Community Home Visiting Services and Child Maltreatment Report Rates, Illinois Zip Codes, 2011–2018

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Abstract

Background: Research is sparse on the community-level impacts of home visiting programs on child maltreatment.

Objective: To examine community-level associations between state-funded home visiting programs (i.e., IDHS-HV), federal-funded home visiting programs (i.e., MIECHV), and child maltreatment report (CMR) rates, overall and within subgroups of age, sex, and maltreatment type.

Participants and Setting: 3,824 zip code-years during 2011–2018 in Illinois for IDHS-HV/CMR associations and 1,896 zip code-years during 2015–2018 for MIECHV/CMR associations.

Methods: We measured county-level IDHS-HV rates (per 1,000 children aged 0–5) since data were only available at that level. MIECHV rates (per 1,000 children aged 0–5), CMR rates (per 1,000 children), and all controls were measured at the zip code level. We used spatial linear models to handle spatial autocorrelation.

Results: Adjusted for controls, longitudinal increases of IDHS-HV rates were significantly associated with decreased overall CMR rates (coefficient: −0.28; 95% CI: −0.45, −0.11), age 0–5 CMR rates (−0.52; −0.82, −0.22), age 6–11 CMR rates (−0.31; −0.55, −0.06), male CMR rates (−0.25; −0.45, −0.05), female CMR rates (−0.29; −0.49, −0.08), and neglect report rates (−0.13; −0.24, −0.02). In contrast, longitudinal increases of MIECHV rates were significantly associated with increased CMR rates within several subgroups.

Conclusions: Our findings suggest that increasing state-funded home visiting services in communities may have benefits in lowering their CMR rates. Given the very low MIECHV service rates and the federal policy that requires MIECHV to target at-risk communities, the significant positive MIECHV/CMR associations we found might indicate MIECHV programs are typically in higher risk communities.

Keywords

child maltreatment; child maltreatment report; home visiting; spatial analysis

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Introduction

Child maltreatment is a pressing public health and social problem. In 2019, 4.7% of U.S. children had a child maltreatment report (CMR) that was investigated or assessed by child protective services (U.S. Department of Health and Human Services, 2021). Lifetime prevalence is multiple times greater than this annual rate. A recent estimate suggests that 37.4% of U.S. children will have at least one CMR (hereafter, CMR refers to investigated or assessed CMR) by age 18 (Kim et al., 2017). Strong research indicates that child maltreatment incidents, both CMRs and surveyed incidents, increase future risks of various developmental, cognitive, academic, behavioral, psychological, and health problems, including premature death, both during childhood and in adulthood (Anda et al., 2006; Cabrera et al., 2020; Lansford et al., 2002; Vaithianathan et al., 2018). The social costs of child maltreatment are heavy. A recent study estimates that the lifetime costs of all CMRs in the United States in a single year add up to $2 trillion USD (Peterson et al., 2018).

Home visiting is a well-regarded prevention strategy against child maltreatment. Studies of several home visiting programs show they reduce child maltreatment incidents and CMRs (HomVEE, n.d.). However, such studies have focused on individual-level outcomes based on experimental designs, high-risk populations, and small, local datasets (Avellar & Supplee, 2013; Gubbels et al., 2021; HomVEE, n.d.). This leaves questions about program impacts for communities as whole, effectiveness in real-world settings, and generalizable findings based on population-level data. Addressing these knowledge gaps can guide policy generally as well as community-based prevention efforts in public health and social work, which are increasingly prevalent (Graaf & Ratliff, 2018; Lo & Cho, 2021; Merzel & D'Afflitti, 2003). To address these gaps, this study examines community-level associations between home visiting services and CMR rates, using Illinois statewide data from 2011 to 2018.

Background

Early childhood home visiting (hereafter just "home visiting") is a voluntary service for at-risk families available from the time of pregnancy and typically during the first 2–5 years of a child's life. In Illinois four major public programs provide funding for home visiting: Illinois State Board of Education-Preventive Initiative (ISBE-PI), Early Head Start Home-Based (EHS-HB), Illinois Department of Human Services-Home Visiting (IDHS-HV), and Maternal, Infant, and Early Childhood Home Visiting (MIECHV). Table 1 lists these programs in descending order in terms of the total number of Illinois children each program serves; in 2020, ISBE-PI served 13,464, EHS-HB served 5,455, IDHS-HV served 2,351, and MIECHV served 876.

Unfortunately, data for community-level home visiting services are not available for ISBE-PI- and EHS-HB-funded programs, and this study therefore focuses on IDHS-HV and MIECHV. It may be more difficult for these programs to have meaningful community-level impacts on CMR rates because they serve fewer children. However, both explicitly aim to reduce child maltreatment risks, whereas the larger programs focus more on child development and education (Illinois Early Childhood Asset Map, 2020). In keeping with this distinction, IDHS-HV and MIECHV serve more children with evidence-supported home

visiting models than ISBE-PI and EHS-HB do. A federally funded ongoing comprehensive review of home visiting research, HomVEE, finds that the two main models IDHS-HV and MIECHV use, Healthy Families America and Nurse Family Partnership, reduce child maltreatment in the treated families (HomVEE, n.d.; see Table 1). In 2020, IDHS-HV and MIECHV served 1,924 children and 335 children, respectively, with Healthy Families America, while ISBE-PI served only 494 with this model. IDHS-HV served 67 children with Nurse-Family Partnership while ISBE-PI served 54 children with this model. EHS-HB funded neither of these home visiting models in 2020. Both ISBE-PI and EHS-HB primarily use Parents as Teachers, EHS-HB, and Baby TALK models, which IDHS-HV and MIECHV either don't use or use with very few children (Table 1). The HomVEE review shows no supportive evidence that these programs prevent child maltreatment (HomVEE, n.d.).

Prior Research

Prior research has predominantly focused on individual-level effects of home visiting on reductions in child maltreatment based on a rigorous research design, such as a randomized controlled trial (Avellar & Supplee, 2013; Gubbels et al., 2021). The HomVEE review has found that a number of home visiting models reduce child maltreatment among service participants (Avellar & Supplee, 2013; HomVEE, n.d.). Specifically, findings indicate Healthy Families America, Nurse-Family Partnership, and Health Access Nurturing Development Services reduce substantiated CMRs. Healthy Families America also reduces caregiver-reported behaviors of neglect, physical abuse, psychological abuse, harsh parenting, and corporal/verbal punishment. Healthy Families America as well as SafeCare increased caregiver-reported use of nonviolent discipline.

Although prior studies help establish the value of home visiting in child maltreatment prevention at the individual level, they have several limitations. First, findings were inconsistent between home visiting studies, perhaps because most studies used relatively small, non-representative samples from different sites (Avellar & Supplee, 2013; HomVEE, n.d.). Some studies on Healthy Families America and Nurse Family Partnership in Oregon and New York sites found favorable effects on reducing substantiated CMRs, whereas studies on these home visiting models in Alaska, Georgia, Massachusetts, and New York sites found no favorable effect (Avellar & Supplee, 2013; HomVEE, n.d.). Similarly, prior findings on self-reported maltreatment and parenting behaviors were also inconsistent between studies with different samples from different sites (Avellar & Supplee, 2013; HomVEE, n.d.). The inconsistency in prior findings limits their policy implications and requires further research based on a generalizable sample. Second, some limitations exist in how prior home visiting studies measured child maltreatment. Studies often measured child maltreatment by self-reported surveys (e.g., the Parent-Child Conflict Tactics Scale; HomVEE, n.d.). This approach can be subject to bias (e.g., social desirability and recall bias) and more expensive than administrative data (e.g., CMRs), especially for routine evaluations on large samples. While many studies also used administrative data to measure child maltreatment, they only used CMRs that were substantiated by child protective services investigations for evidence of child maltreatment (e.g., Zielinski et al., 2009), with an exception of a SafeCare study using all substantiated and unsubstantiated CMRs (Silovsky et al., 2011). A substantial body of research suggests little difference between

substantiated and unsubstantiated CMRs with respect to experiencing current and future child maltreatment risks and their consequences (Kohl et al., 2009). Using all substantiated and unsubstantiated CMRs is generally considered to be a normative approach among recent studies to avoid underestimation of child maltreatment rates (Kim et al., 2017). Finally, prior studies examine individual-level effects of home visiting and have limited implications for community-level impacts of home visiting. The current study attempts to address these limitations by examining community-level associations between home visiting and CMRs (all substantiated and unsubstantiated CMRs), using Illinois population-level data.

Several prior studies have found community services other than home visiting have community-level protective functions. Two studies on the Positive Parenting Program (i.e., Triple P) in North Carolina found that county-level provisions of Triple P had protective impacts on county rates of CMRs, substantiated CMRs, foster care entries, hospitalizations, and emergency department visits for child maltreatment-related injuries (Prinz et al., 2009; Schilling et al., 2020). A multilevel study in Wisconsin found that county-level spending on child maltreatment prevention programs (e.g., family team meetings, wraparound programs, domestic violence, financial support, mental health, parenting education, referrals, respite care, substance use, support groups, youth services, and home visiting) was related to lowered individual-level CMR risks (Maguire-Jack, 2014b). A study on sampled parents in Franklin County, OH, identified lower risks of parent-reported neglect and physical abuse with increases in the availability and accessibility of community services, including domestic violence, mental health, substance use prevention, housing, basic needs, childcare, parenting, and medical services (Maguire-Jack & Negash, 2016). Finally, a study based on sampled parents in Los Angeles County, CA, found that proximity to community services, such as mental health and substance use prevention services, were related to lower risks of parent-reported neglect (Maguire-Jack & Klein, 2015). In general, prior findings suggest that service provisions in communities may have community-level functions in reducing community CMR rates. However, evidence specifically about community-level impacts of home visiting services on CMR rates is sparse.

Theoretical Framework

Although empirical evidence is sparse, several theoretical perspectives support community-level relationships between home visiting and CMR rates. First, it is possible that individual-level relationships lead to community-level relationships. That is, communities with more home visiting services can have lower CMR rates simply because home visiting services decrease CMR risks of program participants. Second, from a sociological perspective, community home visiting services may promote positive social processes, such as social organization (i.e., a community's structural capability) and collective efficacy (i.e., a community's cohesion and willingness) to engage collectively with community problems (Sampson et al., 1999). Home visiting programs offer services for parenting knowledge and skills, and a concentration of knowledgeable and skillful parents may facilitate positive social processes. Home visiting programs also provide services that can more directly enhance social organization and collective efficacy, such as parent support groups and referrals and linkages to community resources and supports. Enhanced social organization and collective efficacy may in turn facilitate collective engagement to prevent community

child maltreatment incidents and reports (Sampson et al., 1999). Third, a psychological perspective suggests that concentrated disadvantages can become environmental stressors, which increase child maltreatment risk, especially while families lack adequate social supports (Belsky, 1993). Home visiting programs mainly target high-risk families and aim at addressing various disadvantages they face. Thus, they may alleviate concentrated disadvantages at some degree. Further, providing parent support groups and referral/linkage services may improve overall social supports, which may buffer environmental stressors and lower CMR rates. Finally, recent research on community service availability suggests that while residents' negative appraisals about their communities can increase stress levels, improved service availability in a community can address negative appraisals, lower stress levels, and eventually reduce CMRs in a community (Maguire-Jack & Negash, 2016). This study does not specifically examine these theoretical perspectives, but they together support community-level research on home visiting services and CMR rates.

Current Study

To address the knowledge gaps in prior research, this study examines community-level associations between home visiting services and CMR rates, using longitudinal community-level data linking multiple Illinois statewide databases from 2011 to 2018. IDHS-HV and MIECHV both support Healthy Families America, Parents as Teachers, and, in some years, Nurse-Family Partnership, and home visiting agencies often receive funding from both sources. Nevertheless, we examine IDHS-HV and MIECHV separately for a few reasons. The first reason is data limitations. Unfortunately, IDHS-HV data were available only at the county level, while all other data were available at the zip code level. We therefore examine how county-level IDHS-HV services were associated with zip code-level CMR rates and zip code-level associations for MIECHV. Considering that IDHS-HV programs serve a far greater number of Illinois children than MIECHV programs (Table 1), we expect that IDHS-HV services have a stronger association with community CMR rates than MIECHV services. The second reason is policy interests. MIECHV is the major federal funding program that exclusively supports home visiting programs, while state general revenue funds sponsor the IDHS-HV programs. Stakeholders (e.g., funders, policy makers, providers, and clients) may be interested in separate findings. Another data limitation is that Illinois MIECHV programs only began in 2012, and MIECHV data are available only from 2015 to 2018, while IDHS-HV data are available from 2011 to 2018.

We examine both within-effects (i.e., longitudinal changes) and between-effects (i.e., inter-community differences) of community home visiting services and their associations with community CMR rates. For within-effects, we expect that a longitudinal increase of home visiting services in a community is associated with a decrease of its CMR rates. Regarding between-effects, there is no specific hypothesis and this examination is exploratory. Increasing services is expected to decrease CMR rates, but allocation of social services between communities is often based on risk levels. The former leads to a negative association (i.e., communities with more services have lower CMR rates), whereas the latter leads to a positive association (i.e., more services are provided in communities with higher CMR rates). Methodologically, within-effects better control risk levels by eliminating inter-community heterogeneity (Bell et al., 2019; Schunck, 2013). Although between-effects

are vulnerable to uncontrolled inter-community heterogeneity, they can examine associations in a wide spectrum of community conditions (Bell et al., 2019; Schunck, 2013). We examine these associations overall and within subgroups of child age (i.e., 0–5, 6–11, and 12–17 years), child sex (i.e., male and female), and maltreatment type (i.e., neglect, physical abuse, and sexual abuse). We expect that children aged 0–5 years mostly have benefits from community home visiting services as they are the target population of home visiting programs, while it is also possible that community home visiting services have protective functions for older children through community-level pathways (e.g., positive social processes). For maltreatment type, prior research suggests differential impacts of community conditions (e.g., poverty) by type (Coulton et al., 2007). It is therefore possible that community home visiting services have different impacts across type. By child sex, we expect little difference as the existing literature has reported no notable differences in child maltreatment rates and their risk factors by child sex (Kim et al., 2017; National Research Council, 2014).

Methods

Data

This study linked the following Illinois statewide databases at the community level: (1) the Department of Children and Family Services (DCFS) CMR records; (2) IDHS-HV records; (3) MIECHV records; and (4) census data. While a statewide individual-level linkage between CMR records and home visiting records was not possible due to confidentiality restrictions, a community-level linkage was possible. IDHS-HV records were available only at the county level, while all other records were available at the zip code level. Prior research suggests that zip codes are valid community boundaries in balance between reliability and homogeneity (Aron et al., 2010). That is, most zip codes are large enough to provide reliable rates of events of interest, as well as small enough to guarantee homogeneous community experiences among residents (Aron et al., 2010). Although counties may be too large to ensure a high level of homogeneity, prior studies have demonstrated that county-level data are still useful to understand community risk and protective factors for child maltreatment (Kim & Drake, 2018; Maguire-Jack, 2014b).

We used DCFS records of all screened-in CMRs for investigations in Illinois from 2011 to 2018. The original records were individual-level records, containing 1,073,168 reported children according to annual unique counts (i.e., each child was counted once per year). From these records, we excluded those with missing ages, ages > 17 years, missing zip codes, or non-Illinois zip codes (3.2%). The remaining 1,038,772 reported children (96.8% of the original records) were aggregated into zip code-years to calculate annual zip code-level CMR rates from 2011–2018. There were 11,064 zip code-years in Illinois from 2011–2018 (i.e., 1,383 Illinois zip codes × 8 years). However, many were "empty" (i.e., having low child populations) and could not produce reliable counts of CMRs. As Aron et al. (2010) suggested excluding low-populated zip codes from analysis for reliability, we excluded 7,237 zip code-years (65.4% of all zip code-years) having < 300 children for any of three age groups (i.e., 0–5, 6–11, and 12–17 years). We further excluded 3 zip code-years due to missing control variables. Altogether, we used 3,824 zip code-years (34.6% of all

zip code-years) for analysis. As we excluded many "empty" zip code-years, these 3,824 zip code-years covered 90.1% of Illinois children from 2011 to 2018.

The Illinois Early Childhood Asset Map (2020) provided IDHS-HV data from 2011 to 2018. Unfortunately, IDHS-HV data were only available at the county level. We therefore linked the county-level IDHS-HV data to the zip code-level CMR data using the 2010 Zip Code Tabulation Area to County Relationship File (U.S. Census Bureau, n.d.-b). When a zip code was entirely nested in a county, we assigned the county's IDHS-HV record to the zip code. When a zip code spanned more than a county, the zip code was linked to the county with the most residents in that zip code. We believe that this approach had almost no impact on our estimates, as in our data 92.8% of zip codes were entirely or nearly entirely nested in a single county. Specifically, 67.7% of zip codes were entirely (100%) nested in a single county and 25.1% of zip codes were close to that (80% to 99.9% nested in a single county).

MIECHV data were obtained from the Center for Prevention Research and Development (n.d.). MIECHV data were provided at the zip code level, and we simply linked them with other data at the zip code level. We used 3,824 zip code-years from 2011 to 2018 for examining associations between IDHS-HV services and CMR rates and 1,896 zip code-years from 2015 to 2018 for examining associations between MIECHV services and CMR rates.

Measures

Dependent Variables

We measured the annual CMR rate per zip code (i.e., the number of children with a CMR per 1,000 children in a zip code in a year) from 2011 to 2018. We measured overall CMR rates, as well as CMR rates specific to subgroups of child age (i.e., age 0–5, 6–11, and 12–17 years), child sex (i.e., male and female), and maltreatment type (i.e., neglect, physical abuse, and sexual abuse). Altogether, we used nine dependent variables: one variable for overall CMR rates and eight variables for subgroup-specific CMR rates (see Table 2).

Independent Variables

This study used two independent variables (Table 2). The first one measured the annual IDHS-HV rate per county (i.e., the number of children served by IDHS-HV programs per 1,000 children aged 0–5 years in a county in a year) from 2011 to 2018. The second one measured the annual MIECHV rate per zip code (i.e., the number of children served by MIECHV programs per 1,000 children aged 0–5 years in a zip code in a year) from 2015 to 2018. We used the number of children aged 0–5 years for the denominator since IDHS-HV and MIECHV programs targeted this population.

Control Variables

Ecological studies have found a range of community risk factors of child maltreatment, such as socioeconomic, demographic, child care burden, residential instability, and urbanicity conditions (Coulton et al., 2007; Maguire-Jack, 2014a; Maguire-Jack & Kim, 2021). Guided by prior research, we controlled for the following variables: percentages of households

in relative poverty, median owner-occupied house values, percentages of vacant housing units, percentages of Black children among resident children, percentages of Latino children among resident children, percentages of foreign-born among residents, percentages of children among residents, percentages of elderly among residents, percentages of adult residents identified as male, percentages of children with disabilities, percentages of moved in one year among residents, and urbanicity. The urbanicity level was measured based on the U.S. Department of Agriculture Rural-Urban Continuum codes, and we combined the original nine codes into the following three categories for simplicity: large urban (code 1), small urban (codes 2 and 3), and rural (codes 4 to 9). All other control variables were obtained from American Community Surveys.

Statistical Analysis

This study used spatial linear models with a Matérn correlation function to handle spatial autocorrelation in distance between zip codes. We used the latitude-longitude coordinates obtained from the Census Gazetteer Files for distance data (U.S. Census Bureau, n.d.-a). We estimated models separately for IDHS-HV/CMR and MIECHV/CMR associations. The analysis data for IDHS-HV/CMR associations (IDHS-HV data) included zip code-years with at least 300 children for each of all three age groups (i.e., 0–5, 6–11, and 12–17 years) from 2011 to 2018 (N = 3,824). The analysis data for MIECHV/CMR associations (MIECHV data) included zip code-years from 2015 to 2018 (N = 1,896). We measured both within-effects (i.e., longitudinal changes) and between-effects (i.e., inter-community differences) of home visiting rates and estimated their associations with CMR rates. We controlled for year-fixed effects to handle repeated observations and overall longitudinal trends of CMR rates. We also adjusted for the control variables. The residuals of all fitted models showed almost normal distributions (skewness 0.238–0.746). We used the *spaMM* package (version 3.9.0) in R (version 4.1.1) for analysis (Rousset & Ferdy, 2014).

Results

Table 2 reports descriptive statistics. The mean CMR rate per zip code-year was 44.7 per 1,000 children from 2011 to 2018 (IDHS-HV data) and 49.1 per 1,000 children from 2015 to 2018 (MIECHV data). The mean CMR rate was generally higher for younger children. The mean rate of type-specific CMRs was the highest for neglect, followed by physical abuse and sexual abuse, indicating that neglect was the most frequent type of child maltreatment. There was little difference in the mean CMR rate between male and female children. On average, IDHS-HV programs served 4.5 per 1,000 children per county-year, while MIECHV programs served 0.7 per 1,000 children per zip code-year.

Table 3 reports the results of the spatial linear models of overall CMR rates. The within-effect of IDHS-HV rate had a significant negative association with the CMR rate while adjusting for no control variable (Model 2), but also while adjusting for the control variables (Model 3). That is, when the number of children served by IDHS-HV programs in a county increased longitudinally by 1 per 1,000 children, the CMR rates of the county's zip codes decreased in general by 0.20 per 1,000 children with no control variable (coefficient [β] = −0.20; 95% confidence interval [CI]: −0.38, −0.03) and by 0.28 per 1,000 children with the

control variables (β = −0.28; 95% CI: −0.45, −0.11). The between-effect of IDHS-HV rate had a significant positive association with the CMR rate with no control (Model 2). That is, when the IDHS-HV rate (per 1,000 children) of a county was one unit higher than other counties, the CMR rates (per 1,000 children) of the county's zip codes were on average 0.44 higher than others zip codes (β = 0.44; 95% CI: 0.02, 0.87). This association became not significant after adjusting for the control variables (β = 0.21; 95% CI: −0.04, 0.46; Model 3). The within-effect of MIECHV rate was not significant with no control variable (β = 0.14; 95% CI: −0.16, 0.44; Model 5), as well as with the control variables (β = 0.18; 95% CI: −0.09, 0.46; Model 6). The between-effect of MIECHV rate was significant with no control variable (β = 5.23; 95% CI: 0.42, 10.04; Model 5), but this became not significant after considering the control variables (β = 2.24; 95% CI: −0.41, 4.88; Model 6).

Table 4 reports the results of subgroup-specific analyses while adjusting for the control variables. The within-effect of IDHS-HV rate was significantly negatively associated with most subgroup-specific CMR rates. For child age subgroups, the within-effect of IDHS-HV rate was associated with decreased CMR rates significantly for younger children (0–5 years) and middle-age children (6–11 years), and not significantly for older children (12–17 years). Specifically, when the IDHS-HV rate longitudinally increased by one unit (1 per 1,000 children), CMR rates decreased significantly by −0.52 per 1,000 children aged 0–5 years (β = −0.52; 95% CI: −0.82, −0.22), significantly by −0.31 per 1,000 children aged 6–11 years (β = −0.31; 95% CI: −0.55, −0.06), and not significantly by −0.18 per 1,000 children aged 12–17 years (β = −0.18; 95% CI: −0.39, 0.02). Regarding child sex subgroups, the within-effect of IDHS-HV rate was significantly associated with both male and female CMR rates. That is, per one unit increase in the IDHS-HV rate (1 per 1,000 children), the CMR rate significantly decreased by 0.25 per 1,000 male children (β = −0.25; 95% CI = −0.45, −0.05) and 0.29 per 1,000 female children (β = −0.29; 95% CI = −0.49, −0.08). With regard to maltreatment type subgroups, the within-effect of IDHS-HV rate was significant only for neglect. A one unit increase in the IDHS-HV rate (per 1,000 children) was significantly associated with a 0.13 decrease in the neglect report rate per 1,000 children (β = −0.13, 95% CI: −0.24, −0.02). The coefficient of the within-effect of IDHS-HV rate was not significant and nearly zero for both physical abuse (β = −0.01; 95% CI: −0.06, 0.04) and sexual abuse (β = 0.01; 95% CI: −0.04, 0.06).

When adjusting for control variables, the between-effect of IDHS-HV rate was not significant for most subgroup-specific CMR rates. Yet, it had a significant *positive* association with a few subgroup-specific CMR rates (i.e., the age 6–11 CMR rate and the male CMR rate). After considering controls, the within-effect of MIECHV rate was significantly *positively* associated with several subgroup-specific CMR rates (i.e., the age 0–5 CMR rate, the male CMR rate, the neglect report rate, and the physical abuse report rate). With controls, the between-effect of MIECHV rate had no significant association for all subgroups.

Discussion

This study reports the first estimates on the community-level associations between home visiting services and CMR rates, based on data linking multiple Illinois statewide datasets

at the community level longitudinally (from 2011 to 2018 for IDHS-HV services and from 2015 to 2018 for MIECHV services). We found that a longitudinal increase in IDHS-HV services in a county (i.e., the within-effect of IDHS-HV rate) was significantly associated with a decrease in CMR rates in sub-county areas (i.e., zip codes) while controlling for a range of potential confounders. This association was significant overall, as well as within most subgroups, including children aged 0–5 years, children aged 6–11 years, male children, female children, and neglect reports. A longitudinal increase in MIECHV services in a zip code (i.e., the within-effect of MIECHV rate) had no significant association with overall CMR rates. This was understandable given the low rate of MIECHV services (i.e., 0.7 per 1,000 children aged 0–5 years) compared with the rate of IDHS-HV services (i.e., 4.5 per 1,000 children aged 0–5 years). Unexpectedly, a longitudinal increase in MIECHV services had a significant *positive* association with age 0–5 CMR rates, male CMR rates, neglect report rates, and physical abuse report rates. This was perhaps because the statutory purposes of MIECHV programs, especially the requirement of targeting at-risk communities (U.S. Department of Health and Human Services, 2016), might increase MIECHV services in increasing-risk communities. Both the between-effects of IDHS-HV services and MIECHV services had a significant positive association with CMR rates with no control. That is, in inter-community comparisons, communities with higher home visiting services had higher CMR rates, which might reflect more service allocations in higher-risk communities. However, after taking the control variables into account, which might somewhat adjust for differences in risk levels, these between-effects became not significant for overall CMR rates or most subgroup-specific CMR rates.

The significant findings on the within-effect of IDHS-HV services have a range of implications. First, these findings have stronger causal implications than those based on a conventional cross-sectional approach. This study's within-effect estimates are equivalent to fixed-effects estimates, which can control for unobserved differences in time-constant characteristics between communities (Bell et al., 2019; Schunck, 2013). The within-effect estimates can still be confounded by unobserved time-varying conditions, but they are methodologically more rigorous than cross-sectional estimates, which can only control for observed differences. Second, the current findings confirm theoretical relationships between home visiting services and CMR rates at a community level in a longitudinal setting. Most prior studies on home visiting programs have only focused on individual-level impacts (Avellar & Supplee, 2013; Gubbels et al., 2021; HomVEE, n.d.). The current study expands this knowledge base to community-level longitudinal impacts, and it serves as groundwork for future research on specific community-level protective mechanisms (e.g., collective efficacy) facilitated by home visiting services. Finally, the present findings have relevant practical implications. Community-level and public health approaches have gained increasing attention for a substantial reduction of child maltreatment at a large population level (Molnar et al., 2016; Scott et al., 2016). This study supports these approaches by providing community-level findings based on large-scale data. Specifically, the reductions in CMR rates after a longitudinal increase of IDHS-HV services suggest potential benefits of state-funded home visiting programs, as well as policies to expand these programs in communities.

This study identified that a longitudinal increase of IDHS-HV rates was significantly associated with a decrease in CMR rates for both age 0–5 and age 6–11 subgroups. The association was also negative for the age 12–17 subgroup, but marginally significant (.05 $< p < .10$). These findings are rather surprising and interesting as IDHS-HV programs exclusively target children aged 0–5 years. The reduction in CMR rates among older children suggests possible spillover impacts of community home visiting services beyond program participants. We offer some speculations for mechanisms of the possible spillover impacts although we cannot test them empirically with the data available. First, early studies suggest that social interactions between children of various ages are common in community settings (Ellis et al., 1981; Whiting & Whiting, 1975), which may facilitate social interactions between their parents. Sampson et al. (1999) refer to intergenerational closure, which occurs when parents know the parents of their children's friends, and suggest that it promotes informative exchange between parents as well as establishment of parenting norms. Within communities, therefore, the benefits of home visiting programs on the programs' target population (i.e., children aged 0–5 years) may spill over to older children. Second, as discussed in the introduction section, community home visiting services may facilitate positive social processes, such as social support, social organization, and collective efficacy. Improved availability of home visiting services can also reduce negative appraisals about community environments, which in turn may lower stress levels among residents (Maguire-Jack & Negash, 2016). These positive community-level changes may be protective against child maltreatment for both younger children and older children. Further research is required to better understand these findings.

This study's community-level findings on type-specific CMR rates are somewhat inconsistent with prior individual-level findings. Regarding home visiting models funded by IDHS-HV (i.e., Healthy Families America, Nurse Family Partnership, and Parents as Teachers), prior studies have far more often found individual-level protective effects on physical abuse than on neglect or sexual abuse (HomVEE, 2019a, 2019b, 2020). Most likely this is in part because they conduct more tests for physical abuse than neglect or sexual abuse. In contrast our study found that a longitudinal increase of IDHS-HV services was significantly associated only with neglect report rates, but not with physical abuse and sexual abuse report rates. Due to a dearth of literature on the matter, we cannot fully explain our findings, but we can make some speculations. On the one hand, physical abuse and sexual abuse reports are much less frequent than neglect reports in communities (Kim et al., 2017), and relatively small community-level impacts may be difficult to be detect for rare outcome events. On the other hand, the impacts of community home visiting services may be indeed more protective against neglect reports than physical abuse and sexual abuse reports. For example, if community home visiting services facilitate positive social processes (e.g., collective efficacy and social cohesion), they may protect against neglectful behaviors better than against physical or sexual abuse. Some prior studies suggest that neighborhood social cohesion reduces neglect incidents, especially those that can be relieved by the exchange of immediate favors between neighbors, such as providing basic necessities (e.g., food, clothing, and cash), exchanging information about community services (e.g., medical services), and assisting with childcare (Maguire-Jack & Showalter, 2016; Maguire-Jack & Wang, 2016). Another possibility is that home visiting services may address risk

factors for neglect more effectively than those for physical abuse and sexual abuse. Home visiting services have a set of components to improve parenting and supervision, economic self-sufficiency, social support, school readiness, and access to medical services (HomVEE, n.d.). These components may be able to address neglect risks, but addressing physical and sexual abuse risks may require more intensive mental health services (Walsh et al., 2002). Although home visitors have training to identify and screen for mental health issues, the treatment is delivered by referrals to community services. Given the widespread shortages of mental health professionals in many communities (Andrilla et al., 2018), and most especially in high-risk communities, such referrals may be unavailable and/or unable to address physical and sexual abuse risks effectively. More research is needed to confirm our findings and understand community-level mechanisms from home visiting services to child maltreatment by type.

While the significant findings on IDHS-HV services are exciting, effect sizes are small. The estimated models suggest that increasing IDHS-HV services by 100% of the current average provision (i.e., 4.5 per 1,000 children aged 0–5 years) would decrease the mean CMR rate by 2.8%, such that 1.26 fewer per 1,000 children are the subject of a CMR report in the community as a whole. A 100% increase in IDHS-HV services would also be expected to lower age 0–5 CMR rates by 4.4%, age 6–11 CMR rates by 3.0%, male CMR rates by 2.6%, female CMR rates by 2.9%, and neglect report rates by 2.6%. These small effect sizes are somewhat disappointing, but provisions of IDHS-HV services are currently very low. Thus local officials should be able to contemplate expanding services by well over 100% depending on resources. It is possible that effect sizes would grow if programs were expanded substantially. In addition, some studies point out that home visiting programs are generally designed as low intensive services that mainly target individual-level behavioral changes, and therefore, home visiting programs may have limited effectiveness in addressing strong risks factors of child maltreatment, such as low socioeconomic status, mental health, substance use disorder, crime, and other demanding factors (Finello et al., 2016; Gomby et al., 1999). Home visiting services might create a substantial reduction in child maltreatment incidents and reports if it were one element in an array of services addressing other factors (Fernandes-Alcantara, 2018; Finello et al., 2016; Gomby et al., 1999).

Unexpectedly, longitudinal increases of MIECHV services were significantly associated with *increased* CMR rates within several subgroups (i.e., children aged 0–5, male children, neglect reports, and physical abuse reports). Given that MIECHV provides the same home visiting models as IDHS-HV, it seems unlikely that the former has harmful effects when the latter does not. Instead, we view this finding as reflecting the allocations of services. The statutory purposes of MIECHV programs require the targeting of at-risk communities (U.S. Department of Health and Human Services, 2016), which might increase MIECHV services in communities with increasing CMR rates over time. In addition, the low level of MIECHV services (less than one-sixth of IDHS-HV services) might be not able to prevent an increase of CMR rates. Thus, the positive longitudinal associations between MIECHV services and CMR rates might be due to greater provisions of MIECHV services in higher risk communities while overall provisions were low. The significant within-effects of IDHS-HV services suggest that expansion of MIECHV may reduce child maltreatment incidents and reports.

With no control, the inter-community differences (i.e., between-effects) of both IDHS-HV services and MIECHV services were significantly *positively* associated with CMR rates. This suggests that, in line with statutory requirements, home visiting programs are allocated to communities according to risk levels (i.e., more services in communities with higher risk levels). After adjusting for the control variables, these associations became not significant overall or within most subgroups. Yet, we still failed to identify a significant *negative* association. This was perhaps because the control variables did not control for all risk levels that drive allocation of programs (e.g., mental health, substance abuse, and crime), which might offset the protective between-effects of home visiting services. Further research with a more rigorous approach, such as randomization of communities (e.g., Prinz et al., 2009) is needed.

Strengths and Limitations

The community-level linkage of multiple Illinois statewide databases allowed this study to examine community-level relationships between home visiting services and CMR rates with strong generalization ability. The examination of both within-effects and between-effects of home visiting services also will increase understanding of relationships between home visiting services and CMR rates in longitudinal dynamics, as well as in inter-community contexts. Another strength is the control of spatial autocorrelation using spatial modeling to provide more scientifically conservative estimates.

This study has several limitations that should be considered when interpreting the findings. First, the outcome of this study was the rate of reported child maltreatment incidents, and the data does not include unreported incidents. A substantial number of child maltreatment incidents are not reported to child protective services (Sedlak et al., 2010). While findings on reported incidents have their own implications for policy and practice, conclusions about actual rates of abuse should be drawn cautiously. Second, potential surveillance bias on reporting of child maltreatment incidents might affect our estimates. Home visiting participants may be more visible to service providers and thus more likely to be reported for child maltreatment than non-participants. A prior study suggests that surveillance bias possibly increases report rates by 12% to 25% while actively participating in home visiting services (Chaffin & Bard, 2006). In any case, however, it would not negate the significant negative relationships between home visiting services and CMR rates because surveillance bias induces a positive relationship rather than a negative one. Thus without surveillance bias our findings might be even more robust, suggesting they may represent a slight underestimation. Third, this study is observational, rather than experimental, and causal implications therefore should be drawn with caution. The current findings have causal implications, however, that are greater than those based on cross-sectional approaches. The within-effects adjusted for even unobserved time-invariant confounders. The year fixed effects controlled for overall longitudinal trends of CMR rates. The analysis further controlled for an important set of time-varying confounders (e.g., poverty rates), which also showed little longitudinal variations. Yet, the findings could be still confounded by uncontrolled time-varying confounders (e.g., other service provisions, such as daycare, substance abuse, and mental health). Fourth, this study examined community-level relationships. The community-level findings have important implications for policy and

practice as funding, coordination, and implementation decisions for home visiting programs are often made at that level (Duffee et al., 2017). But they have limited implications for understanding individual-level pathways and community-level pathways separately from each other. Future multilevel research can address this gap. Fifth, IDHS-HV data were measured at the county level, while all other data were measured at the zip code level. Counties may not be homogeneous, and prior research recommends using census tracts and zip codes as units of analysis for ecological research (Aron et al., 2010). While prior research suggests that county-level data can inform ecological studies of child maltreatment (Kim & Drake, 2018; Maguire-Jack, 2014b), confirming our findings among smaller area units is necessary. Sixth, this study's generalizability to low populated rural zip codes is more limited than its generalizability to highly populated ones. The excluded low populated zip codes are mostly rural and cumulatively are home to 9.1% of Illinois children. However, the inclusion of many relatively populous rural zip codes offsets this study's limitations in rural areas. Seventh, this study could not include ISBE-PI and EHS-HB programs due to the lack of publicly available data. While the home visiting services funded by these programs mainly target child development and academic outcomes, future research needs to include these programs given the considerable amount of home visiting funding from these programs. A challenge is that home visiting data are generally stored separately by multiple different funding sources. Thus such research will require data sharing and collaboration systems between government agencies for comprehensive evaluations of home visiting. Finally, while this study focused on CMRs, future research may expand outcomes to higher levels of child protective services involvement, such as substantiation decisions, service cases, and out-of-home placements.

Conclusions

This study found for the first time that a longitudinal increase of state-funded home visiting services (i.e., IDHV-HV) in communities were weakly but significantly associated with a decrease in their CMR rates, using Illinois longitudinal community-level data. This helps expand the evidence base supporting home visiting from the individual-level relationship to the community-level relationship and supports considering home visiting as a part of community-based prevention strategies in state policies. Even small effect sizes of community home visiting services may be worthwhile, given the high societal costs of child maltreatment and the fact that home visiting service programs in communities are small. This study found no protective associations for federal-funded home visiting (i.e., MIECHV) services perhaps because of the very low level of MIECHV services and the statutory requirements on MIECHV to target high-risk communities. Given the similarity between IDHV-HV- and MIECHV-funded home visiting models, the findings suggest that expanding MIECHV to increase overall home visiting services may help lower CMR rates, and further research should further explore this. Future studies may address this study's limitations to better understand impacts of community home visiting services to help lessen the toll of child maltreatment on our communities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Number of Children Served by Funding Sources and Home Visiting Models, Illinois, Fiscal Year 2020.

Funding Sources	Home Visiting Models						
	Healthy Families America	Nurse Family Partnership	Parents as Teachers	Early Head Start Home-Based	Baby TALK	Other	Total
Illinois State Board of Education-Preventive Initiative (ISBE-PI)	494	54	8,153	36	4,190	537	13,464
Early Head Start Home-Based (EHS-HB)	0	0	0	5,455	0	0	5,455
Illinois Department of Human Services-Home Visiting (IDHS-HV)	1,924	67	360	0	0	0	2,351
Maternal, Infant, and Early Childhood Home Visiting (MIECHV)	335	0	541	0	0	0	876

Source: Thomas et al. (2021).

Table 2.

Descriptive Statistics, Illinois Zip Codes, 2011–2018

Variables	Mean (SD) or %	
	Data used to examine community IDHS-HV services (N = 3,824 zip code-year observations)	Data used to examine community MIECHV services (N = 1,896 zip code-year observations)
Dependent Variables – Child Maltreatment Report Rate		
Total		
Total: # reported children per 1k children	44.7 (31.0)	49.1 (33.2)
By Child Age		
Young: # reported children per 1k children aged 0–5 years	53.7 (42.3)	58.0 (45.2)
Middle: # reported children per 1k children aged 6–11 years	46.9 (32.9)	51.6 (34.9)
Adolescent: # reported children per 1k children aged 12–17 years	36.4 (24.0)	40.8 (26.1)
By Child Gender		
Male: # reported children per 1k male children	44.1 (31.0)	48.6 (33.2)
Female: # reported children per 1k female children	45.2 (31.9)	49.4 (34.0)
By Maltreatment Type		
Neglect: # reported children for neglect per 1k children	22.8 (18.3)	25.5 (19.9)
Physical abuse (PA): # reported children for PA per 1k children	10.5 (6.9)	11.4 (7.1)
Sexual abuse (SA): # reported children for SA per 1k children	5.4 (4.4)	5.8 (4.7)
Independent Variables (based on data for total report rates)		
# children served by IDHS-HV per 1k children aged 0–5 years	4.5 (6.2)	-
# children served by MIECHV per 1k children aged 0–5 years	-	0.7 (2.8)
Control Variables (based on data for total report rates)		
% households in relative poverty (<50% US median household income)	22.6 (11.4)	22.9 (11.5)
Median owner-occupied house value per 10k	21.1 (12.7)	20.3 (12.4)
% vacant housing units	8.7 (4.8)	8.7 (4.9)
% Black children among resident children	13.8 (23.2)	13.8 (23.0)
% Latino children among resident children	17.4 (19.3)	18.0 (19.5)
% foreign-born persons among residents	11.1 (11.0)	11.3 (11.0)
% children among residents	23.9 (4.4)	23.4 (4.3)
% elderly persons (aged 65 years and older) among residents	14.1 (4.5)	14.8 (4.5)
% male adults among adult residents aged 20–64 years	49.5 (3.2)	49.5 (3.2)
% children with disabilities among resident children	10.9 (3.7)	11.2 (3.8)
% moved in one year among residents	12.6 (5.7)	12.6 (5.5)
Urbanicity		
Large urban: zip code in metro area with 1 million population	65.4%	65.7%
Small urban: zip code in metro area with < 1 million population	20.1%	20.0%
Rural: zip code in nonmetro area	14.5%	14.2%
Year		
2011	12.8%	-
2012	12.7%	-

	Mean (SD) or %	
Variables	**Data used to examine community IDHS-HV services (N = 3,824 zip code-year observations)**	**Data used to examine community MIECHV services (N = 1,896 zip code-year observations)**
2013	12.5%	-
2014	12.5%	-
2015	12.4%	25.1%
2016	12.4%	25.0%
2017	12.4%	24.9%
2018	12.4%	25.0%

Note. IDHS-HV: Illinois Department of Human Services Home Visiting programs. MIECHV = Maternal, Infant, and Early Childhood Home Visiting programs.

Table 3.

Spatial Linear Models of Overall Child Maltreatment Report Rates per 1,000 Children, Illinois Zip Codes.

	Coefficient (95% confidence interval)					
	IDHS-HV models (N = 3,824 zip code-year observations from 2011 to 2018)			MIECHV models (N = 1,896 zip code-year observations from 2015 to 2018)		
Fixed effects	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	54.72 (46.88, 62.56)	54.22 (46.59, 61.84)	45.94 (37.27, 54.61)	63.39 (55.96, 70.81)	63.33 (56.05, 70.61)	45.37 (39.34, 51.41)
Year fixed effects						
2011	reference	reference	reference	-	-	-
2012	2.05 (1.05, 3.04)	2.07 (1.07, 3.07)	1.46 (0.47, 2.45)	-	-	-
2013	4.35 (3.33, 5.38)	4.43 (3.40, 5.45)	3.27 (2.21, 4.32)	-	-	-
2014	4.41 (3.39, 5.44)	4.44 (3.42, 5.46)	2.74 (1.63, 3.84)	-	-	-
2015	7.93 (6.90, 8.95)	7.91 (6.89, 8.94)	5.88 (4.76, 7.01)	reference	reference	reference
2016	10.45 (9.42, 11.48)	10.32 (9.28, 11.35)	7.86 (6.70, 9.03)	2.49 (1.54, 3.44)	2.47 (1.52, 3.42)	1.96 (1.02, 2.91)
2017	11.12 (10.08, 12.15)	10.73 (9.64, 11.82)	7.93 (6.68, 9.17)	3.21 (2.25, 4.17)	3.18 (2.22, 4.14)	2.46 (1.48, 3.44)
2018	16.57 (15.53, 17.62)	16.22 (15.13, 17.31)	13.32 (12.04, 14.60)	8.65 (7.67, 9.62)	8.59 (7.61, 9.57)	7.82 (6.78, 8.86)
IDHS-HV						
Within-effect	-	**-0.20 (-0.38, -0.03)**	**-0.28 (-0.45, -0.11)**	-	-	-
Between-effect	-	**0.44 (0.02, 0.87)**	0.21 (-0.04, 0.46)	-	-	-
MIECHV						
Within-effect	-	-	-	-	0.14 (-0.16, 0.44)	0.18 (-0.09, 0.46)
Between-effect	-	-	-	-	**5.23 (0.42, 10.04)**	2.24 (-0.41, 4.88)
% relative poverty			0.86 (0.74, 0.98)			0.87 (0.69, 1.05)
Median house value			-0.06 (-0.20, 0.08)			-0.37 (-0.56, -0.18)
% vacant housing			0.76 (0.59, 0.92)			0.84 (0.57, 1.11)
% Black children			0.22 (0.15, 0.30)			0.21 (0.12, 0.31)
% Latino children			0.12 (0.04, 0.19)			0.16 (0.06, 0.26)
% foreign-born			-0.07 (-0.23, 0.09)			-0.30 (-0.51, -0.09)
% children			-1.35 (-1.57, -1.13)			-1.03 (-1.36, -0.70)
% elderly			-0.83 (-1.09, -0.57)			-0.84 (-1.20, -0.48)
% male adults			0.02 (-0.19, 0.23)			-0.15 (-0.46, 0.16)
% with disability			1.19 (0.92, 1.45)			1.91 (1.49, 2.33)

		Coefficient (95% confidence interval)				
	IDHS-HV models (N = 3,824 zip code-year observations from 2011 to 2018)			MIECHV models (N = 1,896 zip code-year observations from 2015 to 2018)		
Fixed effects	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
% moved	-	-	−0.03 (−0.16, 0.10)	-	-	0.02 (−0.20, 0.24)
Urbanicity						
Large urban	-	-	reference	-	-	reference
Small urban	-	-	5.65 (−2.96, 14.27)	-	-	10.04 (2.07, 18.00)
Rural	-	-	9.60 (1.03, 18.17)	-	-	12.02 (4.12, 19.92)
Model fit: AIC	28865.1	28859.8	28205.1	14862.1	14860.5	14278.9

Note. IDHS-HV = Illinois Department of Human Services Home Visiting programs. MIECHV = Maternal, Infant, and Early Childhood Home Visiting programs. Significant coefficients of home visiting variables (p < .05) are in boldface.

Table 4.

Spatial Linear Models of Child Maltreatment Report Rates by Age, Sex, and Type, Illinois Zip Codes.

	Coefficient (95% confidence interval)					
	IDHS-HV models (N = 3,824 zip code-year observations from 2011 to 2018)			**MIECHV models** (N = 1,896 zip code-year observations from 2015 to 2018)		
Age-specific CMR	Age 0–5 CMR rate	Age 6–11 CMR rate	Age 12–17 CMR rate	Age 0–5 CMR rate	Age 6–11 CMR rate	Age 12–17 CMR rate
IDHS-HV						
Within-effect	**-0.52 (-0.82, -0.22)**	**-0.31 (-0.55, -0.06)**	-0.18 (-0.39, 0.02)	-	-	-
Between-effect	0.22 (-0.11, 0.55)	**0.31 (0.06, 0.56)**	0.08 (-0.13, 0.28)	-	-	-
MIECHV						
Within-effect	-	-	-	**0.77 (0.33, 1.22)**	0.13 (-0.25, 0.51)	0.09 (-0.23, 0.41)
Between-effect	-	-	-	2.59 (-1.26, 6.43)	2.07 (-0.64, 4.78)	1.61 (-0.65, 3.87)
Sex-specific CMR	Male CMR rate	Female CMR rate		Male CMR rate	Female CMR rate	
IDHS-HV						
Within-effect	**-0.25 (-0.45, -0.05)**	**-0.29 (-0.49, -0.08)**		-	-	
Between-effect	**0.25 (0.01, 0.48)**	0.17 (-0.10, 0.44)		-	-	
MIECHV						
Within-effect	-	-		**0.32 (0.00, 0.63)**	0.14 (-0.18, 0.46)	
Between-effect	-	-		2.31 (-0.39, 5.01)	2.01 (-0.75, 4.78)	
Type-specific CMR	Neglect rate	Physical abuse rate	Sexual abuse rate	Neglect rate	Physical abuse rate	Sexual abuse rate
IDHS-HV						
Within-effect	**-0.13 (-0.24, -0.02)**	-	0.01 (-0.04, 0.06)	-	-	-
Between-effect	0.09 (-0.05, 0.24)	-	0.03 (-0.00, 0.07)	-	-	-
MIECHV						
Within-effect	-	-	-	**0.26 (0.09, 0.44)**	**0.10 (0.02, 0.18)**	-0.01 (-0.08, 0.06)
Between-effect	-	-	-	1.29 (-0.32, 2.89)	0.44 (-0.12, 1.00)	0.25 (-0.15, 0.64)

Note. CMR = child maltreatment report. IDHS-HV = Illinois Department of Human Services Home Visiting programs. MIECHV = Maternal, Infant, and Early Childhood Home Visiting programs. All models were estimated separately for each subgroup-specific outcome variable (e.g., age 0–5 CMR rate). All models controlled for year fixed effects, % households in relative poverty, median owner-occupied house value, % vacant housing units, % Black children among resident children, % Latino children among resident children, % foreign-born persons among residents, % children among residents, % elderly persons (aged 65 years and older) among residents, % male among adult residents aged 20–64 years, % children with disabilities among resident children, % moved in one year among residents, and urbanicity. Significant coefficients (p < .05) are in boldface.