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Prevalence of Infant Television Viewing and Maternal Depression Symptoms

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Abstract

Background—Early TV viewing has been linked with maternal depression and has adverse health effects in children. However it is not known how early TV viewing occurs. We evaluated the prevalence at which parents report television (TV) viewing for their children if asked in the first two years of life and whether TV viewing is associated with maternal depression symptoms.

Methods—Using a cross-sectional design, we evaluated TV viewing in children 0 – 2 years of age in 4 pediatric clinics in Indianapolis, IN between January 2011 and April 2012. Families were screened for any parental report of depression symptoms (0 – 15 months) and for parental report of TV viewing (before 2 years of age) using a computerized clinical decision support system (CDSS) linked to the patient's electronic health record (EHR).

Results—There were 3,254 children in the study. By parent report 50% of children view TV by 2 months of age, 75% by 4 months of age and 90% by 2 years of age. Complete data for both TV viewing and maternal depression symptoms were available for 2,397 (74%) of children. In regression models, the odds of parental report of TV viewing increased by 27% for each additional month of child's age (OR: 1.27, CI: 1.25 – 1.30, $p < 0.001$). The odds of TV viewing increased by almost half with parental report of depression symptoms (OR: 1.47, CI: 1.07 – 2.00, $p = 0.016$). Publicly insured children had three times the odds of TV viewing compared to children with private insurance (OR: 3.00, CI: 1.60 – 5.63, $p = 0.001$). Black children had almost four times the odds (OR: 3.75, CI: 2.70 – 5.21, $p < 0.001$) and White children had one and a half times the odds (OR: 1.55, CI: 1.04 – 2.30, $p = 0.032$) of TV viewing when compared to Latino children.

Conclusions—By parental report TV viewing occurs at a very young age in infancy, usually between 0 to 3 months and varies by insurance and race/ethnicity. Children whose parents report depression symptoms are especially at risk for early TV viewing. Like maternal depression, TV viewing poses added risks for reduced interpersonal interactions to stimulate infant development. This work suggests the need to develop early targeted developmental interventions.

Keywords

Preventive services guidelines; CHICA; screening; Television; TV; Maternal Depression

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INTRODUCTION

In 2002, Certain and Kahn¹ reported that 17% of infants below 12 months of age, and 41% to 48% of toddlers below 36 months of age were viewing TV and that their screen exposure far exceeded the TV viewing limits recommended by American Academy of Pediatrics (AAP). Zimmerman and colleagues² reported that 40% of infants regularly watched TV, DVDs or videos by 3 months of age, and by 24 months of age, this proportion increased to 90% with the median age of 9 months in the English speaking households they surveyed.

Considerable past research has shown adverse effects of media exposure on the development and well-being of young children. TV viewing in early childhood is associated with poor diet quality³, fast food intake,⁴ and many behavioral,^{5,6} sleep,^{7,8} and developmental problems, including language,⁹ cognition,^{10,11} and attention capacity.¹²⁻¹⁴ TV viewing among children has also been linked to decreased physical activity,¹⁵ which, perhaps, contributes to the alarming rise in overweight and obesity, in both younger¹⁶⁻¹⁸ and older age groups.^{18,19} In a systematic review²⁰ of screen viewing among children up to 7 years of age, ethnicity, socioeconomic status (SES), and parental control and safety practices were identified as significant factors for TV viewing.

In pre-school aged children increased number of hours of TV viewing is associated with mother's mental distress and depression symptoms.²¹⁻²³ A meta-analysis of 59 studies estimates the average prevalence of maternal depression in the general population to be 13%.^{24,25} Maternal depression is frequently encountered in pediatric practice and has been associated with long-term negative outcomes for children.^{5,21,26-30} Depressed mothers show a reduced sense of parental self-efficacy,^{31,32} and insecure attachments³³ with their children and impairment in effective disciplining.³⁴⁻³⁶

Past research has associated increased number of hours of TV viewing in children with maternal depression,^{11,37} A recent study highlighted the association of maternal depression with increased exposure to "child-directed" media content and overall lesser parental involvement.³⁸ Child-directed programming was defined as programs created for preschoolers and younger children. However, it is known that child-directed TV programming may only be beneficial when combined with a degree of parental involvement.^{39,40}

Given the explosion of exposure to media among children,⁴¹ the frequency with which caregivers encounter depressed mothers in practice,⁴² and the rising evidence of very early TV viewing, it is important to know at what age TV viewing first begins, i.e. as reported by parents in a primary care setting. Furthermore, it is also important to know how the risk relates to mother's reported symptoms of depression. Previous work does not focus on when TV viewing begins, and studies associating symptoms of maternal depression with TV viewing are limited to small sample sizes^{11,38} or retrospective analyses²³ of existing data. Both early TV viewing among children and symptoms of depression among mothers can be screened in primary care settings.^{43,44} At least by one study, early TV viewing in young children may also be a modifiable factor in such settings.⁴⁵

Therefore, we examine whether the association between TV viewing in children and symptoms of maternal depression hold true when data are collected from a primary care sample. The findings from this study would help nurse practitioners, pediatricians or primary care physicians become more effective in screening and advising parents in the context of an office visit to the ill effects of TV viewing on children's brain development beginning in infancy. Here we examine the following hypotheses: 1) Parents seeking routine well child care will report regular TV viewing by their children at a very early age; and 2) Self-reported depressive symptoms by parents, with or without clinical depression, are

associated with increased likelihood of a child's TV viewing even after controlling for age, sex, race, ethnicity (as defined by language preference), and SES.

METHODS

As part of routine use of a CDSS, the "Child Health Improvement through Computer Automation," or CHICA system,⁴⁶ clinics screen⁴³ families of children 0 to 2 years of age in their waiting rooms for TV viewing "on most days." In the 0 – 15 month age group, CHICA also screens for symptoms of maternal depression. Using a cross-sectional study design we explored correlates of TV viewing in children 0 to 2 years of age, including association with self-reported maternal depression symptoms among parents of children in the 0 – 15 month age group, using data from CHICA.

The CHICA System

The CHICA CDSS operates in four inner city pediatric clinics affiliated with a large county hospital system. At each clinic visit, CHICA generates a tailored pre-screening form (PSF) that is completed by the child's family in the waiting room. The PSF contains up to 20 yes/no screening questions about development and other health factors based on the child's age and what is known about the child from the information contained in his or her EHR.⁴³ The PSF is printed in English on one side and Spanish on the other (Figure 1).⁴⁷

The 20 questions are selected from a pool of over 195 screening questions that are prioritized based on the expected value (EV) of screening.⁴⁸ For example, if TV viewing is not known for a child under 2 years of age, a question assessing TV viewing will appear on the PSF for that visit. This question may appear as early as the first visit after a child's birth or later within the 24 months period. Similarly, if the mother has not been previously screened for, or diagnosed with, maternal depression, CHICA will screen for depression symptoms. Although, using this tailored approach, some screening questions may not be printed for a particular visit, both the TV viewing and the maternal depression screening questions have high priorities based on the EV approach and, therefore, appear for most children.

CHICA only repeats a question at subsequent visits, if a sufficient time has passed (one year in case of TV viewing and 3 months for screening for maternal depression symptoms) or if no information exists in the child's EHR for these. This approach allows the system to ask the most relevant information from the families at each visit. The details of how the system works⁴⁶ and for what it screens,⁴³ including randomized trials of screening and management of common childhood conditions, are described in detail elsewhere.^{44,49–53} In this study, we examine responses to the TV viewing question in the 0 – 2 year age group and responses to the maternal depression symptom questions in the 0 – 15 month age group. These responses were collected via automated screening⁵⁴ of families who had a visit at one of the four CHICA clinics between January 21st, 2011 and April 23rd, 2012.

TV viewing and Maternal Depression symptom screeners

The AAP recommends no TV viewing before the age of 2 years.^{55,56} CHICA screens for TV viewing with the following question: "Does < first name > watch some TV most days?" CHICA also screens for maternal depression symptoms using an adaptation of the Edinburgh Postpartum Depression Scale-3 (EPDS-3).¹⁰ The EPDS-3 is a validated ultra-brief screening tool for identifying mothers at increased risk for postpartum depression.¹⁰ EPDS-3 is based on three scaled questions from the anxiety subscale of the EPDS⁵⁷ (EPDS-10). Scored responses to the questions are added for an overall score. EPDS-3 is known for its high sensitivity for identifying postpartum depression in pediatric primary care

settings.¹⁰ Because the pre-screener form asks parents to supply a yes/no response to items, we modified the response scale while keeping the wording of the subscale items from the EPDS-3: In the past 7 days, have you: (1) blamed yourself unnecessarily when things went wrong? (2) felt scared or panicky for not a very good reason? (3) been anxious or worried for no good reason? The EPDS-3, which is derived from the full 10 item EPDS scale, has been validated in both English and Spanish.⁵⁸ Although the predictive validity of the revised items has not been formally evaluated, a positive response on any one of them is expected to correspond to a positive score on the EPDS-3. In a randomized controlled trial of parental depression screening⁴⁴ using CHICA, we found these questions effectively aided in case finding of maternal depression.

Data extraction and Analyses

Data for children in the 0 to 2 year age group who had at least one visit to a CHICA clinic during the study period were extracted. Children whose parents answered the TV question at least once were included in the study. The extracted data set included the following variables:

- *TV viewing*: Data were extracted to determine parental report of child's TV viewing on "most days." Data for multiple visits (up to 8 visits) were extracted for the following two variables - if the question was asked, and/or answered, and the age of the child at the visit.
- *Child's age at visit when family reported TV viewing for the first time*: Child's age (in months) at which TV viewing on "most days" was initially reported by the family on CHICA's automated screening.
- *Maternal Depressive symptoms*: Because CHICA asks only yes/no questions, we rephrased the maternal depression symptom screening questions. We used the language of "often" or "most of the time" for responses to the original EPDS-3 questions. To keep the screen sensitive, we only required this high level answer on any one of the questions. Although the test performance of this strategy may vary somewhat from the original EPDS-3, it is likely to overlap significantly. Any affirmative response to one or more of the 3 items was coded as positive for maternal depression symptoms. This variable is used as a dichotomous variable in statistical analyses.
- *Number of Maternal Depression Symptoms*: Data for self-reported symptoms of anxiety, self-blame, and/or panic were extracted. The number of self-reported symptoms was used as an ordinal variable predictor of TV viewing.
- *Socio-Demographic variables*: Race, sex, insurance category and preferred language (answer to screen on the English vs. Spanish side of PSF questions) were extracted as covariates.

Statistical Analyses

Analyses were performed using Stata version 12 software (www.stata.com, StataCorp, College Station, TX) for any relationship between TV viewing, age at which initial TV viewing is reported, socio-demographic variables, and maternal depression symptoms. To estimate the age at which children first begin TV viewing on most days, we created a series of independent cross sections of children whose parents answered the TV viewing question at each month in the first two years of life. For each month of age, we calculated the ratio of the number of parents reporting their children viewed TV on "most days" divided by the number of parents answering the question about TV viewing. Because parents are asked the TV question at different ages, and they may answer one or many times, this repeated cross

sections approach is the best estimate we could make of the proportion of children viewing TV at any given age (in months). In fact, it will be a slight underestimate of the proportion viewing TV because the parent can only answer “yes” sometime after the child has begun viewing.

To examine the association of any maternal depression symptoms with early TV viewing, we first performed a bivariate analysis of maternal depression symptoms and TV viewing. Next, we performed a bivariate analysis between the number of self-reported maternal depression symptoms and TV viewing. Using TV viewing as the main outcome variable, we performed multivariable logistic regression with socio-demographic variables and any maternal depression symptoms as independent variables.

The Institutional Review Board of Indiana University School of Medicine approved this study.

RESULTS

Families of 3,977 children were asked the TV viewing question one or more times during the study period. There were no significant differences in sex, and racial distribution of families who answered the TV viewing question versus those who did not. However, families who answered the TV viewing question were more likely to have public insurance and more likely to have English as their preferred language. Of the 3,977 families who were asked the TV viewing question, families of 3,254 (82%) children answered the question at least once during the study period and were included in our analyses.

Families of 1,879 (58%) children answered affirmatively to the TV viewing question. Of the families answering affirmatively, a majority (n=1797, 96%) answered at the visit when the question was first asked. Similarly during the course of the study, families whose children had no TV viewing (n=1,375) answered negatively at the visit when the question was first asked. Thus, most of the data used in this study are from initial responses to the TV viewing question. The socio-demographics of the study population are listed in Table 1.

In Figure 2, we show the proportion of families answering affirmatively to the question regarding child’s TV viewing on “most days” as a function of the child’s age. Of families answering the TV viewing question, nearly 50% answered in the affirmative when the question was asked in the 1 to 2 month age group. This number was much higher when the question was asked in a slightly older age group. Almost 75% of families answered in the affirmative to the by the time the child was 4 months old, and over 90% of families answered in the affirmative by the time the child was 2 years old (Figure 2).

Of the 3,977 families who were asked the TV viewing question, 2,497 (63%) also answered PSF items relating to one or more maternal depression symptoms. Family’s race/ethnicity and insurance category differed among those reporting a maternal depression symptom. Black families and other racial groups were more likely to report a maternal depression symptom when compared to Latino families (p=0.001 and p=0.002 respectively). Similarly, families having public insurance were more likely to report a maternal depression symptom when compared to families having private insurance (p=0.001).

Of the 3,254 children whose parents answered the TV viewing question, 2,397 (74%) also answered PSF items relating to one or more maternal depression symptoms (i.e., with answers to both TV viewing and EPDS-3) for our analysis of maternal depression symptoms and childhood TV viewing. Of this complete dataset, 241 (10%) families reported one or more maternal depression symptoms. Among all parents answering the TV questions, there were no significant differences in race/ethnicity or insurance between those who answered

the EPDS-3 and those who didn't. Of those who reported any maternal depression symptom, a majority (n=158, 66%) reported a single symptom; 83 (34%) reported two or more symptoms; and only 24 (10%) reported all three symptoms on the EPDS-3 scale.

In unadjusted analyses, children whose mothers reported any depression symptom were more likely (OR: 1.35, CI: 1.03 – 1.77, $p = 0.028$) to view TV on “most days”. TV viewing was not significantly associated with the number of maternal depression symptoms reported ($X^2:5.09$, $p=0.165$).

In the multivariable logistic regression model (Table 2), the odds of children's TV viewing was significantly and independently associated with child's age at which parents answered the question, public insurance, and maternal depression symptoms. The odds of TV viewing increased (OR: 1.47, CI: 1.07 – 2.0, $p = 0.016$) among children whose mothers reported at least one maternal depression symptom. The odds of TV viewing in children did not increase significantly whose mothers reported additional, i.e., two or three maternal depression symptoms. However, the odds of parental report of TV viewing increased (OR: 1.27, CI: 1.25 – 1.30, $p < 0.001$) with each additional month in the child's age. Children on public insurance had higher odds (OR: 3.00, CI: 1.60 – 5.63, $p = 0.001$) of TV viewing when compared to children on private insurance. There were TV viewing differences by racial groups as well. Black children had higher odds of TV viewing (OR: 3.75, CI: 2.70 – 5.21, $p = 0.000$) when compared to Latino children as did the White children (OR: 1.55, CI: 1.04 – 2.30, $p = 0.032$). Sex of the child, and family's preferred language were not independently associated with child's TV viewing.

DISCUSSION

Many previous studies^{1,2,45} have examined the adverse effects of media use in general and TV viewing in particular among children. One recent randomized controlled trial⁴⁵ aimed at reducing children's media exposure concluded that pediatric primary care may present an important venue for evaluation of interventions at the population level. However, their study did not address the role of maternal depression in TV viewing.

Our study evaluated prospectively collected data to examine the earliest age at which TV viewing is reported by parents when asked in a primary care setting. We also describe the association of the child's TV viewing with mother's depression symptoms. Our results show that frequent TV viewing occurs at a very young age, usually by 2 to 3 months, and the proportion of children viewing TV on most days rapidly increased in the 4 to 24 months age group. Our results also show that children of mothers with symptoms of depression are more likely to be viewing TV on most days when compared to children of mothers with no symptoms.

Our study differs from past studies in several aspects. We describe the proportion of TV viewing by each month of age in the 0 – 2 years age group. We believe ours is the first study to do so. We use data from parent report of the child's TV viewing when the families visit our pediatric primary care clinics for routine care. As these visits are most frequent in the first two years of life, the data allow us to analyze the prevalence of TV viewing in infants and toddlers by month-age and when the family might initially report it, when asked in such a setting. This is in contrast to past studies^{1,2} that have evaluated TV viewing in young children using data either from parent telephone surveys (of mostly English speaking families)² or using retrospective analyses of existing data.¹ Our study also analyzed a large sample of both English and Spanish speaking households. We found that even in the absence of clinical depression, maternal depression symptoms are associated with TV viewing in infants and young children in the first two years of life. Our rates of reported maternal

depression symptoms (10%) in the first two years of life are in line with estimates reported in the general population²⁵ and half of that reported for the first 3 months postpartum.⁵⁹

When compared to past studies,^{1,2} we found much higher rates of TV viewing in young children. Our study shows that TV viewing in children starts early in infancy. By 3 months of age, about three-quarters of parents reported their children viewed TV on “most days.” Perhaps our rates are higher because mothers are receptive to open communication with their pediatricians⁶⁰ and they reported their children’s TV viewing more accurately in pediatric waiting rooms when seeking routine care. Alternatively, the population we studied, largely poor, inner-city and minority families, may have exhibited earlier and more prevalent TV viewing among children.

When compared to earlier work, our study reports a stronger association between maternal depression symptoms and increased TV viewing in infants and young children. In 2007, Thompson and colleagues²³ reported that children of depressed mothers viewed 25% more TV than children of non-depressed mothers. In 2012, Bank and colleagues³⁸ reported households with depressed mothers viewed twice as much TV as households with non-depressed mothers. Whereas both these studies focused on the quantity of TV viewing in young children with depressed mothers, we describe a 47% increase in adjusted risk of TV viewing in mothers with depression symptoms versus mothers without symptoms. We also assessed how this effect differed as children aged. Our study population differed significantly from that of in Bank and colleagues whose sample size was small (n=84) and consisted of only well-educated mothers.

We believe ours is the first study to specifically look at the prevalence of TV viewing with respect to the child’s age in a large primary care-based setting. However, as with all studies, ours has some limitations. We examined variables that were collected from parent report. We estimated the prevalence of TV viewing by the proportion of families reporting TV viewing on most days by age of the child in the first two years of life. Because TV viewing may have occurred prior to the question being asked, the repeated cross sectional approach probably underestimates the proportion of children viewing TV at a younger age. Nonetheless, it is the latest age by which parents reported, so TV viewing may actually begin earlier.

Another limitation of our study is a lack of a representative snapshot of same information from all families at all ages. However the ability to ask the most pertinent questions at each visit is one of the strengths of the CHICA system. We believe that our analysis approach using repeated cross-sections accounts for the representative snapshot. Another consequence of the repeated cross section approach results from the fact that children come to clinic preferentially at ages when they have scheduled visits (2m, 4m, 6m, etc.). As a result, sample sizes vary significantly, and this can result in apparent fluctuations in rates of TV exposure with age (Figure 2). Finally, while questions about TV viewing are usually asked, they can be supplanted by higher priority issues according to the CHICA algorithm. This could conceivably introduce sampling bias.

Another limitation of this study is that our population is mostly inner city neighborhood with low SES. This may limit generalizability, but it may also indicate that TV viewing is especially problematic in this population and in particular with mothers reporting subclinical⁶¹ maternal depression symptoms.

Because the study is observational, we cannot make any conclusions about the causal link between maternal depression symptoms and child’s TV viewing. However, like previous investigators,²³ we suspect that maternal depression precedes young children’s TV viewing. Another limitation is the use of reworded EPDS-3 questions for screening maternal

depression symptoms. The reworded questions have not been tested for their predictive validity, however, the questions have previously aided in maternal depression case finding in a randomized controlled trial of parental depression screening using CHICA.⁴⁴

We were surprised that the number of self-reported depression symptoms was not associated with the likelihood of the child's TV viewing. This begs further investigation. Because CHICA captures a large array of data, we plan to explore how the accumulation of symptoms might correlate with other important indicators with respect to mother's health and well-being, child behavior and development or parent-child interactions.

Though CHICA asked very specifically if the child "watches TV on most days," we don't know the type or content (e.g., foreground or background) of TV viewing, but it may not matter. Change of behavior around TV viewing is shown to be hard in any case.⁶² Furthermore, background TV has also been linked to negative outcomes for children including decreased sustained attention during playtime,⁶³ lower quality of parent-child interactions⁶⁴ and reduced performance on cognitive tasks.⁶⁵ Future studies are needed to understand better why and how parents use TV, i.e. whether they co-view or interact with the child around the content of the TV show or substitute it for another unsupervised child time that could be more unsafe.

Our study supports the importance of psychosocial functioning of women, three months postpartum and the role of understanding maternal depression including subclinical depression, and its impact on their infant's development.⁶¹ Our findings support efforts by caregivers to target these mothers and closely monitor their parent-child interactions to maximize prevention efforts and prompt early intervention for any emerging infant developmental concerns. These may include a more nuanced approach, such as harm reduction; for example, advocating for fewer hours, child-friendly programs and physical and verbal interaction with caregiver during child's TV viewing.

CONCLUSION

Nurse practitioners, pediatricians and other primary care physicians see mothers and infants most frequently in the first two years of life and they are, therefore, uniquely positioned to screen for both TV viewing in young children and symptoms of depression in new mothers.^{60,66,67} Our study suggests that mothers who are depressed are more likely to report early media exposure among their children. This represents yet another important consequence of maternal depression for the child. Both the United States Health Resources and Services Administration (HRSA) and the AAP recommend screening mothers for depression symptoms in the perinatal period.^{68,69} The AAP also strongly discourages media use before 2 years of age, citing lack of evidence supporting educational benefits⁵, and considering the potential adverse health and developmental effects^{63,70} of media use.⁷¹ AAP's revised policy statement includes screening for use of "new media" or internet-connected devices for recreational use.⁷²

Furthermore, AAP also encourages parents to establish a family home use plan for all media.⁷² Educating parents about media limits, management of TV viewing at each well child visit and promotion the importance of encouraging "media free" family time is one of the best options available from a policy perspective.⁷¹

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Abbreviations

CHICA	Child Health Improvement through Computer Automation
PSF	Patient Screening Form
PWS	Physician Work Sheet
RMRS	Regenstrief Medical Record System
CDSS	Clinical Decision Support System
EHR	Electronic Health Record
AAP	American Academy of Pediatrics

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What's New

Children as young as 0 to 3 months are viewing TV on most days. In our sample of 0 to 2 year olds, the odds of TV viewing increased by more than a quarter for each additional month of child's age and by as much as half when the mother screened positive for depression symptoms.

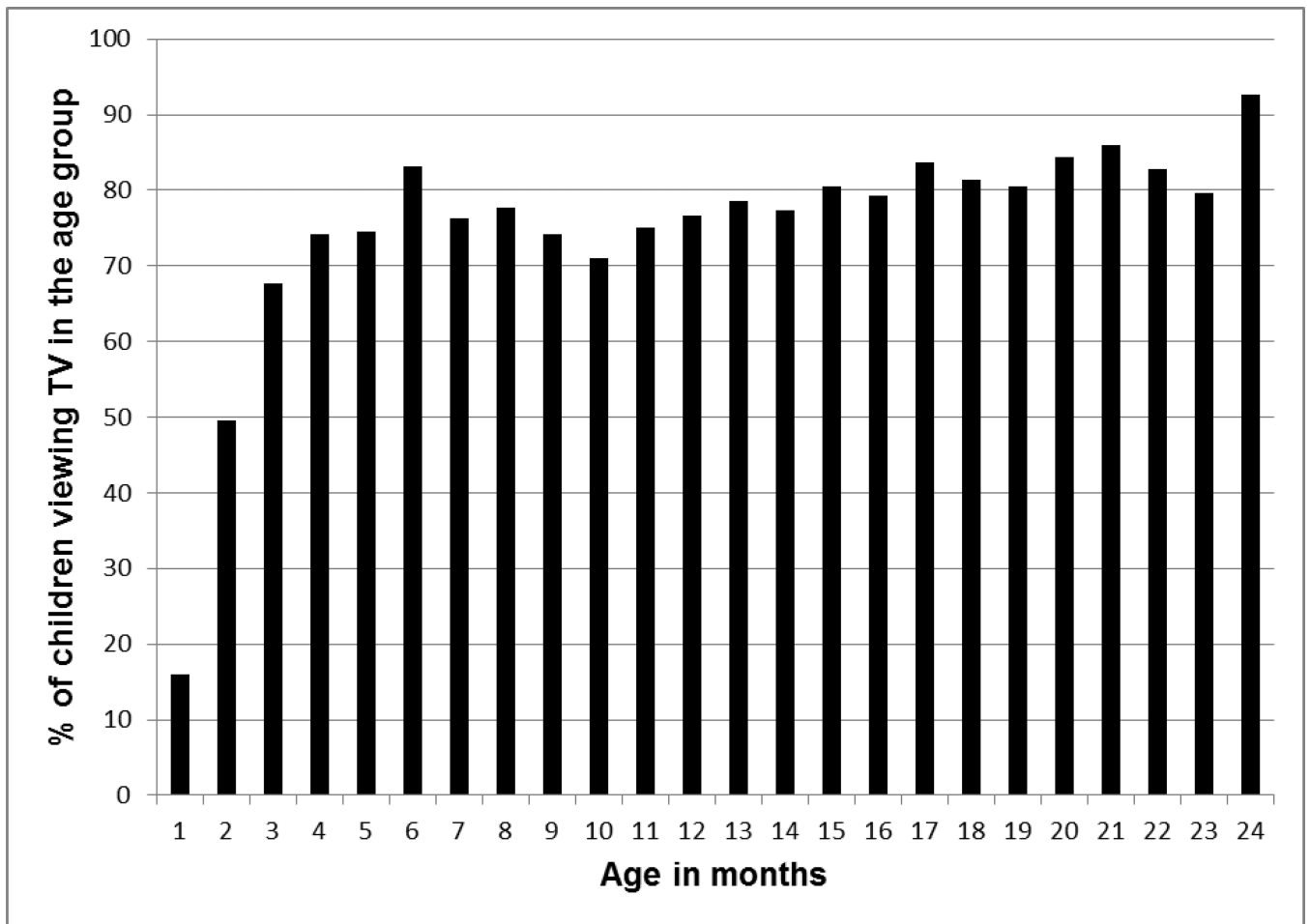


Figure 2.
Percent of parents reporting TV viewing on most days by age of the child in months
(repeated cross-sectional analysis)

Table 1

Demographics of study population (children 0 – 2 years)

Race/Ethnicity (n= 3254)	
	N (%)
Black	1600 (49.2%)
Latino	1175 (36.1%)
Other	118 (3.6%)
White	361 (11.1%)
Infant's Sex (n=3254)	
	N (%)
Female	1552 (47.7%)
Family's Preferred Language (n=3254)	
	N (%)
English	2352 (72.3%)
Spanish	902 (27.7%)
Insurance Category (n= 3254)	
	N (%)
No Insurance	267 (8.2%)
Private	91 (2.8%)
Public	2894 (88.9%)
Unknown	2 (<1%)

Table 2

Logistic Regression Model for TV exposure in children 0 – 2 years old (N = 2397)

Variable	Odds Ratio	95% Confidence Limits		P value
Child's age* (in months at visit when family reported TV exposure for the first time)	1.27 per month	1.25	1.30	<0.001
Insurance				
Public*	3.00	1.60	5.63	0.001
No Insurance	1.40	0.69	2.86	0.344
Private		Comparator		
Maternal Depressive Symptom* (1 or more positive items on EPDS-3)	1.47	1.07	2.0	0.016
Preferred Language				
Spanish	1.14	0.82	1.60	0.437
English		Comparator		
Race				
Black*	3.75	2.70	5.21	0.000
Other	1.50	0.86	2.60	0.154
White*	1.55	1.04	2.30	0.032
Latino		Comparator		
Infant's Sex				
Male	1.03	0.85	1.25	0.759
Female		Comparator		

* =Significant variables

(Sex and Family's Preferred Language were not significantly associated with likelihood of TV viewing)