Using time-to-event analysis to identify preconception and prenatal predictors of child protective services contact

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ABSTRACT

We examined preconception and prenatal predictors of time to first child protective services (CPS) contact among Alaska children. Data were from the Alaska Longitudinal Child Abuse and Neglect Linkage (ALCANLink) project, a population-representative data source linking 2009–2011 Alaska Pregnancy Risk Assessment Monitoring System (PRAMS) data with administrative data sources through 2015. We examined the incidence CPS contact using the Kaplan-Meier method and predictors of CPS contact using Cox proportional hazards regression. Using data from the Alaska Permanent Fund Dividend and Child Death Review, we censored children who emigrated out-of-state or died during the study period. Significant predictors included low socioeconomic status (HR = 2.23, 95% CI 1.68, 2.96), maternal smoking during pregnancy (HR = 1.87, 95% CI 1.55, 2.24), unmarried maternal marital status (HR = 1.62, 95% CI 1.31, 1.99), urban residence (HR = 1.59, 95% CI 1.32, 1.92), lower maternal education (HR = 1.54, 95% CI 1.24, 1.92), maternal experience of intimate partner violence in the 12 months before childbirth(HR = 1.32, 95% CI 1.01, 1.74), Alaska Native/American Indian race (HR = 1.40, 95% CI 1.15, 1.71), a greater number of living children (HR = 1.20, 95% CI 1.13, 1.29), a greater number of stressful life eventsin the 12 months before childbirth (HR = 1.16, 95% CI 1.11, 1.21), and younger maternal age at childbirth (HR = 0.95, 95% CI 0.93, 0.97). Use of multiple linked data sources and time-to-event analysis methods adds to the growing literature regarding predictors of CPS contact. Results suggest that assessing for and addressing clinical, social, and environmental indicators during the prenatal period may aid prevention efforts in mitigating family need for involvement with CPS.

1. Introduction

Child maltreatment is an important public health issue in the United States given its prevalence and association with adverse health outcomes across the life course (Anda et al., 2006; Fergusson, Boden, & Horwood, 2008; Gilbert et al., 2009; Hussey, Chang, & Kotch, 2006). In 2015, child protective service (CPS) agencies in the U.S. received an estimated 4 million referrals, including approximately 7.2 million children, for alleged maltreatment (U.S. Department of Health & Human Services, 2017). Previous research suggests that it is possible to identify factors shortly before or during pregnancy that increase the likelihood of a child's future contact

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with CPS (Afifi, Boman, Fleisher, & Sareen, 2009; Coohey, Johnson, Renner, & Easton, 2013; Dong et al., 2004; Eastman, Mitchell, & Putnam-Hornstein, 2016; McGuigan & Pratt, 2001; Parrish, Young, Perham-Hester, & Gessner, 2011; Parrish, Lanier, Newby-Kew, Arvidson, & Shanahan, 2015; Putnam-Hornstein & Needell, 2011; Putnam-Hornstein, Needell, King, & Johnson-Motoyama, 2013; Stith et al., 2009; Thompson et al., 2013; Van Horne et al., 2015; Wu et al., 2004). From a public health perspective, CPS contact (i.e., any report of alleged maltreatment regardless of screening or outcome determination) may represent a proxy for potential or experienced harm to the child with results from previous studies suggesting that CPS contact functions as an independent marker of child risk and vulnerability (Putnam-Hornstein, 2011; Putnam-Hornstein, Schneiderman, Cleves, Magruder, & Krous, 2014; Putnam-Hornstein, Simon, Eastman, & Magruder, 2015). Thus, early identification of families at risk for CPS contact can aid primary prevention efforts in the development of targeted intervention strategies to prevent potential child harm and the need for involvement with CPS. Focusing on preconception and prenatal predictors of CPS contact can aid prevention efforts as the prenatal period represents a time of frequent interaction with the health care and other service systems. As such, this period offers multiple opportunities for professionals to assess for and address social, environmental, and clinical factors that may be associated with later need for CPS involvement.

1.1. Preconception and prenatal predictors

Previously identified preconception or prenatal predictors of CPS contact include pregnancy intendedness (Parrish et al., 2011; Thompson et al., 2013); timing of prenatal care (Eastman et al., 2016; Putnam-Hornstein & Needell, 2011; Putnam-Hornstein et al., 2013; Wu et al., 2004); maternal cigarette (Parrish et al., 2011; Stith et al., 2009; Thompson et al., 2013; Wu et al., 2004), alcohol (Parrish et al., 2011; Stith et al., 2009; Thompson et al., 2013; Wu et al., 2004), or drug use during pregnancy (Parrish et al., 2011); poverty (Stith et al., 2009); maternal age (Putnam-Hornstein & Needell, 2011; Putnam-Hornstein et al., 2013; Stith et al., 2009; Thompson et al., 2013; Wu et al., 2004), education (Parrish et al., 2011; Putnam-Hornstein & Needell, 2011; Putnam-Hornstein et al., 2013; Stith et al., 2009; Thompson et al., 2013; Wu et al., 2004), marital status (Parrish et al., 2011; Thompson et al., 2013; Van Horne et al., 2015), Medicaid status (Putnam-Hornstein & Needell, 2011; Putnam-Hornstein et al., 2013; Van Horne et al., 2015; Wu et al., 2004), history of pregnancy terminations (Putnam-Hornstein & Needell, 2011; Putnam-Hornstein et al., 2013), parity (Putnam-Hornstein & Needell, 2011; Van Horne et al., 2015), and experience of intimate partner violence or stressful life events during pregnancy (Afifi et al., 2009; Coohey et al., 2013; Dong et al., 2004; McGuigan & Pratt, 2001; Parrish et al., 2011, 2015; Stith et al., 2009; Thompson et al., 2013); and infant sex (Van Horne et al., 2015), birthweight (Putnam-Hornstein et al., 2013; Putnam-Hornstein & Needell, 2011; Van Horne et al., 2015; Wu et al., 2004), and birth defects (Putnam-Hornstein & Needell, 2011; Putnam-Hornstein et al., 2013). These predictors have been largely identified through linkage of administrative data sources, such as statewide CPS and birth records. Importantly, previous studies demonstrate that specific sub-populations, such as children of mothers of minority race/ethnicity or with lower education, tend to have disproportionate contact with CPS (e.g., Parrish et al., 2011; Putnam-Hornstein et al., 2013).

1.2. Time-to-event analysis

To date, the majority of the existing research regarding preconception and prenatal predictors of CPS contact has identified significant predictors using logistic regression, with some using generalized linear regression. Under these methods, CPS contact is treated as a binary outcome indicating whether or not CPS contact occurred within a specified timeframe of birth. Notably, these methods do not account for the timing of CPS contact. To the best of our knowledge, no research has examined potential preconception and prenatal predictors of CPS contact accounting for time from the child's birth to the first contact (i.e., child age at first contact). This can be accomplished using time-to-event analysis. Time-to-event analysis has been used widely in other areas of child abuse and neglect research, primarily to examine factors associated with time to recurrence of maltreatment following an initial contact with CPS (Dubowitz et al., 2011; Fluke, Shusterman, Hollinshead, & Yuan, 2008; Fuller & Nieto, 2009; Lipien & Forthofer, 2004; Putnam-Hornstein et al., 2015; Thompson & Wiley, 2009). In contrast to logistic regression, time-to-event analysis uses information regarding both the occurrence and timing of an event. By accounting for the timing of the event, time-to-event analysis utilizes more of the statistical information available and has increased power to detect significant associations (Green & Symons, 1983).

In addition to accounting for the timing of an event, time-to-event analysis can also account for differing lengths of "at risk" time among individuals. This is accomplished by censoring, or removing from the analysis, individuals when they are no longer at risk for the event of interest (George, Seals, & Aban, 2014; Rothman, Greenland, & Lash, 2008). Death and out-of-state emigration are two events that would cause a child to no longer be at risk for CPS contact in a particular state. In time-to-event analysis, children who die or emigrate out-of-state during the study period are included in the analysis up until the date of death or emigration and are then censored at this date. In contrast, under logistic regression, children who die or emigrate out-of-state during the study period are assumed to remain in the cohort event free (i.e., no CPS contact) until the end of the study period. This assumption can attenuate estimates and mask potentially significant associations (Parrish et al., 2017). Moreover, failing to account for censoring due to out-of-state emigration can bias comparisons of specific sub-populations (i.e., married vs. non-married mothers) as some sub-populations are more likely to move out-of-state than others (Parrish et al., 2017).