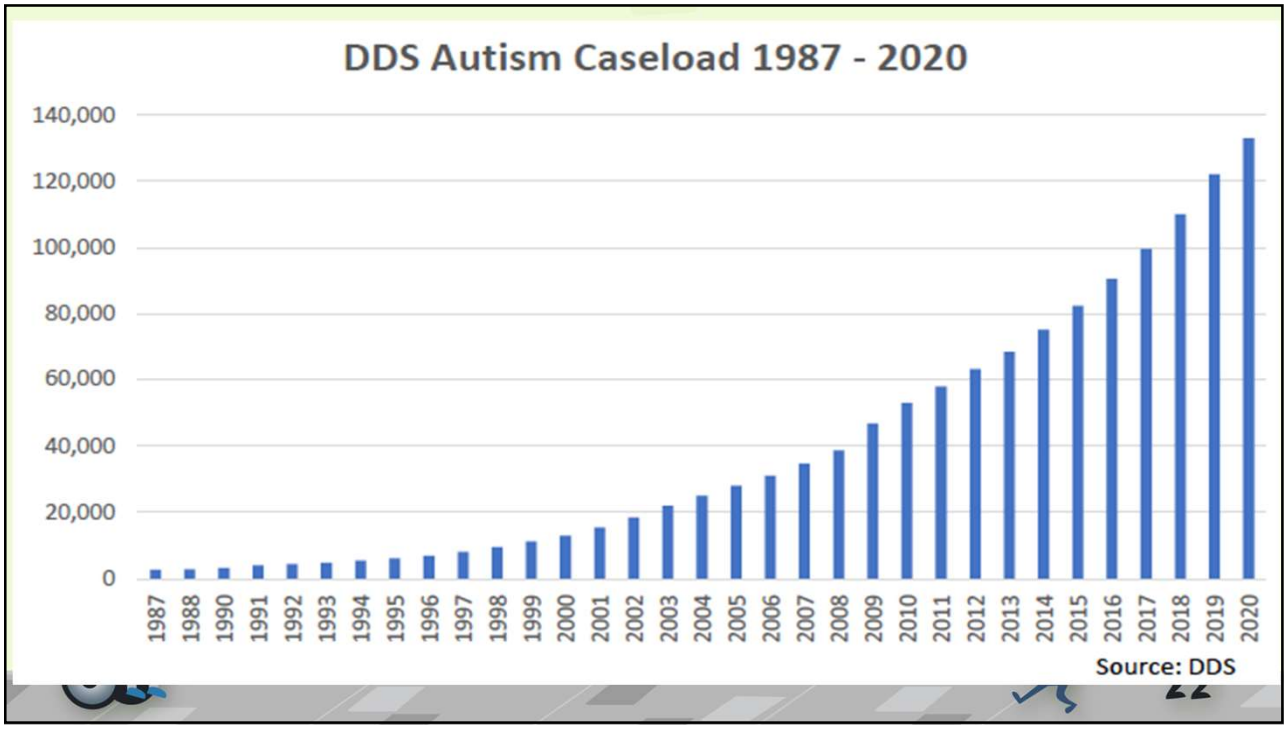

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Parents of children with disabilities disproportionately affected

- University of Connecticut national survey of 407 caregivers of children with and without a developmental disability (Chafouleas and Lovino, 2020)
  - Caregivers of children with developmental disabilities experienced significantly higher caregiver burden, depression, anxiety and stress than caregivers of typically developing children during the pandemic.
- UCLA and UC Riverside Primary Care and LEND clinics survey of Covid 19 impacts
  - 70.6% child behavior difficulties
  - 64.7% mental issues
  - 58.8% physical issues
  - 52.9% childcare issues
  - 41.2% financial issues


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Parents of Children with Disabilities, More Stress

- Families with children with a disability reported higher levels of emotional difficulty (US DHHS, 8/21)
- Families with a child with a disability were more likely to experience an interruption in child care during the pandemic
- Families with children under five from lower-income households, single-parent families, Black households as well as young children with disabilities experienced the largest increases in emotional or behavioral problems
  - Closure of ECE services plus material hardships negatively affected caregiver well-being which had an adverse effect on the emotional and behavioral health of young children
- Families with a child with special needs have disproportionately greater challenges including higher rates of material hardship, higher rates of emotional distress for both parents and children and higher healthcare disparities (RAPID-EC Survey, Fisher et al., 4/27/21)
- Globally (N=25,000, Save the Children Covid Hidden Impact Survey, 11/21) survey found that 82% of caregivers of children with disabilities reported reduced psychological wellbeing since Covid
- Parents reported 22% higher signs of distress as compared to parents of children without disabilities


36

Missed Well Visits and Developmental Screenings

- Over 26% of US households with children reported missing, skipping or delaying preventative visits in 2020 because of Covid (Lebrun-Harris, Public Health Reports 2022)
  - Missed or delayed visits were significantly higher among respondents who were not caught up on rent/mortgage and among respondents who reported children were not eating enough in the last 7 days because of affordability
  - Californians missed more than the national average at 29.9% (the range missed was from 17.9% to 37%)
    - California was already poor at screening with only 1 in 5 children under 4 receiving all 3 recommended screenings in 2019; a 21% screening rate was significantly below the national median of 33% (source: www.calhealthreport.org)
  - Wellness checks for **children 18 months to 5 years old were missed the most** (Rapid EC Survey 10/13/20)
  - Recently released data by DHCS reports that only *26% of children in Medi-Cal received at least six of the eight AAP recommended well visits between 0 to 15 months and only 25% were developmentally screened in the last 12 months before their first, second or third birthday*

Delays in well-child visits mean missed identification of developmental delays during wellness screenings as well as opportunities to observe signs of child abuse and neglect

37

Decrease in Early Intervention referrals and children served

- Nearly all home visiting programs across the country reported social distancing was required and **88% were required to stop in-person home visits.** (HARC 4/10/2020)
- CDC reported that Covid-19 "highly impacted" early identification of developmental delays and disabilities in young children (0 to 5) www.cdc/ActEarly
  - At least half of the EI programs across the country reported the number of children served by early childhood programs and systems overall had decreased since the Covid Pandemic started.
  - Referral rates for Black and Latino families and families with limited English proficiency dropped disproportionately (The Education Trust, May 2021)
  - Parents whose children participate in assistance programs like Early Head Start, Early Intervention, and home visitation programs in California experienced significant disruptions, with **34% reporting not receiving services during Covid** (WestEd Trust, poll of 600 California parents of children ages 0-5)
  - Potential home visiting beneficiaries in California were below the national average at .8% versus the 2.1% national average (Zero to Three State of Babies Yearbook 2022)

38

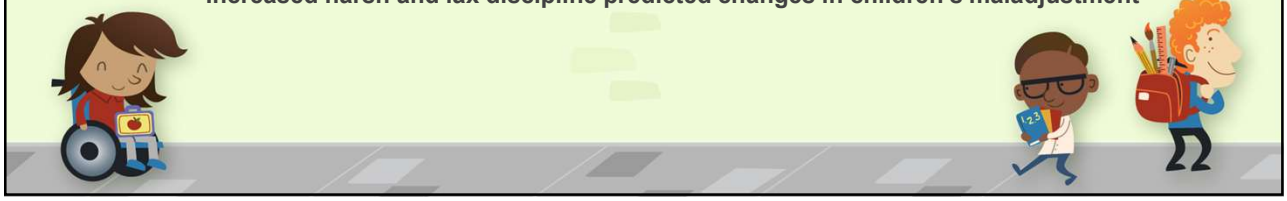
Parental Stress, Parent Functioning and Child Functioning

- Survey (1000 parents) found a significant relationship between parents' perceptions of Covid psychological impacts and their experiences of parental burnout which both predicted greater stress and fewer positive behaviors in children (Kerr et al. 2021)
  - Association between parents' Covid 19 psychological impacts and children's stress varied based on income, significant only at lower income levels
- Global scoping review among 95 studies found (Kotlar et al. 2021)
  - Severe increases in maternal mental health, clinically relevant anxiety and depression
  - Spike in domestic violence reports
  - Decrease in prenatal care visits

39

Stress Contagion between parents and children

- Increases in children's internalizing symptoms of stress increased from pre-pandemic to pandemic (May to August 2020) and higher levels of Covid stress were associated with increased maternal depression. *Maternal depression and children's behavior symptoms were significantly correlated*. (Doan et al 2022)
- Pandemic related stress during April 2020 through May 2020 was significantly associated with *higher maternal psychological distress which was significantly associated with higher negative parenting* which was significantly associated with higher child behavior problems (Shelleby et al. 2022)
- Maternal mental health among low-income first-time mothers of young toddlers predicted children's early levels of pandemic levels of adjustment problems and changes in adjustment across 6 months of the pandemic (Thompson et al. 2021)
- Disruptions to family functioning among 4-year-olds (204 families surveyed) during the pandemic predicted increases in children's maladjustment including stress and behavior problems (Fosco et al. 2021)
  - **Increased harsh and lax discipline predicted changes in children's maladjustment**



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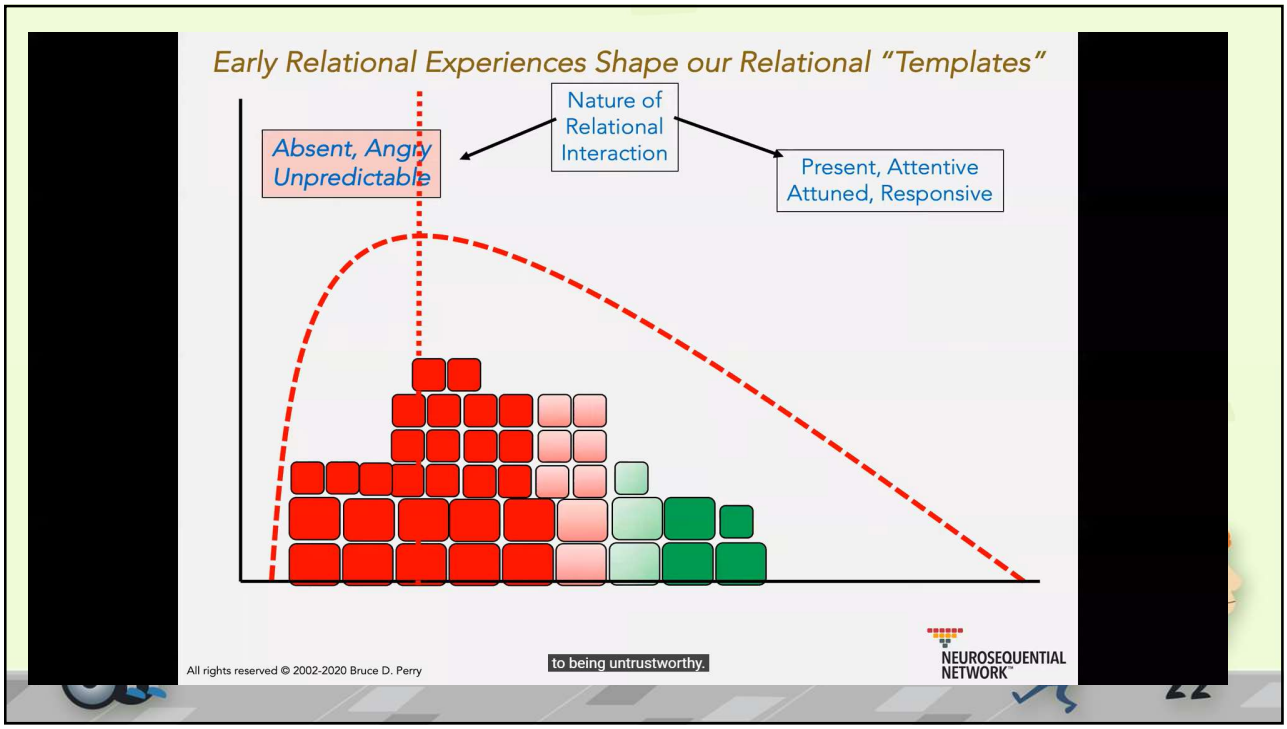

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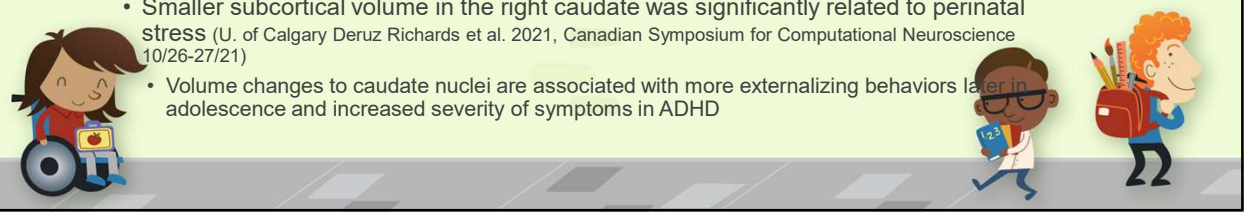
Giving Birth during Covid was highly stressful

- Clinically significant anxiety in the range of 34-71% and clinically significant depressive symptoms in 24 to 43% among mothers who gave birth during the pandemic (Liu et al. 2022)
  - Reduced access to medication was associated with higher levels of depression and PTSD symptoms after giving birth during Covid
  - Most prevalent change to birth plan was not having support person present for birth (35%)
  - Separation from their baby for a long period after deliver was associated with higher PTSD symptoms
- Pregnant and postpartum women (160) who delivered babies from April 28 to June 30, 2020 Washington State University (3/19/21)
  - 52% worried about babies contracting Covid 19, 27% couldn't obtain healthy food, and 25% missed prenatal appointments
  - *Pregnant women were more stressed than postpartum women surveyed*


42

Maternal Stress, Depression and Infant Brain Development

- University of Calgary (Manning et al 2022.) surveyed 8,000 women who were pregnant during the pandemic
  - Approximately half reported anxiety and one-third reported depression which was much higher than in pre-pandemic years
  - MRI imaging scan of 75 babies 3 months after birth to people who reported prenatal distress (anxiety/depression)
    - Different structural connections between their amygdala, the brain region involved in emotional processing, and their prefrontal cortex, the brain region responsible for executive functioning
      - Lower social support was a significant predictor of clinically elevated prenatal maternal distress
    - Previous small study (Lebel 2015) found a link between prenatal depression and brain connectivity in the same areas and found that in boys those brain changes correlated with aggressive and hyperactive behavior at preschool age
  - Smaller subcortical volume in the right caudate was significantly related to perinatal stress (U. of Calgary Deruz Richards et al. 2021, Canadian Symposium for Computational Neuroscience 10/26-27/21)
    - Volume changes to caudate nuclei are associated with more externalizing behaviors later in adolescence and increased severity of symptoms in ADHD



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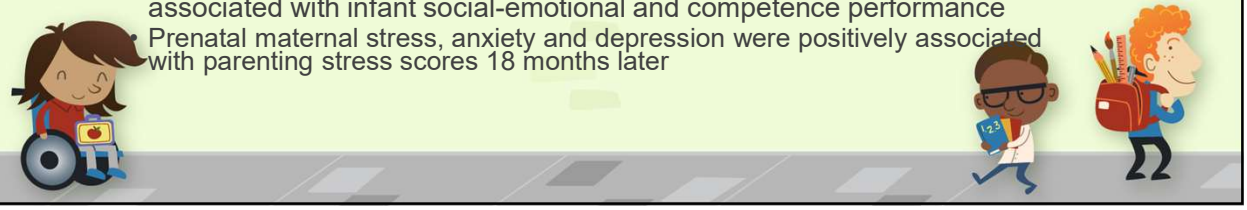
Maternal Stress, Brain Development and Cognitive and Social-Emotional Development

- Prenatal stress was negatively associated with changes to in utero brain development during the latter half of gestation and to social-emotional cognitive performance of those infants after birth (Wu et al. 2022, Lu et al. 2022, Developing Brain Institute, Washington DC
  - Elevated maternal anxiety and stress were associated with smaller hippocampal and cerebellar volumes
    - Higher maternal anxiety was associated with lower white matter
    - Elevated maternal anxiety and depression were associated with higher sulcal depth
  - White matter, hippocampus and cerebellar volumes were decreased in pandemic babies as compared to a pre-pandemic cohort
  - Cortical surface area and local gyrification were also decreased in all 4 lobes, sucal depth lower in frontal, parietal, and occipital lobes in the pandemic cohort
    - Prenatal stress altered fetal cortical folding, which in turn was negatively associated with infant social-emotional and competence performance
    - Prenatal maternal stress, anxiety and depression were positively associated with parenting stress scores 18 months later



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Anxiety affected regulatory capacity; and depression, not anxiety, affected motor development

- Among 169 women who experienced emotional stress and only had partial social support during Covid pregnancy reported higher anxiety. Postnatally anxiety was linked to the infants' regulatory capacity at 3 months (Provenzi et al. 2021)
  - Parenting stress and mother-infant bonding mediated the regulatory capacity
- Prenatal and Postpartum depression among 117 women were both significant negative predictors of infant motor ability (Papadopoulos et al. 2022)
  - Neither pre- or postnatal stress was associated with newborn motor outcomes
  - Depression both prenatally and postnatally resulted in poorer motor outcomes in low birthweight and preterm babies

45

NICU Babies

- Covid 19 in pregnancy associated with preterm birth in California (Karasek et al. 2021)
  - Covid 19 diagnosis was associated with ***a 40% increase in preterm birth and a 60% increase in very preterm birth***
  - In Ca. Covid 19 diagnosis rates in pregnant women increased across all ethnic groups but were disproportionately higher among Latinx, American Indian, and Native Hawaiian/Pacific Islander women and among people with public insurance.
    - Latinx mothers represented 47% of the sample and 72% of Covid 19 positive cases

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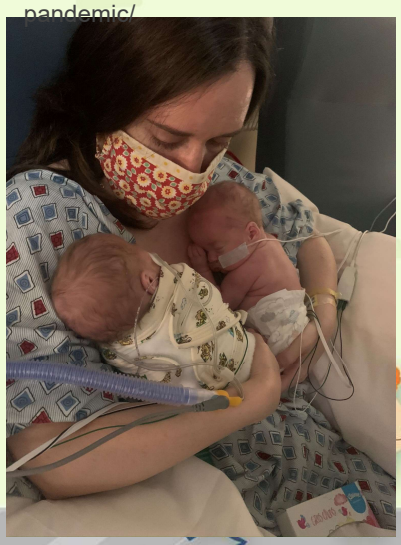
NICU Babies

- Parents of 169 NICU babies in a national survey among 38 states reported extremely stressful experiences during the pandemic (Vance et al. 2021)
  - Parents reported extreme isolation and disconnection, disruption to their family with almost half of families reporting only one parent was allowed into the NICU at a time, and concerns about child development due to lack of shared experiences and lack of visible facial expressions due to masks

Amy Rogeness
https://health.choc.org/being-a-parent-nicu-during-covid-19-pandemic/



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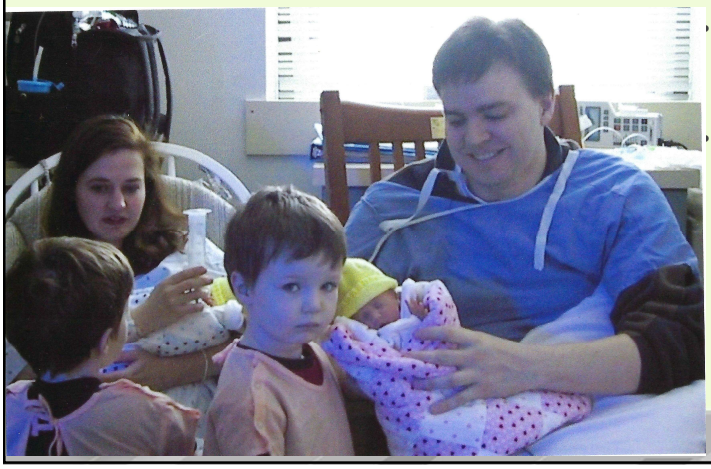
Global NICU experience

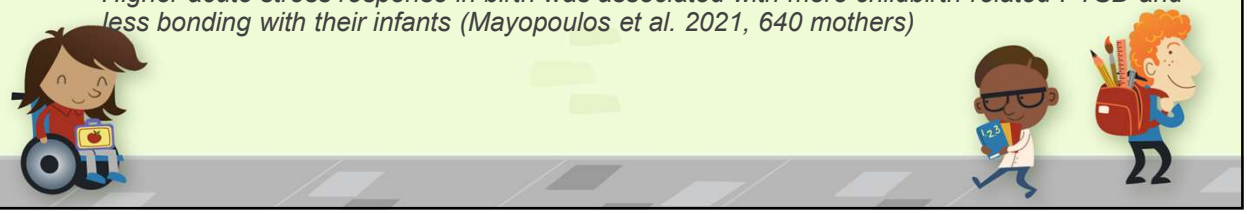


- 2,103 participants from 56 countries (Kostenzer et al. 2021) reported similar responses to the US study including:
- 63% of families were not allowed to be accompanied by another person in NICU and 52% did not have a support person present during the birth
- Only 10% reported that skin-to-skin (Kangaroo care) was initiated immediately after birth
- Restrictions of time allowed with their babies included 15% with none at all, 30% were permitted up to one hour
  - Research shows that the separation of parents and their newborns can impair developmental outcomes (Gale et al. 2021)

48

PTSD, Depression and Bonding

- *Prenatal depression was the only unique predictor of impaired maternal-infant bonding after postpartum depression was controlled for. (Kornfield et al. 2021, 833 mothers)*
  - *ACEs, prenatal depression and anxiety, and Covid stress predicted a greater likelihood of postpartum depression*
- *Depression in pregnant women was associated with lower quality bonding while a higher level of anxiety was positively associated with bonding (Koire et al. 2021, 686 mothers)*
- *Postpartum depression was related to lower quality bonding but the anxiety was not associated. (Liu et al. 2021)*
  - *Covid-related grief was significantly associated with lower quality bonding but Covid-related health worries were associated with higher-quality bonding*
- *Higher acute stress response in birth was associated with more childbirth-related PTSD and less bonding with their infants (Mayopoulos et al. 2021, 640 mothers)*



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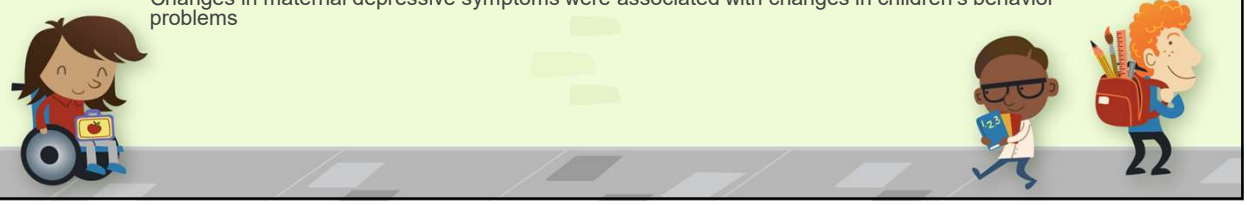
Epigenetics and Transgenerational Trauma

Historical trauma examples

- 9-month-old babies of women who were pregnant and traumatized by 9/11 showed low cortisol levels (R. Yehuda, 2005)
  - Mothers reported that their babies were unusually anxious and afraid of strangers
- Research showed that heightened SLC6A4 methylation in infants exposed to prenatal maternal depression and stress as well as to postnatal ACES. (Provenzi et al. 2016)
- SLC6A4 is a serotonin transporter gene, that is a stress-related gene that has implications for behavioral and socio-emotional development

Covid examples

- Greater Covid-related prenatal stress was significantly associated with higher infant SLC6A4 methylation and that in turn predicted infants' temperament at 3 months. (Provenzi et al. 2022)
- Maternal hair cortisol was significantly associated with increases in maternal depressive symptoms over time. (Doan et al. 2022)
  - Changes in maternal depressive symptoms were associated with changes in children's behavior problems



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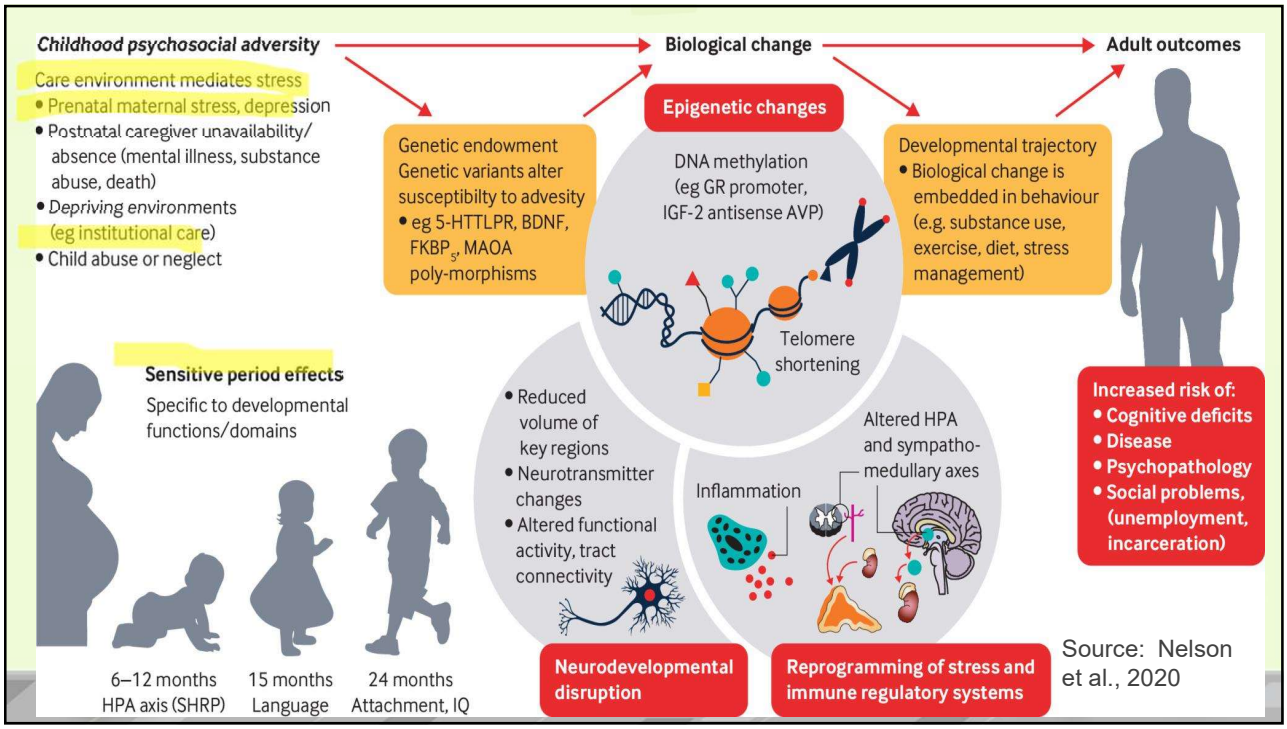

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Concerns that infection with SARS could result in neurodevelopment disorder

- Current research found that babies prenatally exposed to SARS-CoV-2 showed no sign of atypical development and had age-appropriate brain development (Radiological Society of North America (RSNA) 2021 Annual Meeting, Sophia Stöcklein
- However, previous research has found that it would be possible with severe infection "but uncommon" as vertical transmission of viruses is rare
  - "We were reassured early on that it doesn't seem to cause vertical transmission in the same sense that Zika would" Karin Nielsen-Sanies, UCLA
- Research has found that some pregnant women infected with the virus had increased levels of cytokine IL-8 (protein) which has previously been linked to atypical brain development, (K. Nielsen, UCLA, 04/21/2022, www.aap-oc.org)
  - In addition, infants with prenatal exposure to SARS-CoV2 showed dysregulation of a signaling pathway involved in brain development.


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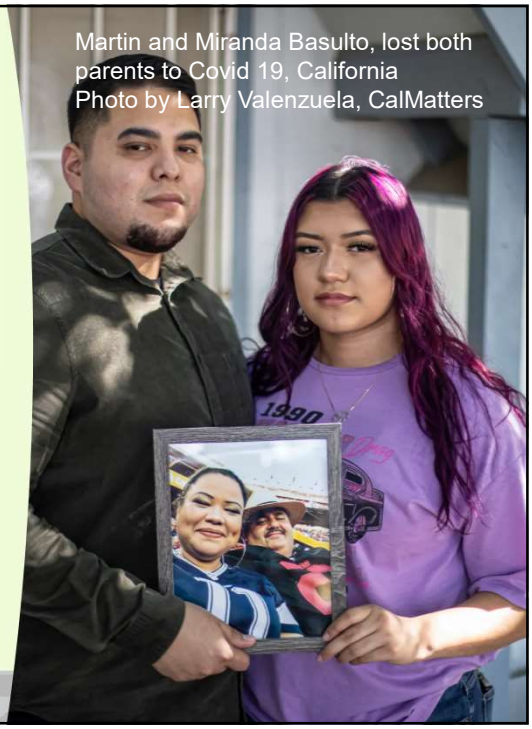
Orphans From Covid

- Newest data shows that 32,000 children under 18 in California have experienced the death of a parent or primary caregiver from Covid. (CalMatters, Aguilera, 7/22/22)
  - Latino children accounted for 66% of Covid orphans in California
  - Immigrants were the majority (58%) of Covid related deaths in the 10 California industries with the highest rates of pandemic related deaths

If kids don't get adequate support – or if their hardships are particularly severe-the stress can even change the architecture of their brains" Susan Hills, co-chair Global Reference Group on Children Affected by Covid-10



Martin and Miranda Basulto, lost both parents to Covid 19, California
Photo by Larry Valenzuela, CalMatters

53

Loss of a parent is an ACE

- 23% of American children live in single-headed households, risk of losing only caregiver is significant (Pediatrics, Hillis et al. 2021)
  - More than 13,000 children have lost their only in-home caregiver (Treglia et al. 2021)
- In 2019, 4.5 million children lived with a grandparent providing their housing
  - Black, Hispanic and Asian children are twice as likely as white children to live with a grandparent
  - Children living in grandparent-headed versus parent-headed homes, are more likely to have experienced other ACEs (divorce, parental substance abuse, parental incarceration, domestic violence)
    - Almost 70,000 children in the US have lost a grandparent who lived in the home (Treglia et al. 2021)
- Approximately 5 to 10% of children will experience traumatic, prolonged grief that requires clinical intervention (Treglia et al. 2021)
  - Parental loss during early life (birth to 5) puts children at higher risk for later poor mental health and academic outcomes compared to older children who experience parental loss
  - Younger children may be more likely to display anxiety symptoms, such as separation anxiety and clinging to remaining caregivers
    - Major life disruptions during this period can be especially detrimental to developing physiology and cognitive and social/emotional skills if they are not protected by the presence of one or more warm, consistent and nurturing caregivers

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Inequities Created Compounded Covid Stress as Californian Struggled to Meet Basic Needs

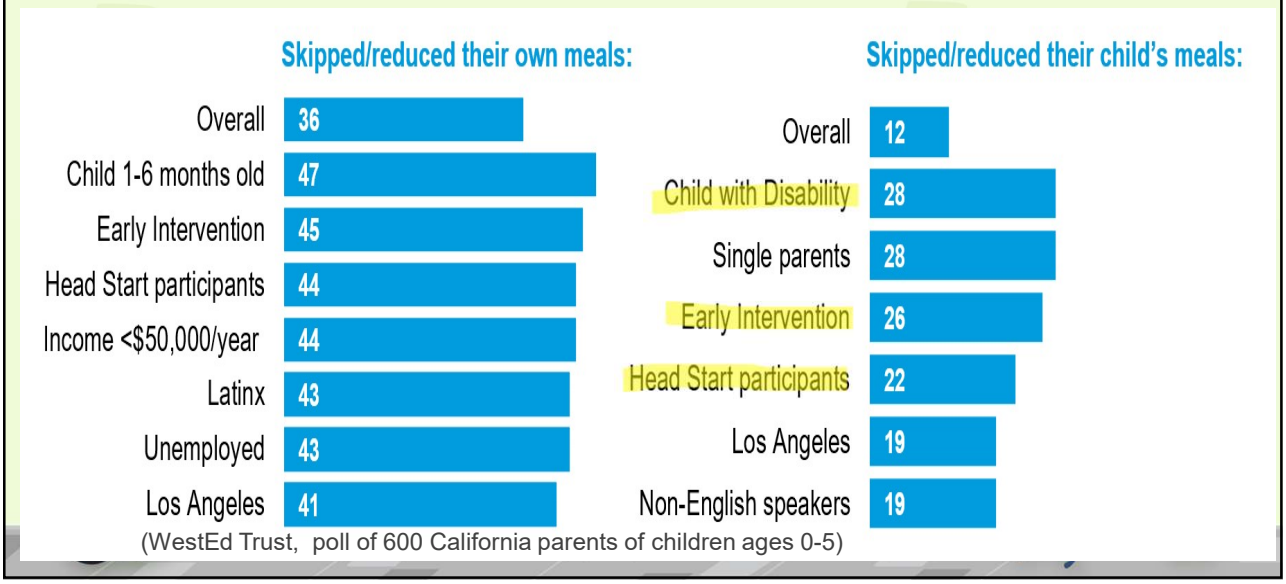
- As of July 22, 2020 an estimated 2,395,000 households in California (42.7%) were unable to pay rent and were at risk of eviction. (Household Pulse Survey Data)
  - Slightly over 2/3 of adults in households lost some income since the state declared a national emergency.
- More than 3 in 5 have worried about running out of food in the past 12 months (2020)
  - Black (69%) and Latinx (75%) Californians were more likely to experience food insecurity
  - Parents (74%) were also more likely to face this food insecurity than Californians without kids (56%)
    - Over half of parents with young children reported they had their hours cut back, wages reduced or had to leave their jobs to provide care for their family during the pandemic
  - More than half ran out of food without money to get more
  - 80% express some level of need for additional money to buy food

Source:: Online survey of 1,000 Californians with household incomes below $50,000 and 6 focus groups including parents, immigrants, Spanish and Cantonese speakers (Nourish California, Tia Shimada, December 2020)

In 2020, As many as 36.2 % of infants and toddlers in Ca. lived in households with incomes less than twice the federal poverty line (Zero to Three State of Babies 2022)

55

Parents dealt with crisis by skipping meals or having kids skip meals



(WestEd Trust, poll of 600 California parents of children ages 0-5)

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Covid 19 contextual hardships (employment/childcare loss) predicted changes in maternal mental health and Covid 19 health risks compounded symptoms

- University of Washington examined maternal mental health as a predictor of child adjustment during the pandemic among 147 first time mothers of young toddlers living in low-income context (Thompson et al. 2021)
  - The greater the increase in maternal mental health symptoms predicted greater child adjustment problems
  - Maternal mental health predicted children's early level of adjustment problems and changes across 6 months of the pandemic.

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Child Abuse

- Across 43 states and Washington, D.C., reports of abuse and neglect in April 2020 dropped by an average of 40.6 percent in each state from the levels reported in the same month of 2019. (NBC News)
- At the same time, in April 2020, calls for domestic violence increased by 9% across the country (National Domestic Violence Hotline 2020)
- Globally a higher proportion of parents with children with disabilities (43% vs. 15%) reported violence at home (Save the Children, 11/21)
  - A higher proportion (33% vs. 21%) of parents of children with disabilities reported an increase in their use of negative parenting

"The problem with these (child abuse) statistics is that they are flawed, relying on reporting by child welfare agencies…Local reports to child welfare services were down significantly at points during the pandemic. Despite that, child abuse medical evaluation did not see a reduction in visits. In fact, for the last two years we have had an increase in inpatient consultations, indicating injury severe enough to lead to a hospital admission"

Shalon Nienow, MD
Chadwick Center, Rady's San Diego
The San Diego Union-Tribune
3/29/22

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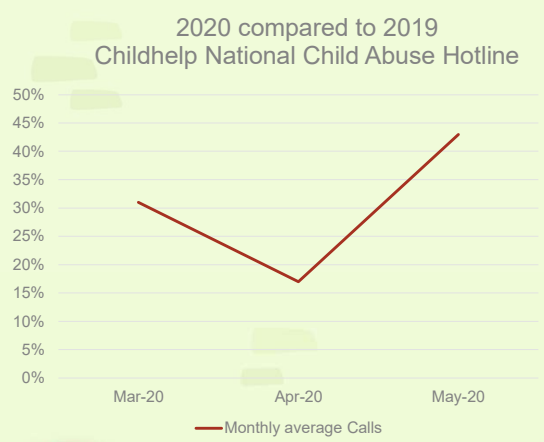
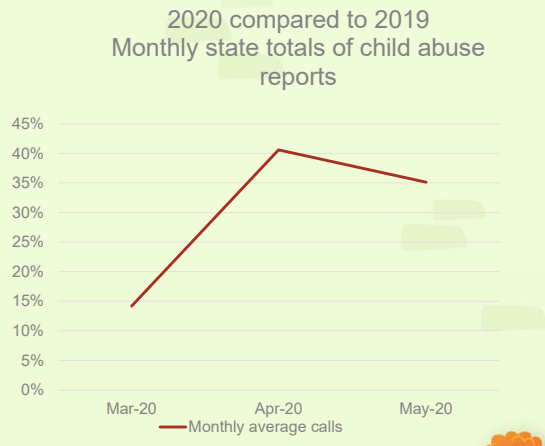
Child Abuse – Contradictions in Data





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California Child Abuse Numbers- looking at data differently

- In California, during the first two quarters of 2020 there was a 14.3% drop in the overall number of child protection reports, however, there was a 25% increase in the proportion of reports with allegations of domestic violence. (Rebbe et al. 2021)
  - The reporter type "changed" with a 7% increase in the proportion of CPS reports with Domestic Violation allegations from law enforcement
- In Los Angeles, using police statistics as well as spatial and temporal data on neighborhoods they found that there was a 7.95% decrease in the number of child abuse and neglect reports during the Covid-19 pandemic compared to the same time immediately preceding it. (Barbosa et al. 2020) HOWEVER…
  - New and intensified "hot spots" in Los Angeles showed increasing rates of child abuse and neglect that were highly associated with lower labor force participation, school absenteeism, severe housing burden, and poverty.
  - These "hot spots" with increasing reports were in the most vulnerable parts of the city before the onset of the pandemic

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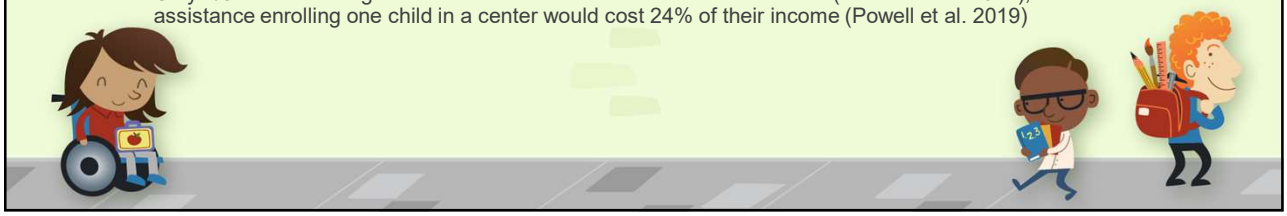
California Child Care Crisis

- *Next to Washington DC, California was the state with the largest year-over-year decline in employment among mothers with children younger than years between April 2020 and April 2021*
- Child-care staff turnover is especially high due to wages often being *below the living wage*, especially for single parents
  - The California Resource & Referral Network estimates that in some counties, family, friend, and neighbor providers earn as little as $3 per hour when they accept ECE vouchers through programs like CalWorks (Powell et al. 2019)
- Up to 21% of California's federal investment in Head Start, $270 million, is at risk of being lost due to under-enrollment due to teacher vacancies (Head Start California 5/13/2022)
- California ranked as one of the least affordable states for licensed care for parents even before the pandemic started (Child Care Aware 2018)
  - Only 1/3 of income-eligible children have access to child-care subsidies (Melnick et al. 2017), without financial assistance enrolling one child in a center would cost 24% of their income (Powell et al. 2019)



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What do we know about the negative impacts of childcare changes to young children's development?

- Variability in childcare is linked to less secure attachment behaviors with mothers (Suwalsky et al. 1993)
- Instability in childcare arrangements is associated with problematic behavior at age 4 and in first grade and negatively associated with social adjustment in prek (Howes & Hamilton 1993, Bacharach and Baumeiser 2003, Bratsch-Hines et al. 2015)
- Daycare stability between 2.5 and 4 years old was positively related to school readiness among low-income children (Loeb et al. 2004)
- Changes in the number of caregivers predicted increased problem behavior and decreased prosocial actions (Morrisey 2009)

62

Chaos

- National survey among 1,836 mothers of preschoolers conducted in May 2020 (Kracht et al 2021)
  - **Preschoolers in high chaos households (crowding, noise, and disorder in the home) had less physical activity and more screen time when compared to low chaos households**
  - Mothers who viewed routines as "less/not important" reported more preschooler screen time compared to mothers who viewed routines as "very important"
  - Preschoolers in higher chaos households had less physical activity and sleep
    - Bedtime rituals and views on routines were related to preschooler sleep and screen time despite chaos
- Maintaining a structured predictable routine in the home environment acted as a mitigating factor to adverse effects of Covid 19 stress (Glynn et al. 2021)
  - Preschoolers depressive and externalized symptoms were elevated compared to pre-Covid levels (169 preschoolers in a predominately economically disadvantaged sample in Southern California)

28% of California babies are living in crowded housing versus the national average of 15.4% (State of Babies 2022, Zero to Three)

63

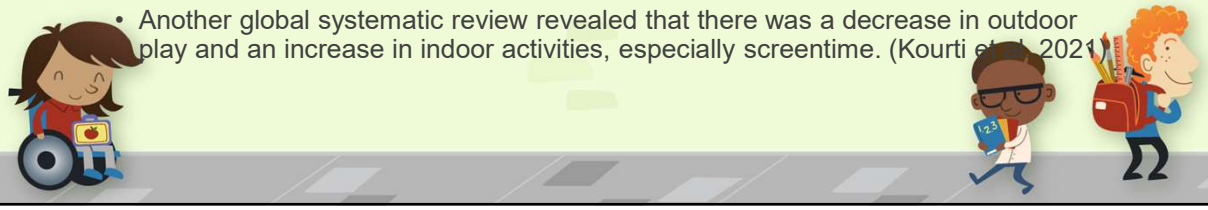
What do we know about how chaos affects development?

- Chaos (residential density, noise, clutter) negatively predicted language acquisition at 36 months and five years (Veron-Feagans et al. 2012, 2016)
  - Household chaos in the first year of life also leads to lower behavioral control in children measured at 3 to 5 years of age
- High levels of instability are associated with health problems and depression in caregivers and attention/impulsivity in children (McCoy and Raver 2014)
  - Preschoolers in higher chaos households had less physical activity and sleep and more screen time than less chaos households
    - Bedtime rituals and views on routines were related to preschooler sleep and screen time despite chaos

64

How disrupted were young children's daily routines?

- Systematic review found that a very high percentage of parents reported changes in daily routines including increased screen time and decreased physical activity which negatively influenced sleep.(Camacho-Montano et al. 2022)
  - Most parents reported an increase in sleep disturbances including anxiety at bedtime, night waking, nightmares, and involuntary movements
  - **Infants and preschoolers had less regularity in their sleep routines**
- Global meta-analysis found Covid created a perfect storm for "habit discontinuity" (Neville et al. 2022) and daily physical activity decreased by 20% which promoted an increasingly sedentary "new normal"
- Globally, a higher proportion of children with disabilities reported playing less (55 % to 44%) and sleeping less (44% vs. 12%) (Save the Children Covid 19 Hidden Impact Survey 11/21)
- Another global systematic review revealed that there was a decrease in outdoor play and an increase in indoor activities, especially screentime. (Kourti et al. 2021)



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Play behaviors during Covid

- **Almost 2/3 of parents felt indifference or that it was difficult to play with their children during social distancing (**National survey among 705 participants across 47 states for children aged 0 to 8 on play activities during early social distancing (Casey et al. 2022, Beers Dewhirst 2021)
- Parents took social distancing guidelines seriously by keeping children at home and away from other children during the period of social distancing, thus affecting play behaviors. (Dewhirst et al. 2021)

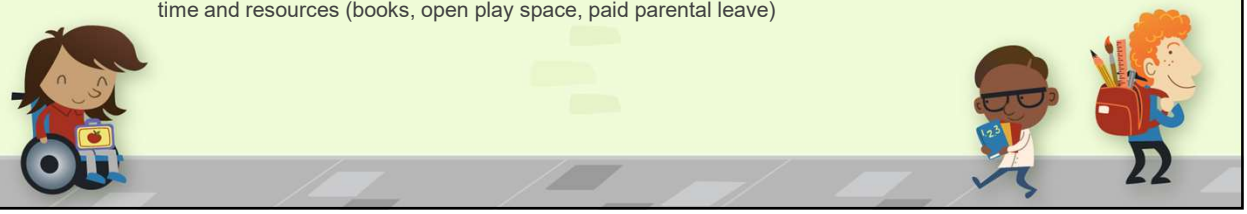
Play Development

- Zero to Three: The Growing Brain
  - Beginning at 15 months, children start to engage in parallel play, observing and imitating.
  - Between 18 to 24 months, children start to move into associative play, although playing independently they often do the same thing as other children.
  - Starting at 30 to 36 months, children begin to engage in cooperative play, interacting and building social skills including cooperation, compromise, negotiation and empathy.

66

Executive functioning, Screentime and Resource Constraints

- 575 8 to 36-month-olds (UK, Hendry et al. 2022)
  - Lower executive functioning skills **and regulation** were associated with screen use (prepandemic, first lockdown, subsequent lockdown among 575 8 to 36 month olds in UK) (Hendry et al.2022)
    - Previous research found that infants frequently exposed to screens as a soothing technique when they are distressed or bored may not develop their own coping mechanism (Coyne et al. 2021)
    - Same cohort also showed that passive screen use during the pandemic was also negatively associated with vocabulary development (Kartushina et al., 2021)
  - Higher SES were less likely to report high infant screen use, screen use mediated the association between SES and both regulation (partially) and executive functioning skills
  - Two different profiles of parent activities emerged during the two lockdown periods - during the initial lockdown, lower SES families were disproportionately disadvantaged when playgrounds and libraries closed.
    - interventions to promote parent-child activities are only effective if they address the availability of time and resources (books, open play space, paid parental leave)



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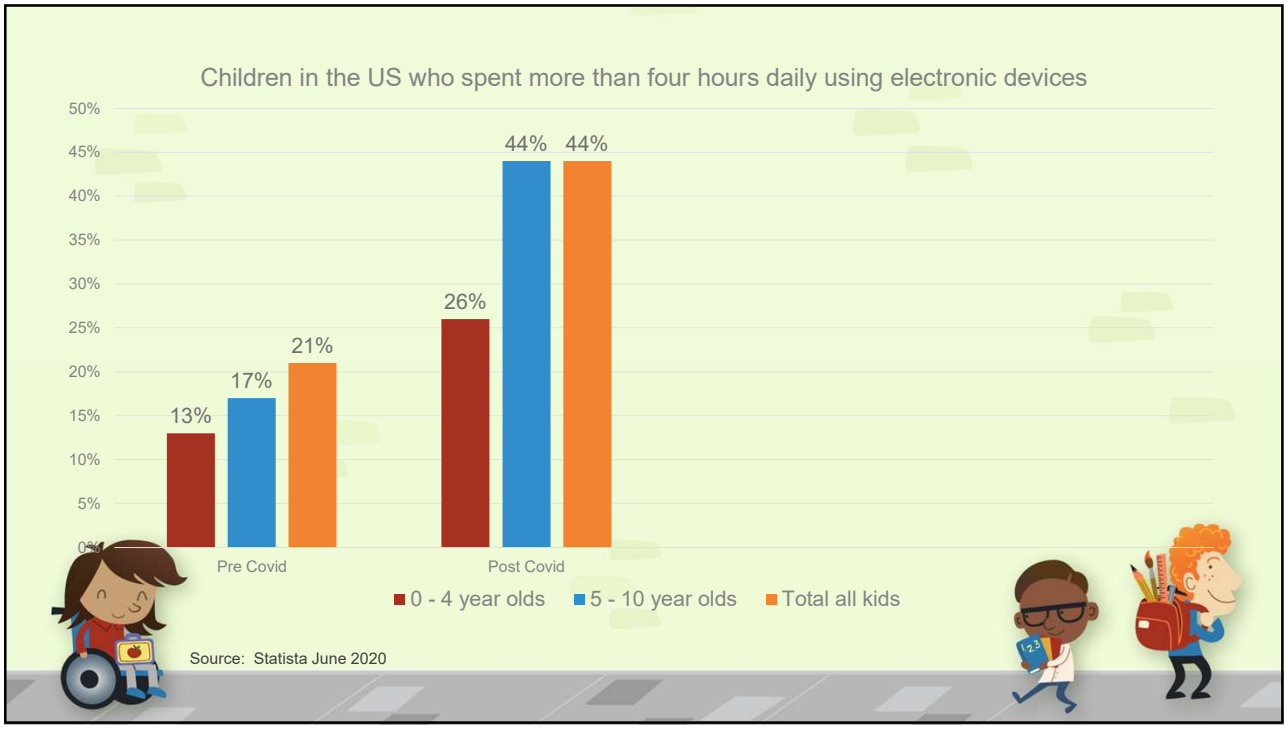

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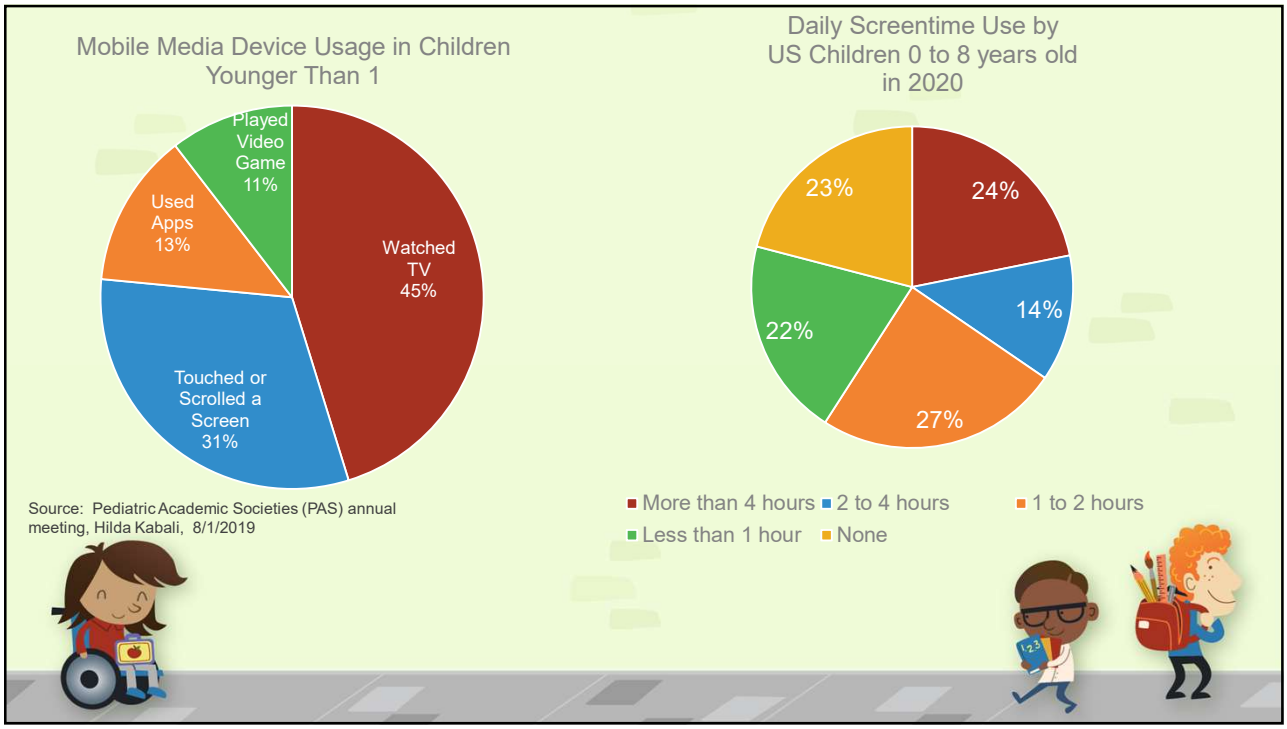
Mobile Media Device Usage in Children Younger Than 1
Played Video Game 11%
Used Apps 13%
Watched TV 45%
Touched or Scrolled a Screen 31%
Source: Pediatric Academic Societies (PAS) annual meeting, Hilda Kabali, 8/1/2019
Daily Screentime Use by US Children 0 to 8 years old in 2020
23%
24%
14%
22%
27%
More than 4 hours
2 to 4 hours
1 to 2 hours
Less than 1 hour
None

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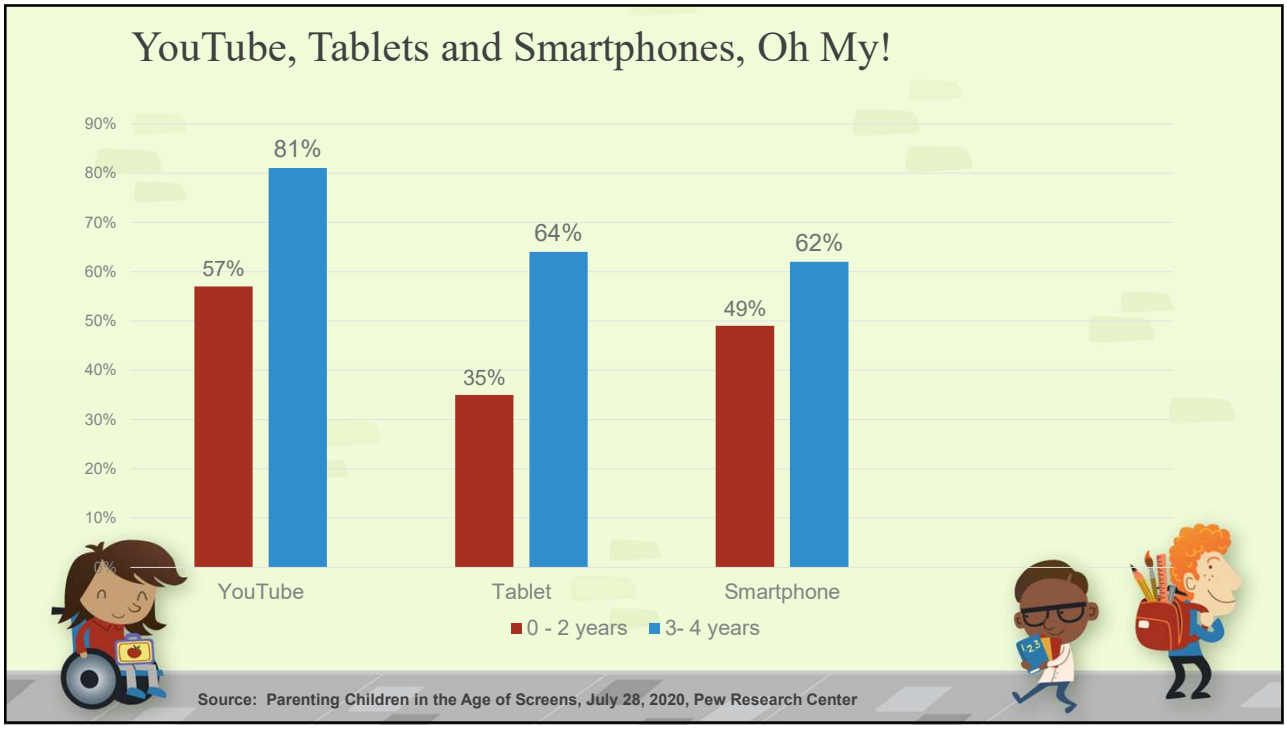
YouTube, Tablets and Smartphones, Oh My!
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
57%
81%
35%
64%
49%
62%
YouTube
Tablet
Smartphone
0 - 2 years
3- 4 years
Source: Parenting Children in the Age of Screens, July 28, 2020, Pew Research Center

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Screens as Babysitters

- Caregivers reported toddlers with no online schooling requirements were exposed to more screen time during lockdown, more screentime was negatively associated with SES (socio-economic status), caregiver screentime and attitudes towards children's screentime (2209 caregivers across 12 countries, Bergmann et al. 2022)
  - As early as 8 months some children had regular daily screentime
  - The longer caregivers were at home working from home the more screen time kids had
- **Decrease in parent well-being was tied to loss of child care and increase in children's screen time was tied to loss of child care (1,000 US parents, Hartshorne et al 2021)**
- Parents of preschool-aged children who didn't have childcare reported that screentime was associated with financial strain, food insecurity, and parent anxiety (Canada, 610 parents, Stienwandt et al. 2021)

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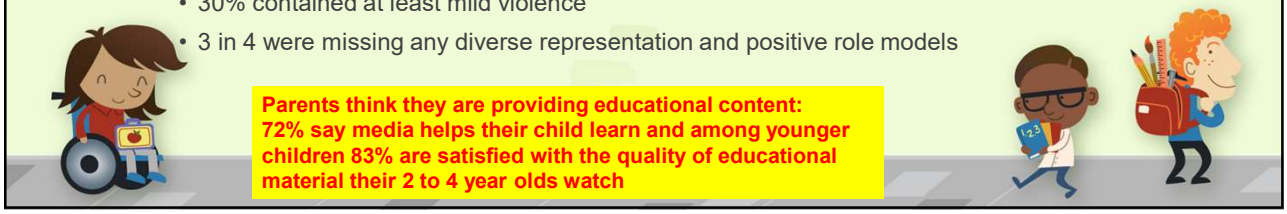
Screentime did not necessarily increase due to educational use

- Western European Meta-analysis for children aged 0 to 5 found that social distancing created more time on recreational screen use, notably YouTube, but not a greater growth in educational content (Lozano-Blasco et al. 2021)
- Parents of 166 preschoolers in the US reported that they were concerned about their children's social/emotional development and they did not feel their child had the attention skills to stay focused on the screen. (Stites et al. 2021)
- Young children are primarily watching entertainment (YouTube), not educational content as only 5% of videos had high educational value (2020 Common Sense Media analysis of 1,639 YouTube Videos watched by 0 to 8-year-olds between 3/26/20 to 4/1/20)
  - Advertising occurs in 95% of early childhood videos
  - 1 in 5 videos contained ads that were not age appropriate
  - Almost half featured products for kids to buy
  - 27% of those watched are intended for older audiences
  - 30% contained at least mild violence
  - 3 in 4 were missing any diverse representation and positive role models

Parents think they are providing educational content: 72% say media helps their child learn and among younger children 83% are satisfied with the quality of educational material their 2 to 4 year olds watch



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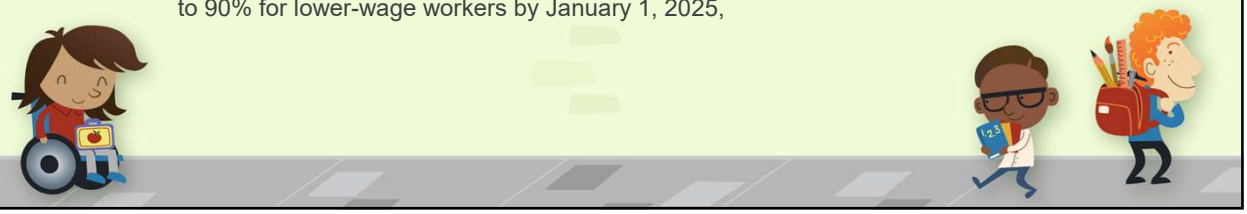
What do we need to do now? Developmental Services Trailer Bill SB188 and CA Family Leave-SB951 are a good start

- SB-188 (Went into effect with the passage of the budget)
  - Eligibility criteria were changed from 33% to 25% in one or more areas of development.
    - Retroactively, children who were assessed between 1/22 and 6/22 who did not qualify due to a developmental delay between 25 to 32% now qualify.
  - Communication development was separated into two categories, expressive and receptive communication development, which increases the total number of developmental areas from 5 to 6 in which a child will be evaluated.
    - Retroactively for children who didn't qualify, receptive and expressive language will be reviewed separately.
- SB951 (waiting for governor's approval)
  - Would increase wage replacement rates for Paid Family Leave from 60% (currently) to 90% for lower-wage workers by January 1, 2025,



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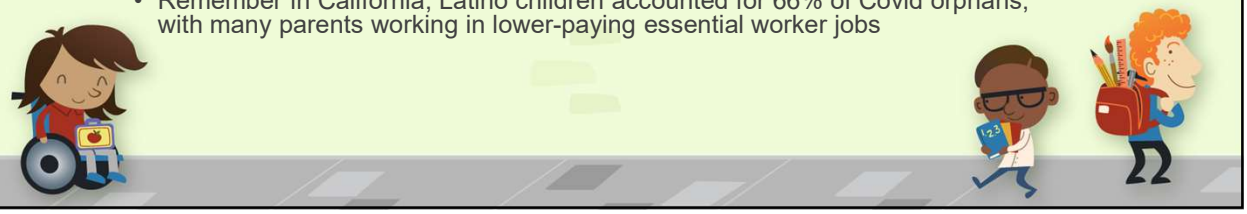
Help for Orphans?

- Santa Clara County approved a program to identify and support youth who lost caregivers to Covid.
- California has allocated $100 million as trust funds for low-income children who lost a parent or primary caregiver to Covid 19 (Hope, Opportunity, Perseverance and Empowerment for Children Trust Account Fund)
  - Great idea except that they can't access it until they turn 18!
- Research has found that families where a parent dies are more likely to have experienced other disadvantages including poverty, lower maternal education, and more paternal unemployment. (Treglia et al 2021)
- Remember in California, Latino children accounted for 66% of Covid orphans, with many parents working in lower-paying essential worker jobs



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CDC Milestones Changes

- *A handful of the revised CDC speech and language milestones do not align with ASHA's (American Speech Hearing Association) speech and language development publication (updated in 2015)*
- ASHA concerned that the checklists were translated into multiple languages and language milestones are not universal across all languages

"A lot of referrals happen between 18 months and age four. I worry about kids who might have had a minor delay that a year of early Intervention would correct. What happens when they don't get that?" Anna Johnson, Development Pscyhologist, Georgetown

- **ASHA is very conscious of what many members report, that children are already being referred to them later than they optimally should be. ASHA members worry that any reassignment of expected skills to an older age will entrench the "wait and see" approach**

Of the 94 original milestones that were retained, **2/3 moved to older age**

New Milestones	Before 30 months	After 30 months
Social Emotional	13	7
Language	8	11
Cognitive	8	6
Motor	7	5

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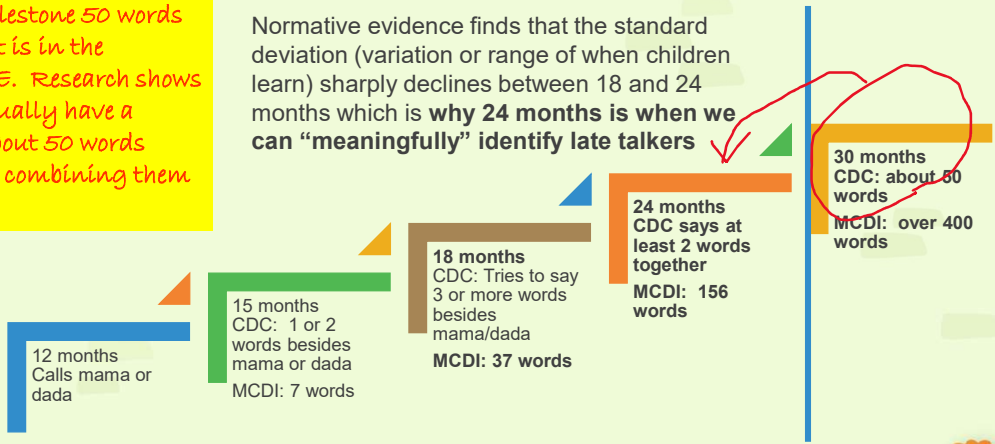
Surveillance is intended to capture developmental progress longitudinally

CDC added a milestone 50 words at 30 months. It is in the WRONG PLACE. Research shows that children usually have a vocabulary of about 50 words before they start combining them into phrases

Normative evidence finds that the standard deviation (variation or range of when children learn) sharply declines between 18 and 24 months which is **why 24 months is when we can "meaningfully" identify late talkers**



Comparison between CDC milestones and what most children are achieving
Per MCDI (MacArthur Bates Developmental Inventory)
word bank *source: The Informed SLP March Reviews

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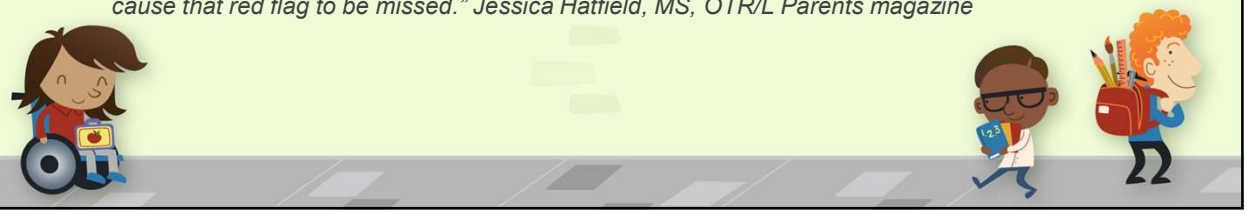
Concerns about crawling being removed as a milestone

- World Health Organization 2006– longitudinal data collected with 816 children over multiple years in 6 geographic regions around the world to create tool to measure development
- – 6 major gross motor milestones identified, including crawling
  - (only 4.3% of sample did not exhibit hands and knees crawling)
- Michigan State University 2013 – research supports that hands and knees crawling is a important for coordination and preparatory phase for walking
  - Cognitive and spatial development: Children who crawled on hands and knees were able to locate a hidden toy correctly more often than children who were not able to crawl on hands and knees
  - Memory flexibility: Research found that children who were crawling showed greater memory retention when tested in same and different settings versus children who were not crawling.
  - *"When babies don't crawl that's a red flag that something else might be wrong such as physiological difference in their feet/legs, reflux, inability to integrate reflexes, delay in other less obvious milestones, poor strength and muscle tone so eliminating it as a milestone could cause that red flag to be missed." Jessica Hatfield, MS, OTR/L Parents magazine*



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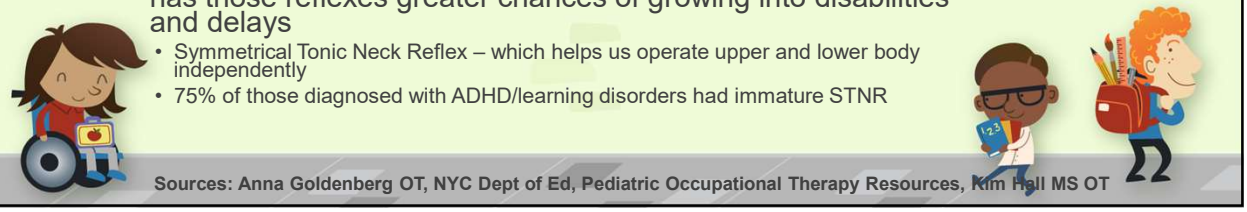
Risks for kids who skip crawling

- Cross-lateral crawling develops the corpus callosum in a balanced way which belly crawling does not develop
  - This supports cognitive function and problem solving
- Strengthens hand-eye coordination
- Lengthens finger muscles, develops arches in the hand and development of thumb and web space which help with grasping and manipulation of smaller items (pencils/spoons)
- Children who crawled scored better on visual perceptual tests better than non-crawlers – affects your ability to feed, dress, write, avoid falling off a surface
- Binocular vision – child can look to the distance where they are going and back down to where hands are crawling – important for future tasks such as taking a note in class
- Primitive reflexes are inhibited by crawling, the longer an infant has those reflexes greater chances of growing into disabilities and delays
  - Symmetrical Tonic Neck Reflex – which helps us operate upper and lower body independently
  - 75% of those diagnosed with ADHD/learning disorders had immature STNR



Sources: Anna Goldenberg OT, NYC Dept of Ed, Pediatric Occupational Therapy Resources, Kim Hall MS OT

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Lessons Learned

"Children are not born "resilient" they are born malleable." Bruce Perry, What Happened to You?

1. The question we should be asking is, "Is the FAMILY ok?"
2. Covid affected young children disproportionately due to sensitive periods of brain development
3. Covid affected the most vulnerable members of society (the poor) the worst
4. Life is not necessarily back to "normal" as we come out of Covid
5. We need to continue to reference prior research about development as a lot of research couldn't continue during Covid
6. Parents need to be educated about screen time, they truly believe that they are offering an educational experience.
7. Teaching parents about parent-child interaction techniques are only valuable if we also provide them with the time and resources to follow through (how can you read if you have no books and no time)
8. We need to provide support earlier (prenatal at-risk mothers)

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