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# Can center-based childcare reduce the odds of early chronic absenteeism?

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ABSTRACT

This study was the first to position itself in the intersection on research on center-based care and on chronic absenteeism. Given the growth in the utilization of center-based care and given the recent vocalized policy concerns of the detrimental effects of chronic absenteeism in early school years, this study inquired as to whether attending center-based care predicted differential odds of early absence patterns. Using a newly-released national large-scale study of children (the Early Childhood Longitudinal Study – Kindergarten Class of 2010–2011), the findings indicated that children who attended center-based care in prekindergarten had lower odds of being chronically absent in kindergarten. The conclusions were consistent even after employing multiple methodological approaches (fixed effects, propensity score matching) as well as exploring multiple definitions of chronic absenteeism, though were not differentiated by socioeconomic status. Additional noteworthy findings are discussed, including the significance of children's internalizing symptoms and parental mental health.



## Introduction

When considering the short-term effects of attending center-based childcare, research has predominantly focused on achievement and socioemotional outcomes (Claessens, 2012; Crosnoe, 2007; Loeb, Bridges, Bassok, Fuller, & Rumberger, 2007; Magnuson, Rhum, & Waldfogel, 2007; Turney & Kao, 2009). Research generally supports that attending center-based care boosts achievement (Burger, 2010; Loeb et al., 2007; Loeb, Fuller, Kagan, & Carrol, 2004; National Institute of Child Health and Human Development [NICHD], 2006). Research mostly links attending center-based care to null or lower socioemotional development and null or higher behavioral issues (Baker, Gruber, & Milligan, 2008; Belsky et al., 2007; Herbst & Tekin, 2010; Loeb et al., 2007; Magnuson et al., 2007; NICHD, 2006; Yamauchi & Leigh, 2011).

Early academic and socioemotional outcomes are certainly critical to examine, particularly as they signal school readiness. However, in the discourse surrounding the influence of attending center-based childcare, research has not considered how going to center-based care may be linked to early patterns of chronic absenteeism. Although no absolute definition exists, chronic absenteeism is defined here as missing at minimum two or more weeks of school for any reason in a given year (Balfanz & Byrnes, 2012; Gottfried, 2014).

This gap in examining school absences as outcomes is critical to address: The short- and long-term negative consequences associated with excessive school absences cannot be overstated, including lower achievement, increased behavioral issues, lower social development, greater chances of grade retention, higher odds of school dropout, increased risk of the use of drugs and alcohol in young adulthood and adulthood, and lower employment prospects (Alexander, Entwisle, & Horsey 1997; Broadhurst, Patron, & May-Chahal, 2005; Chen & Stevenson, 1995; Connell, Spencer, & Aber, 1994; Ekstrom, Goertz, Pollack, & Rock, 1986; Finn, 1993; Gottfried, 2009, 2010, 2014; Hallfors et al., 2002; Kane, 2006; Morrissey, Hutchison, & Winsler, 2014; Newmann, 1981). It is estimated that somewhere between 10% and 15% of young school-aged children are chronically absent and thus susceptible to these negative consequences (Balfanz & Byrnes, 2012; Romero & Lee, 2007). This estimate is larger for students of lower socioeconomic status (SES) (Ready, 2010), thereby exacerbating these risks.

In elementary school, chronic absenteeism is highest in kindergarten (Balfanz & Byrnes, 2012; Romero & Lee, 2007). The notion of 'chronic' absenteeism is fairly nascent in both policy and research, and therefore most research in early school absences have not considered the effects of chronic absenteeism per se (as opposed to greater/fewer school absences) (Gottfried, 2014). The few research studies in the area of early chronic absenteeism found negative effects. Chang and Romero (2008) linked chronic

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absenteeism in kindergarten to lower first grade academic performance. Connolly and Olson (2012) linked chronic absenteeism in kindergarten to lower achievement, grade retention, and future chronic absenteeism. Gottfried (2014) linked chronic absenteeism in kindergarten to lower academic and socioemotional development.

Given that negative consequences of chronic absenteeism emerge in kindergarten, research has attempted to identify the drivers of school absences. Most research has focused on individual- and family-level factors. At the individual level, significant factors include educational disengagement or alienation from school (Harte, 1994; Reid, 1983). Family factors include family structure, father's occupation, mother's work status, household size, parental involvement, mother's age, mother's depression and socioeconomic status (SES) (Catsambis & Beveridge, 2001; Claessens, Engel, & Curran, in press; Fan & Chen, 2001; Jeynes, 2003; McNeal, 1999; Muller, 1993; Ready, 2010; Reid, 1983;Romero & Lee, 2007; Sampson & Laub, 1994). Little work has been conducted outside of identifying individual and family factors.

A significant lapse in the research on both the effects on center-based care and the drivers of chronic absenteeism is the intersection between the two. On the one side, the research on the effects of center-based care has generally remained limited to achievement and socioemotional development. Other critical early indictors of early school success or risk of failure, such as absenteeism, have largely been ignored. On the other side, research into the drivers of chronic absenteeism have generally been limited to studying individual and family factors. In fact, altogether little is known about what programs and practices in early childhood might influence early chronic absenteeism. Additional research on the drivers of absenteeism beyond these factors will develop a more robust agenda around how to reduce this negative behavior at the onset of school entry, when the frequency of this behavior is highest.

### *Center-based care and early chronic absenteeism*

Aside from one descriptive study linking attending prekindergarten care to lower rates of chronic absenteeism in kindergarten (Connolly & Olson, 2012), no large-scale study exists in the overlap of childcare and chronic absenteeism. Given the positive link between center-based care and early achievement, it is reasonable to expect that center-based care is linked to lower chronic absenteeism. There are four potential ways by which center-based care might be linked to lower chronic absenteeism in kindergarten: child transitions, family logistics, health, and timing.

#### *Child transitions*

Childhood is filled with ecological transitions that require adaptation to new environments (Bronfenbrenner, 1979), and school entry represents a significant ecological transition in early childhood (Ladd & Price, 1987). Kindergarten entry requires children to face many new demands including academic challenges, adaptation to institutional expectations, and socialization (Bensen, Haycraft, Steyaert, & Weigel, 1979; Bogart, Jones, & Jason, 1980; Holland, Kaplan, & Davis, 1974). Unsuccessful transition into kindergarten correlates with children feeling less secure about their environments and increased stress, thereby leading to school avoidance and negative feelings about school (Ladd & Price, 1987). These negative feelings materialize as absences (Ekstrom et al., 1986; Newmann, 1981) through refusal to attend school or pretending to be sick (Giallo, Treyvaud, Matthews, & Kienhuis, 2010).

Children who attend formal preschool often have better mastery of this transition into kindergarten (Ladd & Price, 1987). No single explanation exists. However, one reason may be that center-based care provides a structured learning environment that mirrors what school will be like. Children are formally assigned to a classroom, taught by a specific set of teachers, and have regulated schedules with established times for instructional activities. In contrast, children who are cared for in informal settings may not gain the same experience of participating in a formal school-like schedule (Claessens, 2012). Second, children in center-based care get an early start on adapting to long periods of parental separation (Ladd & Price, 1987). Third, center-based instructors are often more academically qualified than guardians in informal care alternatives such as relatives in home-like settings (Barnett, Carolan, Fitzgerald, & Squires, 2011). Therefore, in formal care, children have greater exposure to adults who more closely mirror school teachers in classrooms. Fourth, children in center-based care are often in environments with many peers, and this provides them with early opportunities to socialize, understand individual differences, and adapt to group behavior. Finally, attending center-based care provides children with an early opportunity to adapt to a routine of regularly leaving the home (Ladd & Price, 1987).

It is thus theorized that going to center-based care in prekindergarten facilitates the transition into kindergarten, either by providing children with an early school-like routine or with additional opportunities to adapt to interacting with adults who are similar in characteristics to schoolteachers and to interacting with other children in a classroom setting. Hence, when entering kindergarten, they have fewer adjustment demands and are more equipped to cope with new environments. This may actualize as having positive feelings about school and less anxiety about attending school; feelings such as these are linked to lower odds of being absent.

This framing of transitions fits into the larger literature on preparatory socialization. As described by Germain and Bloom (1999), preparatory socialization exists when spending time in one setting allows the individual to learn the processes and roles required in a future setting. Early in education, this entails learning how school demands differs from those at home, which, as described above, might facilitate children learning how to develop a school-going routine or how to interact with teachers and peers in a classroom-like setting. In young adulthood, this may surface as preparing for the requirements of the working world (Golde, 1998). The concept of transitions from setting-to-setting certainly has implications beyond this study to the extent which experiences in one environment leads to successful functioning in a future environment.

#### *Family logistics*

Going to center-based care may also influence parents' behavior as it relates to chronic absenteeism in kindergarten. First, a direct-effects hypothesis suggests that parents are also adjusting to the routine of sending their children to a formal non-home setting. Thus, center-based care may be putting both children and their families in the mindset of regularly attending school, even before starting formal schooling (Ehrlich et al., 2014). Through the actions of sending their children to center-based care, parents have an extra year to adapt to school-going logistics, such as determining transportation options, shifting work schedules, instituting early-morning wake up, preparing/packing children's breakfasts and lunches, buying appropriate school attire – all of which are significant factors of good attendance once in school (Chang & Romero, 2008). Moreover, this extra year of school-going practice may be particularly crucial for working parents, who may not have the capacity to accommodate absenteeism.

Second, there may be an indirect mechanism. Once kindergarten begins, parents may hold more positive feelings and attitudes about their child's transition to kindergarten due to the previous period of adjustment to a school-like setting via center-based care (Margetts, 2000). Hence, not only is it possible that attending center-based

care increases the efficiency by which parents determine the logistics of sending their children to formal schooling, but this efficiency also reduces parents' stress and anxiety and increases parents' positive feelings about the transition to kindergarten, which in turn, increases their children's positive feelings about the transition to kindergarten (Giallo et al., 2010). Positive feelings about school-going by parents or children, as mentioned earlier, are inversely related to school absenteeism.

*Health*

There are also potential unique health benefits of attending center-based care. First, programs such as Head Start are designed to increase children's health through immunizations and health screenings (U.S. Department of Health and Human Services, 2010; Yoshikawa et al., 2013). An increase in child health established prior to kindergarten might reduce the odds of absenteeism once in kindergarten, as increased absenteeism has been shown to be highly correlated with impaired health (Ready, 2010). Second, because children in center-based care are surrounded by many children simultaneously, it is possible that children are exposed to illnesses, like chicken pox, and develop immunities before starting school (Ehrlich et al., 2014). This can work out in the favor of reducing absenteeism once in kindergarten.

*Timing*

The first three conceptualizations of the role of center-based care on reducing chronic absenteeism focus on the role of center-based care in the year prior to kindergarten. Therefore, the first research question is put forth as follows:

RQ1: Does attending center-based care in prekindergarten reduce the odds of chronic absenteeism in kindergarten?

However, attending center-based care before/after school during the kindergarten school year might also reduce chronic absenteeism. Children can also adapt to the demands of schooling once they are participating in school – they do not learn to transition solely based on the skills acquired prior to entry (Bodrova & Leong, 2005). Given this, the overall experience of participating in kindergarten combined with center-based care before/after kindergarten hours may help to solidify transitions skills. For instance, being in center-based care before/after kindergarten hours year may reinforce the routine of attending a structured school-like environment all day. This may continue to facilitate children's preparation and practice of going to school, hence building positive attitudes toward school and hence lowering odds of chronic absenteeism. Or, the routine of going to center-based care before/after kindergarten hours may reinforce parental routines for their child's school attendance. If parents are responsible for making arrangements for both going to kindergarten and center-based care before/after the school day, then center-based care during this year may be reinforcing the logistics of attending school, which may be especially critical for working parents. Also, center-based care before/after kindergarten hours might provide other opportunities for children to interact with teachers and children, hence providing additional reinforcement to make sense of and adapt to the ecology of school-like settings (Bodrova & Leong, 2005), thereby increasing positive school attitudes and reducing negative feelings – all of which are linked to lower chronic absenteeism (Ekstrom et al., 1986; Gottfried, 2009; Newmann, 1981). A second research question is put forth as follows:

RQ2. Does the timing of attending center-based care (prekindergarten, before/after school during kindergarten, or both) reduce the odds of chronic absenteeism in kindergarten?

*Family moderating factors*

Prior research has found that students with greater absences in kindergarten are from lower-SES families (Nauer, Mader, Robinson, & Jacobs, 2014; Ready, 2010). For instance, Applied Survey Research (2011) found that no other child characteristic provided statistically-significant differences in absence patterns besides SES. Chang and Romero (2008) found that once family SES was taken into account, racial differences were no longer significant. It appears, then, that one major determinant of early chronic absenteeism is low SES.

Children from low-SES families have been shown to benefit from center-based care, academically and developmentally (Barnett, 1995; Burchinal, Campbell, Bryant, Wasik, & Ramey, 1997; Loeb et al., 2004). A key empirical issue, however, is that children from low-SES families are much less likely to utilize childcare (Meyers & Jordan, 2006). In addition, families selecting not to utilize childcare are characterized by lower maternal education, single-parent households, non-English home language, higher mobility, and maternal depression (Bainbridge, Meyers, Tanaka, & Waldfogel, 2005; Crosnoe, 2007; Fuller, Eggers-Piérola, Holloway, Liang, & Rambaud, 1996; Greenberg, 2011; Hebra et al., 2013; Hirshberg, Huang, & Fuller, 2005; Wolfe & Scrivner, 2004). In fact, Johnson, Martin, and Brooks-Gunn (2011) found that low-SES families with childcare subsidies were relatively more advantaged (on the characteristics mentioned above) than non-recipient eligible low-SES families. Therefore, one concern is that family selection bias drove the observed positive associations between center-based care and child outcomes: Families with the lowest levels of resources, motivation, or knowledge to send their children to center-based care are also the least likely to be making educational and developmental advances. As an example, children with less depressed mothers are more likely to attend center-based childcare (Hebra et al., 2013). Therefore, the association between childcare and child outcomes for low-SES children may not be solely attributed to the childcare itself.

These similar family selection issues might also be obscuring the link between center-based care and early school absenteeism. For instance, families who are sufficiently organized to enroll their child in prekindergarten as well as to develop the logistics to ensure their children attend on a regular basis (and are hence less likely to drop out of programs such as Head Start) are the same families who are more likely to ensure that their children perform better once in kindergarten, including having stronger school attendance. While maintaining school-going routines might be the most valuable especially for low-SES families particularly given high rates of mobility and maternal depression, it might be these families who are least likely to be exposed to these logistics-building opportunities. Hence, the relationship between center-based care and attendance might be capturing a specific sample of families who have selected into center-based care as well as who have ensured their children remain in the program. Accounting for family selection issues, as they pertain to SES and other high-risk family attributes, is critical in this evaluation and is addressed below. As critical is addressing whether there are differences in any observed relationship between center-based care and absenteeism, but doing so by SES.

Even after addressing selection, there are still several reasons to hypothesize that the above 4-pronged conceptualization (transitions, logistics, health, timing) would be especially important for children in low-SES families. First, research suggests that low-SES parents do not have the resources readily available to address the going-to-school logistics required for kindergarten, such as having access to reliable transportation (Chang & Romero, 2008). Hence, center-based care during prekindergarten might induce these parents to address these demands and adjust to school-going routines. Second, given that children in low-SES households face greater

health issues (Hughes & Ng, 2003; Romero & Lee, 2007), center-based care attendance in prekindergarten may provide health benefits, such as immunization, that would in turn reduce absences once in school. Finally, low-SES parents may not have developed the skills or knowledge to help support their children in formal schooling (Chang & Romero, 2008). Additionally, parents in low-SES families might have had negative schooling experiences (Chang & Romero, 2008). Therefore, center-based care might be especially critical to develop and reinforce positive attitudes about formal schooling (and hence reducing chronic absenteeism), as they might not be exposed to this type of environment at home (Ready, 2010).

Given these potential benefits, the final research question asks:

RQ3. Do the relationships differ by socioeconomic status?

Kindergarten is an extremely critical period that sets the foundation for future success (Duncan et al., 2007; Olson, Sameroff, Kerr, Lopez, & Wellman, 2005; Posner & Rothbart, 2000). Therefore, knowing what early childhood experiences reduce chronic absenteeism would help to set children on a strong trajectory. Given the lack of knowledge of the role of center-based care on chronic absenteeism and of early programs and policies that reduce this negative behavior, this study contributed to the research through these unexplored research questions.

The utilization of center-based care is increasing in the U.S. (Blau & Currie, 2004; Claessens, 2012; Smith, Kleiner, Parsad, Farris, & Green, 2003; Yamauchi & Leigh, 2011). Therefore, this study addresses how to improve outcomes for an increasing number of children taking part in these early childhood programs. By informing stakeholders invested in the efficacy of center-based programs alongside stakeholders invested in the reduction of chronic absenteeism, the unification of both areas will help formulate new policy discussions around understudied but potentially influential factors of early childhood success.

## Method

### *Participants*

Data in this study were sourced from the Early Childhood Longitudinal Study – Kindergarten Class of 2011 (ECLS-K:2011), which represents the most contemporary national-level data available to evaluate the research questions in this study. This dataset was developed by the National Center for Education Statistics (NCES). The collection process included a large-scale survey design and assessment data collection of children and their families and schools. Children were in kindergarten in 2010–2011, the first year of data collection. The ECLS-K:2011 used a three-stage stratified sampling strategy, in which geographic region represented the first sampling unit, public and private school represented the second sampling unit, and students stratified by race/ethnicity represented the third sampling unit. Hence, observations in the dataset are from a diversity of school types, socioeconomic levels, racial, and ethnic backgrounds. At the time of this study, the fall and spring survey waves from 2010 to 2011 were available.

To account for the loss of information, chained multiple imputation was employed (Royston, 2004). Consistent with Claessens et al. (in press), missing values were imputed back to the sample for which there were nonzero weights. Ten datasets were imputed, in which measures were replaced with a random sample of plausible values (Schafer, 1997). These ten sets of plausible values were imputed to resemble the distributions of the observed variables. Outcome model results were aggregated across the imputed datasets (Schafer & Graham, 2002). Sample weights provided by NCES for the ECLS-K dataset were employed in both the imputation and in the analysis. After imputation, this sample consisted of approximately $n = 14{,}060$ child observations. Sample sizes are rounded to the nearest tens digit, per NCES rules.

### *Outcomes*

Table 1 presents all measures utilized in this study broken out by the four different care scenarios. The key measure was binary, indicating if a student was chronically absent in kindergarten. Absence information was only available from child's teacher survey: in the spring survey wave, a child's teacher was asked to report the number of absences that a child had in that year. Each teacher selected from a discrete set of choices: 0, 1–4, 5–7, 8–10, 11–19, and 20 or more. Some consider chronic absenteeism as beginning after missing a cumulative two weeks of school (Gottfried, 2014) while others indicate that chronic absenteeism occurs after missing more than 18 days of school (Balfanz & Byrnes, 2012). To be the most inclusive of these definitions, the primary chronic absenteeism measure equaled 1 if a student had missed more than two weeks of school (i.e., 11 or more days) and 0 otherwise.

Because no one definition of chronic absenteeism exists, two subsequent outcomes were explored, as derived from a taxonomy of absenteeism in Gottfried (2014). First, "moderate" chronic absenteeism was 11–19 absences, and 20 or more absences was classified as "strong". Approximately 12% of the sample was chronicly absent (broken into 9% as moderate and 3% as strong). This overall percentage conformed to prior national estimates (Balfanz & Byrnes, 2012).

### *Center-based care*

Based on the fall parent survey, a child attended center-based care if his or her parents indicated that he or she went to center-based care during the prekindergarten and/or kindergarten years (asked as separate questions in the survey). Prekindergarten center-based care also included Head Start as consistent with prior research using ECLS-K data (Crosnoe, 2007). As for center-based care before/after school during the kindergarten year, note that the questions were phrased to address care that a child was receiving in addition to attending kindergarten. Therefore, even if children were in center-based private kindergarten, the survey questions distinguished between this and other center-based care outside of kindergarten hours.

Three binary indicators were created. The first was whether a child attended center-based care in prekindergarten. The second was whether a child attended center-based care before/after school during the kindergarten school year. The third was whether a child attended center-based care during both prekindergarten and kindergarten years. Almost 70% of the sample attended center-based care in prekindergarten, as consistent with prior research using other national samples of child data (Loeb et al., 2007). Almost 20 percent of children attended center-based care outside of kindergarten during the kindergarten school year, as consistent with prior research (Claessens, 2012). Finally, 15% of the sample had attended care in both years.

### *Other measures*

#### *Entry skills*

Three sets of school entry skills were utilized, assessed at the start kindergarten. First a child's item response theory-scaled scores on math and reading assessments were included. Second were five socioemotional scales, which were utilized in prior research using ECLS-K (e.g., Claessens, 2012). The scales were derived from the teacher's assessment of child behavior. Based on the *Social Skills Rating System* ('SSRS'; Gresham & Elliott, 1990), NCES modified these scales and created its own *Teacher Social*

**Table 1**
Descriptive statistics ($N = 14{,}060$).

| | Center PK only | | Center in K only | | Center PK & Center in K | | Neither | |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Chronic absenteeism | 0.12 | *(0.33)* | 0.11 | *(0.32)* | 0.08 | *(0.26)* | 0.17 | *(0.38)* |
| Moderate | 0.10 | *(0.29)* | 0.07 | *(0.27)* | 0.06 | *(0.23)* | 0.13 | *(0.33)* |
| Strong | 0.03 | *(0.17)* | 0.05 | *(0.20)* | 0.02 | *(0.13)* | 0.05 | *(0.21)* |
| *Skills at kindergarten entry* | | | | | | | | |
| Reading | 36.07 | *(11.78)* | 32.97 | *(12.25)* | 37.45 | *(11.54)* | 31.96 | *(11.68)* |
| Math | 30.44 | *(10.74)* | 27.65 | *(10.60)* | 31.94 | *(10.53)* | 26.69 | *(10.57)* |
| Self-control | 3.12 | *(0.62)* | 2.98 | *(0.62)* | 3.00 | *(0.64)* | 3.08 | *(0.63)* |
| Interpersonal skills | 3.02 | *(0.63)* | 2.90 | *(0.62)* | 2.94 | *(0.62)* | 2.97 | *(0.65)* |
| Approaches to learning | 3.00 | *(0.67)* | 2.84 | *(0.65)* | 2.92 | *(0.67)* | 2.90 | *(0.69)* |
| Internalizing problem behaviors | 1.44 | *(0.47)* | 1.49 | *(0.54)* | 1.45 | *(0.48)* | 1.48 | *(0.51)* |
| Externalizing problem behaviors | 1.57 | *(0.61)* | 1.74 | *(0.64)* | 1.72 | *(0.66)* | 1.57 | *(0.61)* |
| Praises school | 0.86 | *(0.36)* | 0.87 | *(0.36)* | 0.83 | *(0.37)* | 0.84 | *(0.37)* |
| Eager to attend school | 0.86 | *(0.35)* | 0.86 | *(0.35)* | 0.82 | *(0.38)* | 0.84 | *(0.36)* |
| *Student characteristics* | | | | | | | | |
| Male | 0.52 | *(0.50)* | 0.52 | *(0.50)* | 0.52 | *(0.50)* | 0.51 | *(0.50)* |
| Black | 0.11 | *(0.31)* | 0.14 | *(0.38)* | 0.17 | *(0.37)* | 0.14 | *(0.34)* |
| Hispanic | 0.20 | *(0.40)* | 0.29 | *(0.44)* | 0.16 | *(0.36)* | 0.32 | *(0.46)* |
| Asian | 0.04 | *(0.26)* | 0.03 | *(0.24)* | 0.04 | *(0.27)* | 0.03 | *(0.23)* |
| Other | 0.05 | *(0.23)* | 0.07 | *(0.23)* | 0.07 | *(0.26)* | 0.06 | *(0.25)* |
| Has disability | 0.22 | *(0.41)* | 0.28 | *(0.43)* | 0.21 | *(0.40)* | 0.19 | *(0.38)* |
| English language learner | 0.11 | *(0.34)* | 0.13 | *(0.35)* | 0.05 | *(0.26)* | 0.21 | *(0.41)* |
| Kindergarten entry age (months) | 66.31 | *(4.59)* | 65.82 | *(4.92)* | 65.80 | *(4.70)* | 66.02 | *(4.78)* |
| Health | 1.58 | *(0.80)* | 1.71 | *(0.83)* | 1.53 | *(0.75)* | 1.65 | *(0.85)* |
| *Household characteristics* | | | | | | | | |
| Parents married | 0.69 | *(0.46)* | 0.50 | *(0.50)* | 0.68 | *(0.47)* | 0.59 | *(0.49)* |
| Number of siblings | 1.52 | *(1.08)* | 1.54 | *(1.25)* | 1.11 | *(0.91)* | 1.65 | *(1.25)* |
| Age of mother at first birth | 24.45 | *(5.75)* | 22.36 | *(5.47)* | 25.87 | *(6.20)* | 22.52 | *(5.23)* |
| Number of children's books at home | 95.61 | *(145.88)* | 77.23 | *(146.43)* | 96.02 | *(143.63)* | 68.71 | *(90.80)* |
| Distance from school | 5.01 | *(4.25)* | 5.15 | *(6.32)* | 5.20 | *(3.45)* | 4.99 | *(4.69)* |
| Number of places child has lived | 1.99 | *(1.20)* | 2.36 | *(1.41)* | 2.02 | *(1.20)* | 2.11 | *(1.25)* |
| Mother reported depression | 0.19 | *(0.39)* | 0.26 | *(0.44)* | 0.20 | *(0.39)* | 0.24 | *(0.42)* |
| Learning activities | 2.99 | *(0.45)* | 2.88 | *(0.48)* | 2.95 | *(0.43)* | 2.94 | *(0.50)* |
| Parental involvement | 3.65 | *(2.55)* | 2.89 | *(2.41)* | 3.78 | *(2.58)* | 2.82 | *(2.41)* |
| Mother's education | | | | | | | | |
| Less than high school | 0.10 | *(0.30)* | 0.18 | *(0.38)* | 0.04 | *(0.20)* | 0.21 | *(0.41)* |
| High school diploma or GED | 0.20 | *(0.40)* | 0.30 | *(0.45)* | 0.15 | *(0.35)* | 0.28 | *(0.45)* |
| Some college | 0.34 | *(0.47)* | 0.34 | *(0.48)* | 0.33 | *(0.47)* | 0.33 | *(0.47)* |
| College graduate or beyond | 0.36 | *(0.48)* | 0.18 | *(0.40)* | 0.48 | *(0.50)* | 0.19 | *(0.40)* |
| Father's education | | | | | | | | |
| Less than high school | 0.12 | *(0.31)* | 0.18 | *(0.39)* | 0.07 | *(0.22)* | 0.22 | *(0.40)* |
| High school diploma or GED | 0.27 | *(0.43)* | 0.34 | *(0.47)* | 0.24 | *(0.41)* | 0.33 | *(0.47)* |
| Some college | 0.28 | *(0.44)* | 0.32 | *(0.46)* | 0.28 | *(0.44)* | 0.27 | *(0.44)* |
| College graduate or beyond | 0.33 | *(0.49)* | 0.16 | *(0.38)* | 0.41 | *(0.50)* | 0.18 | *(0.41)* |
| Household income | 68,130.36 | *(54,556.58)* | 51,687.44 | *(50,066.03)* | 81,997.89 | *(59,222.46)* | 48,177.77 | *(45,581.48)* |
| Mother works full time | 0.31 | *(0.46)* | 0.47 | *(0.50)* | 0.63 | *(0.48)* | 0.28 | *(0.44)* |
| Mother works part time | 0.29 | *(0.45)* | 0.25 | *(0.42)* | 0.26 | *(0.44)* | 0.24 | *(0.43)* |
| Mother does not work | 0.40 | *(0.49)* | 0.28 | *(0.45)* | 0.11 | *(0.30)* | 0.48 | *(0.50)* |
| *Other child-care measures* | | | | | | | | |
| Non-center non-parental preK care | 0.10 | *(0.30)* | 0.24 | *(0.43)* | 0.12 | *(0.33)* | 0.09 | *(0.28)* |
| Non-center non-parental K care | 0.08 | *(0.27)* | 0.06 | *(0.24)* | 0.06 | *(0.23)* | 0.07 | *(0.24)* |
| Hours of all non-parental preK care | 16.78 | *(10.80)* | 13.63 | *(17.51)* | 24.96 | *(13.91)* | 8.40 | *(14.83)* |
| Hours of all non-parental K care | 4.51 | *(9.64)* | 10.42 | *(6.69)* | 11.20 | *(7.68)* | 4.99 | *(10.76)* |
| Center-based care before preK | 0.56 | *(0.50)* | 0.24 | *(0.43)* | 0.53 | *(0.50)* | 0.11 | *(0.30)* |
| Full-day kindergarten | 0.82 | *(0.39)* | 0.88 | *(0.33)* | 0.82 | *(0.39)* | 0.82 | *(0.39)* |
| % of sample | 0.50 | | 0.02 | | 0.15 | | 0.33 | |

*Rating Scales* (SRS) in ECLS-K:2011. All scales were continuous on a 4-point Likert metric, with higher scores indicating more frequent behavior. All scales had high internal consistency, with the alpha reliability coefficients ranging from 0.79 to 0.91, as noted in the user's manual (Tourangeau et al., 2013).

The 4-item self control scale ($\alpha = 0.81$) measured the extent that the child was able to control his or her temper, respect others' property, accept his or her peers' ideas, and handle peer pressure. The 5-item interpersonal skills scale ($\alpha = 0.86$) was the frequency by which a child was able to get along with others, form and maintain friendships, help other children, show sensitivity to the feelings of others, and express feelings, ideas, and opinions in positive ways. The 7-item approaches to learning scale ($\alpha = 0.91$) was the frequency that the child was able to keep his or her belongings organized, show eagerness to learn new things, adapt to change, persist in completing tasks, pay attention, and follow classroom rules. The 5-item externalizing behaviors scale ($\alpha = 0.88$) was the frequency with which a child argue, fought, got angry, acted impulsively, and disturbed ongoing activities. The 4-item internalizing behaviors scale ($\alpha = 0.79$) was the extent that the child exhibited anxiety, loneliness, low self-esteem, and sadness.

As this study addressed school-going behavior, two additional entry skills were included. In the fall survey, parents rated the frequency with which their child praised school: a binary measure was created, indicating if praising school occurred more than once per week. Parents rated the frequency with which their child expressed

eagerness to attend school. Again, a binary measure was created, indicating if expressing eagerness occurred more than once per week.

*Student characteristics*

Student characteristics include a common set of measures, such as gender, race, having a disability, and English language learning status. Additional key measures are also included. First, age of kindergarten entry is included, as prior research has indicated that younger kindergarten entrants may have a more difficult transition into kindergarten due to younger age (Datar, 2006; Elder & Lubotsky, 2009). Second, ECLS-K asked parents to rate their child's health on a five-point scale (1 was highest, 5 was lowest). Students who are less healthy have greater absences (Allen, 2003; Bloom, Dey, & Freeman, 2006).

*Household characteristics*

ECLS-K:2011 included a wide span of family variables, which are used to account for selection into center-based care. This study included measures for whether parents were married, the number of siblings, age of mother when she first gave birth to any child, and the number of books at home. Also, Gottfried (2010) found a link between absenteeism and distance from school, and thus this was included as a measure. Student mobility has also been linked to absenteeism (Chang & Romero, 2008; Ready, 2010) and was included. Claessens et al. (in press) linked maternal depression to absenteeism. A binary measure reported if a mother reported feeling depressed in the week prior to the survey.

Two home involvement scales were also employed, as replicated from Votruba-Drzal, Li-Grining, and Maldonado-Carreno (2008). The first scale, which was comprised of 15 dichotomously-scored items, measured the number of learning activities in which children participated. This scale assessed whether in the past month, the child engaged in activities such as visited a book store, took music lessons, or attended tutoring lessons. The second scale, relating to parental involvement, was measured on a 4-point Likert scale. The 10-item parental involvement scale assessed the frequency that parents engaged the child in various activities, such as playing games, singing songs, reading books, and doing arts and crafts.

Finally are measures of socioeconomic status. Both maternal and parental education are included. Additional measures were household income and maternal employment.

*Other child-care measures*

Two indicators designated whether a child received non-parental, non-center care during the prekindergarten year (such as relative care and/or non-relative care) and during the kindergarten year. Also, the number of hours of all types of non-parental care in both prekindergarten and kindergarten were included. Next was a binary measure for attending center-based care prior to prekindergarten. Finally was an indicator for attending full-day kindergarten. With more absences occurring in kindergarten because students and families are not yet acclimated to the schooling schedule (Balfanz & Byrnes, 2012; Chang & Romero, 2008), this might be less of a concern in a full-day schedule.

*Analytic approach*

*Baseline approach*

This study began with a baseline logistic regression model:

$$prob[CA_{ik}] = prob[CA_{ik} = \beta_0 + \beta_1 CBC_{ik} + \beta_2 E_{ik} + \beta_3 S_{ik} + \beta_4 F_{ik} + \beta_5 C_{ik} + \varepsilon_{ik}] > 0.$$

In this model, $CA_{ik}$ represented the binary outcome as to whether a child $i$ in school $k$ was a chronically absent. Given that $CA_{ik}$ was binary, ordinary least squares was not appropriate (Cameron & Trivedi, 2010). The model was run separately for each chronic absence measure – first for the comprehensive measure and then for moderate and strong. In this way, there were three models run for assessing the effect of center-based care: each was designated by chronic absenteeism outcome. It was tested as to whether the models for moderate and strong chronic absenteeism were statistically different from one another. Using a seemingly unrelated regression postestimation test, the findings suggested that these models were indeed different at the $p < 0.01$ level. Thus, moderate and strong models are presented separately in the tables going forward.

$CBC_{ik}$ represented all center-based care indicators: prekindergarten, before/after school in kindergarten, and both years. $E_{ik}$ represented entry skills, $S_{ik}$ represented child characteristics, $F_{ik}$ represented family characteristics, and $C_{ik}$ represented other care measures. The error term was school clustered to account for the non-independence of individual observations. Thus, clustering student data at the school provided for a corrected estimate of the variance of the error.

*Fixed effects modeling*

It might have been the case that omitted variable biases persisted in this model. A first attempt at reducing any omitted variable bias coming through at the school, county, or state levels was through a fixed effects strategy: the mechanics of such an approach are described in detail in Schneider, Carnoy, Kilpatrick, Schmidt, & Shavelson (2007) and in other studies on absenteeism using ECLS-K (e.g., Gershenson, Jacknowitz, & Brannegan, 2014).

Three fixed effects approaches were employed. First were school fixed effects to account for possible unobserved school-level influences on going to center-based care and on chronic absenteeism. For example, some schools might have highly-involved principals, though unobserved to the researcher. Here, highly-involved principals might find ways (e.g., working with the PTA, revising school budget, etc.) to introduce before/after school care for children in kindergarten. Therefore, in these schools, the probability of being a child who attended center-based care before/after school in kindergarten might be higher than in other schools. At the same time, highly-involved principals might make additional investments to reduce school absences in kindergarten. Without measuring all principal efforts, the estimate of the variables in $\beta_1$ would be systematically biased. To address this, a school fixed effects approach was employed:

$$prob[CA_{ik}] = prob[CA_{ik} = \beta_0 + \beta_1 CBC_{ik} + \beta_2 E_{ik} + \beta_3 S_{ik} + \beta_4 F_{ik} + \beta_5 C_{ik} + \delta_k + \varepsilon_{ik}] > 0.$$

In this model, $\delta_k$ represents school fixed effects for children in school $k$. This term represents a set of binary variables that indicates if a child had attended a particular school. This set of indicator variables leaves out one school as the reference group. School fixed effects held constant all school-to-school variation by conducting a within-school analysis: common but unobservable factors among children in the same school were held constant. Note that all school variables (and any that would be at a higher level) dropped away with school fixed effects.

Following school fixed effects were county and state fixed effects. The results were similar between school and county and state fixed effects. Thus, the description of the two approaches and their findings can be found in the online supplementary material for this journal.

*Propensity score matching*

Another concern might be the selection by families of their children into center-based care. As it stands so far, all students identified as having been in center-based care are compared to all other students in the sample. A restricted control group might make for a more accurate comparison. To do so, propensity matching was employed.

Based on the fact that out of the three key measures only prekindergarten was statistically significant in the baseline and school fixed effects reuslts to follow, students were matched on the propensity of having attended center-based prekindergarten care. As ancillary tests, the models were rerun twice (first on the propensity to having attended center-based kindergarten care; second on the propensity to having attended center-based care in both years). These results were also consistent with the baseline and fixed effects, namely a lack of significant effects.

In a two-stage procedure, students from the treatment (i.e., center-based care in prekindergarten) were matched to a control group (i.e., no center-based care in prekindergarten) based on observable characteristics. Note that in the propensity score models in which the treatment was center-based care attendance in prekindergarten, all variables that could have been affected by this treatment were required to be excluded (e.g., having attended center-based kindergarten, having attended both years, hours of care). Thus, the full set of predictors utilized in the first stage of the propensity score analysis included: gender, race, disability status, non-English was primary spoken language, parent-rated health, parental marital status, number of siblings, age of mother at first birth, number of books at home, distance from school, number of places the child has lived, maternal depression, home learning activities, parental involvement, parental education, household income, employment status, and center-based care attendance prior to prekindergarten.

In the first stage, the propensity score was calculated for selection into center-based prekindergarten care. The propensity score was the conditional probability that a child with a set of observable characteristics was in center based-care. The propensity score was estimated using logistic modeling (Rosenbaum & Rubin, 1983). The second stage used the propensity scores from the first stage to match children who were and were not in center-based care. The difference between the outcomes for these two groups was the average treatment effect. The matching method employed was one-to-one nearest-neighbor matching without replacement (Rubin, 1973). Any control group observations that did not have a match were discarded. In doing so, the distribution of the observable characteristics between children attending and not attending center-based prekindergarten care were much more similar and allowed for a more refined comparison (Dehejia & Wahba, 2002).

## Results

*Baseline models*

Table 2 presents the findings from the baseline logistic models. Each model presented in the table is unique – the binary dependent variable is indicated by column heading. The key predictors are located in the first section of the rows. The coefficients are odds ratios (with standard errors clustered by school in parentheses). A larger value of the coefficient suggests a worse outcome – a higher odds of being a chronic absentee. A more favorable outcome occurs with lower coefficient values, which indicates a lower odds of being a chronic absentee.

Across all models, the results in Table 2 indicate that going to center-based prekindergarten care was associated with lower odds of being a chronic absentee in kindergarten. In more detail, having attended center-based prekindergarten care was associated with odds of 0.80-to-1 that a child was chronically absent, as indicated in the first column. When chronic absenteeism was evaluated through its alternative definitions, similar patterns emerged. Having attended center-based prekindergarten care, children had lower odds of moderate chronic absenteeism in kindergarten (0.84-to-1) and even lower odds of strong chronic absenteeism (0.75-to-1). Odds ratios were translated into effect sizes per Cox (1970) and What Works Clearinghouse (NCES, 2014). The effect size of prekindergarten care for the overall measure of chronic absenteeism was 0.13 and was 0.10 for moderate and 0.17 for strong outcomes. These effects were consistent with (or slightly larger) other assessments of center-based care using secondary data (Bassok, 2010; Claessens, 2012; Loeb et al., 2007; Turney & Kao, 2009; Yamauchi & Leigh, 2011), though this was the first study addressing absence outcomes.

As for research question two, neither having attended center-based care before/after school in the same year as kindergarten nor having attended center-based care during both prekindergarten and kindergarten years was statistically significant. Therefore, the relationship between center-based care and chronic absenteeism in kindergarten was driven specifically by care in the year just before kindergarten. This finding is also reinforced by the fact that the indicator for having attended center-based care prior to prekindergarten (near the bottom of the table) was not significant in predicting chronic absenteeism in kindergarten. Again, the relationship between center-based prekindergarten care and chronic absenteeism was unique.

Overall, there are several key interpretations. First, children in center-based care in prekindergarten had lower odds of chronic absenteeism compared to children not in center-based prekindergarten care. Second, the interpretation of all three models was consistent. Distinguishing between absence definitions did not dramatically change the conclusion. Finally, looking across all models, statistically-significant odds of center-based care only arose for prekindergarten care. Only attending prekindergarten care reduced chronic absenteeism.

Briefly turning to the wide span of control variables implemented in this study, kindergarten entry skills and individual characteristics were generally not associated with differences in the odds of chronic absenteeism. One interesting exception, however, was that children with higher frequencies of internalizing and externalizing behaviors tended to have higher odds of chronic absenteeism. This finding corresponds to previous research, suggesting that feelings of anxiety, disengagement, or alienation are linked to higher rates of missing school (Ekstrom et al., 1986; Newmann, 1981). Unsurprising, health was a consistently strong predictor of chronic absenteeism. Children with lower health ratings (and presumably poorer health) were more likely to be chronically absent. Children in poorer health tend to be at the highest levels of risk for chronic absenteeism (Allen, 2003; Bloom et al., 2006). Health is such an important factor that children in schools without health personnel tend to have greater absences (Allen, 2003).

There were several notable findings from the set of household characteristics. Children with siblings were less likely to be chronic absentees. Children in households that have been more mobile had higher odds of chronic absenteeism, as supported by the literature (Felner, Primavera, & Cauce, 1981). One intriguing result was that children with parents who are highly involved in learning activities had higher odds of being chronic absentees. While speculation, highly-involved parents might allow for their child to be absent more by assuming that they could supplement school material at home through their involvement. Consistent with Claessens et al. (in press), maternal depression was linked to higher odds of chronic absenteeism. Note that maternal depression has been linked to

**Table 2**
Center-based care and the odds of chronic absenteeism.

| | | | | Alternative definitions | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Chronic absenteeism | | | Moderate | | | Strong | | |
| *Center-based care* | | | | | | | | | |
| Prekindergarten center-based care | 0.80 | *(0.07)* | *** | 0.84 | *(0.08)* | * | 0.75 | *(0.08)* | * |
| Kindergarten center-based care | 0.64 | *(0.15)* | | 0.60 | *(0.16)* | | 0.84 | *(0.32)* | |
| Both | 1.05 | *(0.27)* | | 1.13 | *(0.33)* | | 0.89 | *(0.39)* | |
| *Skills at kindergarten entry* | | | | | | | | | |
| Reading | 0.99 | *(0.00)* | * | 0.99 | *(0.01)* | | 0.99 | *(0.01)* | |
| Math | 1.00 | *(0.00)* | | 1.00 | *(0.01)* | | 1.00 | *(0.01)* | |
| Self-control | 1.09 | *(0.11)* | | 1.03 | *(0.11)* | | 1.23 | *(0.23)* | |
| Interpersonal skills | 1.02 | *(0.09)* | | 1.06 | *(0.10)* | | 0.91 | *(0.15)* | |
| Approaches to learning | 0.77 | *(0.07)* | ** | 0.80 | *(0.07)* | * | 0.77 | *(0.11)* | |
| Internalizing problem behaviors | 1.23 | *(0.08)* | *** | 1.14 | *(0.08)* | | 1.36 | *(0.14)* | ** |
| Externalizing problem behaviors | 0.82 | *(0.08)* | * | 0.79 | *(0.07)* | ** | 0.94 | *(0.13)* | |
| Praises school | 0.89 | *(0.09)* | | 0.89 | *(0.10)* | | 0.96 | *(0.18)* | |
| Eager to attend school | 0.95 | *(0.09)* | | 0.93 | *(0.09)* | | 1.02 | *(0.19)* | |
| *Student characteristics* | | | | | | | | | |
| Male | 0.93 | *(0.06)* | | 1.04 | *(0.07)* | | 0.73 | *(0.09)* | ** |
| Black | 0.89 | *(0.10)* | | 0.81 | *(0.10)* | | 1.17 | *(0.21)* | |
| Hispanic | 0.91 | *(0.09)* | | 0.92 | *(0.09)* | | 0.94 | *(0.18)* | |
| Asian | 1.16 | *(0.19)* | | 0.91 | *(0.18)* | | 1.88 | *(0.48)* | * |
| Other | 1.39 | *(0.16)* | ** | 1.25 | *(0.16)* | | 1.60 | *(0.31)* | * |
| Has disability | 1.14 | *(0.10)* | | 1.09 | *(0.11)* | | 1.20 | *(0.22)* | |
| English language learner | 0.69 | *(0.10)* | ** | 0.69 | *(0.10)* | ** | 0.77 | *(0.18)* | |
| Kindergarten entry age | 0.99 | *(0.01)* | | 1.00 | *(0.01)* | | 0.99 | *(0.01)* | |
| Health | 1.23 | *(0.05)* | *** | 1.15 | *(0.05)* | *** | 1.35 | *(0.09)* | *** |
| *Household characteristics* | | | | | | | | | |
| Parents married | 0.86 | *(0.07)* | | 0.85 | *(0.08)* | | 0.94 | *(0.13)* | |
| Number of siblings | 0.89 | *(0.03)* | *** | 0.92 | *(0.03)* | ** | 0.87 | *(0.05)* | ** |
| Age of mother at first birth | 0.97 | *(0.01)* | *** | 0.98 | *(0.01)* | * | 0.96 | *(0.02)* | * |
| Number of children's books at home | 1.00 | *(0.00)* | | 1.00 | *(0.00)* | | 1.00 | *(0.00)* | |
| Distance from school | 1.02 | *(0.01)* | ** | 1.02 | *(0.01)* | ** | 1.02 | *(0.01)* | |
| Number of places child has lived | 1.06 | *(0.03)* | * | 1.03 | *(0.03)* | | 1.12 | *(0.05)* | * |
| Learning activities | 1.37 | *(0.10)* | *** | 1.29 | *(0.10)* | ** | 1.45 | *(0.20)* | ** |
| Parental involvement | 0.98 | *(0.01)* | | 1.00 | *(0.02)* | | 0.92 | *(0.02)* | ** |
| Mother's reported depression | 1.23 | *(0.10)* | * | 1.10 | *(0.11)* | | 1.49 | *(0.17)* | *** |
| Mother's education | | | | | | | | | |
| Less than high school | 1.08 | *(0.12)* | | 1.01 | *(0.13)* | | 1.20 | *(0.23)* | |
| Some college | 0.92 | *(0.08)* | | 0.98 | *(0.09)* | | 0.80 | *(0.13)* | |
| College graduate or beyond | 0.87 | *(0.10)* | | 0.83 | *(0.11)* | | 1.03 | *(0.21)* | |
| Father's education | | | | | | | | | |
| Less than high school | 0.95 | *(0.12)* | | 1.08 | *(0.14)* | | 0.70 | *(0.14)* | |
| Some college | 0.94 | *(0.08)* | | 0.87 | *(0.09)* | | 1.14 | *(0.16)* | |
| College graduate or beyond | 1.04 | *(0.12)* | | 1.01 | *(0.12)* | | 1.11 | *(0.22)* | |
| Household Income | 1.00 | *(0.00)* | | 1.00 | *(0.00)* | | 1.00 | *(0.00)* | |
| Maternal employment | | | | | | | | | |
| Full time | 0.69 | *(0.06)* | *** | 0.78 | *(0.07)* | ** | 0.57 | *(0.10)* | *** |
| Part time | 0.78 | *(0.06)* | *** | 0.85 | *(0.08)* | | 0.67 | *(0.10)* | * |
| *Other child-care measures* | | | | | | | | | |
| Non-center non-parental preK care | 0.75 | *(0.11)* | | 0.75 | *(0.12)* | | 0.82 | *(0.21)* | |
| Non-center non-parental K care | 0.84 | *(0.14)* | | 0.76 | *(0.14)* | | 1.10 | *(0.31)* | |
| Hours of all non-parental preK care | 1.00 | *(0.00)* | | 1.00 | *(0.00)* | | 1.00 | *(0.01)* | |
| Hours of all non-parental K care | 1.01 | *(0.00)* | | 1.01 | *(0.00)* | | 1.01 | *(0.01)* | |
| Center-based care before preK | 1.03 | *(0.08)* | | 1.06 | *(0.09)* | | 0.94 | *(0.12)* | |
| Full-day kindergarten | 1.18 | *(0.13)* | | 1.21 | *(0.14)* | | 1.05 | *(0.17)* | |
| *n* | 14,060 | | | 14,060 | | | 14,060 | | |

*Note*: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Robust standard errors adjusted for clustering in parentheses.

children's internalizing behaviors, and childcare attendance reduces this association (Hebra et al., 2013). Children with working mothers had lower odds of chronic absenteeism. Other care measures were not statistically significant.

### *Fixed effects*

Thus far, the logistic regression models included a wide range of control measures that might have confounded the relationship between going to center-based care and chronic absenteeism. To account for unobserved school influences that may have influenced going to center-based care as well as the odds of chronic absenteeism, the original baseline logistic regression models from Table 2 were modified to include school fixed effects.

Table 3 presents the odds ratios and clustered standard errors from baseline, school fixed effects, and propensity models. The first section presents odds ratios and standard errors for the models where the outcome was general chronic absenteeism, the second section for moderate chronic absenteeism as an outcome, and the third for strong chronic absenteeism.

This portion of analysis focuses specifically on comparing baseline and school fixed effects models. Both models include the set of control variables from Table 2. Note that the sample sizes changed based on variation in the outcomes at the level of the fixed effect specification (e.g., schools lacking variation would be dropped). Examining the fixed effects models and comparing them with the baseline, the results are consistent. The sizes of the odds as well as the standard errors are similar in each regression. This indicates

**Table 3**
Comparison of alternative specifications.

| | Key covariates | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Prekindergarten care | | | Kindergarten care | | Both | | *n* |
| *Outcome: chronic absenteeism* | | | | | | | | |
| Baseline (Table 2) model | 0.80 | *(0.07)* | *** | 0.64 | *(0.15)* | 1.05 | *(0.27)* | 14,060 |
| School fixed effects model | 0.71 | *(0.08)* | *** | 0.58 | *(0.15)* | 1.13 | *(0.32)* | 11,480 |
| Propensity score matching[a] | 0.85 | *(0.27)* | *** | – | | – | | 11,740 |
| *Outcome: moderate chronic absenteeism* | | | | | | | | |
| Baseline (Table 2) model | 0.84 | *(0.08)* | * | 0.60 | *(0.16)* | 1.13 | *(0.33)* | 14,060 |
| School fixed effects model | 0.78 | *(0.09)* | * | 0.61 | *(0.17)* | 1.12 | *(0.34)* | 11,480 |
| Propensity score matching[a] | 0.85 | *(0.27)* | *** | – | | – | | 11,740 |
| *Outcome: strong chronic absenteeism* | | | | | | | | |
| Baseline (Table 2) model | 0.75 | *(0.08)* | * | 0.84 | *(0.32)* | 0.89 | *(0.39)* | 14,060 |
| School fixed effects model | 0.64 | *(0.14)* | * | 0.66 | *(0.28)* | 1.04 | *(0.53)* | 11,480 |
| Propensity score matching[a] | 0.80 | *(0.27)* | *** | – | | – | | 11,740 |

*Note*: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Robust standard errors adjusted for clustering in parentheses.

[a] As described in the text, propensity score models were matched on center-based prekindergarten attendance. 'Kindergarten care' and 'both' covariates were thus not included in the matching algorithm.

that there was either no bias at the school level or alternatively that the fixed effects approach did not identify the most likely source of bias, which probabilistically occurred due to family selection (hence the use of a matched design to follow). While there were some minor differences, nothing veers from the interpretation: center-based prekindergarten care linked to lower odds of chronic absenteeism.

### *Propensity score matching*

While the analysis has included a rich set of measures and fixed effects, there was nonetheless the possibility that children (families) in center-based care were different in some fundamental way compared to those not in center-based care. Given the statistically-significant findings for attending center-based prekindergarten care, a propensity score matching design was implemented to match children who did and did not attend center-based prekindergarten care. In doing so, propensity matching was useful in creating a more well-defined comparison group.

Table 4 presents standardized mean differences for the covariates utilized in the matching algorithm between children who did and did not attend center-based prekindergarten care. The first column presents the standardized mean differences for the full, original sample. The second column presents standardized mean differences only for those sample members who had a matched treatment-control pairing. The measures running down the right-hand side of the table list all variables included in the matching algorithm. Note, however, that including entry-level skills did not change the findings, though they were not included in this final model as they were technically measured after having attended center-based prekindergarten. Comparing the columns, the standardized mean difference on the variables used in the first phase of the propensity matching analysis were reduced to |.10| or less. This stands in contrast to the standardized mean differences on many of the variables prior to having matched children.

The original results were re-examined and are presented in Table 3 below the school fixed effects results. The propensity score matching results were close in size compared to the original results (though they often held greater level of statistical significance). The results from the propensity matching analysis suggested a slight overestimation of the previously-estimated low odds associated with center-based prekindergarten on chronic absenteeism – as indicated by odds for all three outcomes. Family selection was slightly overestimating the prior sets of results, which were not picked up by the baseline model nor by the fixed effects models. That said, this overestimation was small, only moving the odds up by five percentage points for chronic absenteeism, one percentage points for moderate, and five percentage points for strong. Therefore, the findings from this model nonetheless conclude with the same interpretation: children who attended center-based prekindergarten care had lower odds of chronic absenteeism.

**Table 4**
Standardized mean differences on all first stage predictors in the propensity score analysis.

| | Original sample ($n = 14{,}060$) | Matched sample ($n = 11{,}740$) |
|---|---|---|
| Male | 0.02 | 0.02 |
| Black | −0.03 | −0.03 |
| Hispanic | −0.26 | −0.01 |
| Asian | 0.05 | 0.05 |
| Other | −0.01 | −0.01 |
| Has disability | 0.07 | 0.07 |
| English language learner | −0.25 | −0.09 |
| Health | −0.10 | −0.10 |
| Parents married | 0.22 | 0.08 |
| Number of siblings | −0.20 | 0.07 |
| Age of mother at first birth | 0.41 | −0.03 |
| Number of children's books at home | 0.21 | −0.07 |
| Distance from school | 0.04 | 0.04 |
| Number of places child has lived | −0.11 | −0.10 |
| Mother reported depression | −0.11 | −0.10 |
| Learning activities | 0.08 | 0.08 |
| Parental involvement | 0.35 | 0.06 |
| Mother: less than high school | −0.36 | −0.05 |
| Mother: some college | 0.02 | 0.02 |
| Mother: college graduate or beyond | 0.44 | −0.10 |
| Father: Less than high school | −0.26 | −0.05 |
| Father: some college | 0.04 | 0.02 |
| Father: college graduate or beyond | 0.37 | −0.02 |
| Household income | 0.46 | −0.07 |
| Mother: full time employment | 0.23 | −0.08 |
| Mother: part time employment | 0.09 | 0.09 |
| Attended center-based care prior to prekindergarten | 0.91 | 0.03 |

### *Heterogeneity*

Previous research has suggested that SES moderates attendance patterns (as well as the effect of center-based care on other child outcomes, such as achievement or socioemotional development). Hence, to be comprehensive in this study, SES characteristics were examined. Recent policy dialog in chronic absenteeism for low-SES children has supported a movement beyond examining traditional SES measures such as receiving free lunch (Nauer et al., 2014). To align with this effort, various measures of socioeconomic status were tested.

**Table 5**
Analysis by socioeconomic status.

| | Chronic absenteeism | | Alternative definitions: Moderate | | Alternative definitions: Strong | |
|---|---|---|---|---|---|---|
| Low health rating × | | | | | | |
| Prekindergarten center-based care | 1.04 | *(0.19)* | 0.97 | *(0.19)* | 1.35 | *(0.43)* |
| Kindergarten center-based care | 0.97 | *(0.54)* | 0.24 | *(0.26)* | 5.12 | *(3.54)* |
| Both | 0.83 | *(0.52)* | 3.06 | *(3.44)* | 0.21 | *(0.19)* |
| ECLS-K poverty indicator × | | | | | | |
| Prekindergarten center-based care | 1.22 | *(0.22)* | 1.17 | *(0.23)* | 1.35 | *(0.43)* |
| Kindergarten center-based care | 0.15 | *(0.10)* | 0.13 | *(0.11)* | 0.25 | *(0.23)* |
| Both | 6.42 | *(4.49)* | 8.02 | *(7.04)* | 3.19 | *(3.56)* |
| Family received food stamps × | | | | | | |
| Prekindergarten center-based care | 1.24 | *(0.19)* | 1.21 | *(0.21)* | 1.41 | *(0.39)* |
| Kindergarten center-based care | 0.61 | *(0.27)* | 0.28 | *(0.17)* | 2.96 | *(2.10)* |
| Both | 1.58 | *(0.79)* | 3.63 | *(2.39)* | 0.26 | *(0.22)* |
| Mother has less than high school degree × | | | | | | |
| Prekindergarten center-based care | 0.94 | *(0.18)* | 1.17 | *(0.25)* | 0.56 | *(0.18)* |
| Kindergarten center-based care | 1.77 | *(0.91)* | 1.49 | *(0.92)* | 1.74 | *(1.41)* |
| Both | 0.71 | *(0.44)* | 0.73 | *(0.57)* | 0.86 | *(0.82)* |
| Mother does not work × | | | | | | |
| Prekindergarten center-based care | 0.86 | *(0.13)* | 0.75 | *(0.13)* | 1.40 | *(0.38)* |
| Kindergarten center-based care | 1.12 | *(0.50)* | 0.86 | *(0.48)* | 1.94 | *(1.21)* |
| Both | 0.94 | *(0.51)* | 1.29 | *(0.85)* | 0.42 | *(0.34)* |

*Note*: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Robust standard errors adjusted for clustering in parentheses.

To test for moderating effects, partially-interacted models were employed where indicators for center-based care were interacted with a measure of SES. Utilizing partially-interacted models is deemed as appropriate for assessing heterogeneity in childcare effects delineated by a child-level characteristic (Yamauchi & Leigh, 2011). Hence, it was the approach also adopted here. Table 5 presents these moderating effects. Each grouping represents a unique regression. The odds ratio and school-clustered standard errors were derived from running a logistic regression model similar to that in Table 2. The sections of Table 5 present interactions between center-care measures and different SES measures, including indicators for: fair or poor parental health rating, family was at/or below poverty level, received food stamps assistance in the 12 months prior to kindergarten entry, child's mother did not complete high school (note that the results were the same when using father's education), and maternal unemployment.

Across all measures, there was no statistical significance. Thus, children of varying degrees of SES did not experience differences in the odds of chronic absenteeism based on attending center-based care. The lack of statistical significance of effects by SES were consistent with recent research on center-based care on other child outcomes (Claessens, 2012). Instead, when considering SES, all children benefited (equally) from having attended center-based care. Note that other moderating characteristics were tested as well. Those selected were those that were statistically-significant findings in Table 2, such as: gender, living close to school, and degree of home learning activities. There were no moderating effects of these on chronic absenteeism. Instead, only the direct, main effect of center-based prekindergarten care emerged.

## Discussion

This study was the first to position itself in the intersection on research on center-based care and on chronic absenteeism. Given the growth in the utilization of center-based care, this study contributed the body of research focusing on early schooling outcomes of children in these programs. Given recent policy concerns of the detrimental effects of chronic absenteeism in early education (see Balfanz & Byrnes, 2012; Chang & Romero, 2008; Gottfried, 2014; Nauer et al., 2014), this present study also contributed new research to the field of school absenteeism by examining whether attending center-based care influenced absences. With increased enrollment in center-based care alongside increased concerns of the detrimental effects of chronic absenteeism, this study addressed a critical research gap in order to draw conclusions about both.

To do so, this study relied on the most recent national dataset of school-aged children in the U.S. – the ECLS-K:2011. Given these data, it was possible to incorporate a wide span of measures and methods in the analyses to better isolate the association between going to center-based care and chronic absenteeism. Importantly, prior to this study, little work had focused on attending center-based care before/after school during the kindergarten school year (Claessens, 2012). However, the ECLS-K:2011 dataset uniquely provides information on care experiences in both prekindergarten and kindergarten years, allowing this study to evaluate how the timing of center-based care influenced chronic absenteeism. This new perspective was critical, given the growing national trend of children attending both prekindergarten and kindergarten center care.

Addressing each research question led to the following conclusions. As for the first, children in center-based prekindergarten care had lower odds chronic absenteeism in kindergarten. These relationships held true regardless of absenteeism definition. The findings were robust to multiple methodological approaches, though propensity matching suggested a slight overestimation in prior models hence elucidating the value of a matched design.

Based on the mechanisms addressed in the introduction, it does seem feasible that center-based prekindergarten care enables for the development of school-going skills that ease the transition into schooling for both children and parents. In a formal school-like setting, children build skills to adapt to the transition into schooling and consequently develop positive school-going attitudes once in kindergarten (Ladd & Price, 1987). Positive attitudes, which as previously mentioned, are inversely related to school avoidance and absenteeism (Ekstrom et al., 1986; Gottfried, 2014; Newmann, 1981). Parents might be in a better position to develop schedules and logistics prior to starting kindergarten, which reduce stress and anxiety once their children are start school (Ehrlich et al., 2014) – and again positive school-going behaviors are developed. Maintaining routines seems critical for families to reduce chronic absenteeism, as highlighted by the statistically-significant effect of family mobility. A third explanation might be the health benefits of early exposure to health programs (Yoshikawa et al., 2013).

As for research question two, only the measure of having gone to center-based care during prekindergarten significantly

predicted differences in odds in chronic absenteeism. No other center-based care measure was significant. In the year prior to schooling, center-based care would be the only exposure children would have to a formal school-like environment. On the other hand, as Claessens (2012) describes, center-based care before/after the kindergarten day may not add significant value above-and-beyond the school-going and transition skills children are already acquiring in kindergarten itself. Therefore, the importance of center-based care on chronic absenteeism might be driven by the mechanisms described in the introduction pertaining to prior-to-kindergarten center-based care rather than as concurrent reinforcement.

As for the third research question, the results were comparable between various measures of SES, as consistent with prior research (Claessens, 2012). The relationship between center-based prekindergarten care and chronic absenteeism was not accentuated for one group. Rather, all students were positively influenced by having attended prekindergarten center-based care.

The null findings by SES has important research implications. A limitation of ECLS-K:2011 is that center quality was not directly observed or measured. Families of higher SES who send their children to center-based care might be sending them to 'higher quality' center-based care on some unobserved measure. Therefore, in examining moderating effects by SES, any differentiation in quality might have been reflected in statistically-significant results by these moderating effects. These moderating results, however, were not significant, thereby implicating that at least these rough proxies for quality did not skew the results.

From these findings, there are several concluding implications. First, less is known about the influence of center-based care on outcomes such as chronic absenteeism, which has recently been supported as a key indicator of academic risk (Nauer et al., 2014). Therefore, this study has explored a relatively new facet of how center-based care links to school success beyond achievement and development. Having done so enabled for a richer discussion as to why center-based care might be linked to achievement or socioemotional development in the first place. For instance, chronic absenteeism reduces achievement and weakens socioemotional development in kindergarten (Gershenson et al., 2014; Gottfried, 2014). As this study has shown, attending center-based prekindergarten care linked to lower chronic absenteeism. Therefore, one path by which center-based care links to achievement or socioemotional development may be through chronic absenteeism – namely that center-based prekindergarten care increases positive school-going behaviors, reduces chronic absenteeism, and hence increases achievement and socioemotional development. This study encourages further exploration down this line as well as new research to consider additional indicators of child success and risk.

Second, moving beyond identifying a standard set of individual and family factors, this study was also unique is that it broadened the dialog on what drives chronic absenteeism. The fact that both moderate and strong chronic absenteeism were influenced by center-based prekindergarten care suggests that stakeholders might consider how early childhood programs link to school-going behaviors and attitudes. The findings of this study urge for further documentation and exploration of the link between early childhood experiences and early chronic absenteeism, such that policy and practice supports those factors and environments that promote positive school-going behaviors. Hence, the first two implications of this research are intertwined. On the one side, identifying how center-based care links to chronic absenteeism contributes new knowledge as to how center-based care influences a wider span of early schooling outcomes; and on the flip-side, knowing this relationship also appeals to those invested in identifying what may be driving chronic absence patterns and how to mitigate them.

While this study focused on center-based care and chronic absenteeism, other factors nonetheless emerged as significant. First, almost unsurprising was the role of child health (Allen, 2003; Bloom et al., 2006). The fact that health predicted chronic absenteeism implies that child health ought to remain at the forefront of policy when it comes to curtailing early absences, through access to health care services and federal health programs (Zhang, 2012). The fact that SES did not moderate the relationship between center-based care and chronic absenteeism suggests that the operative conditions might be more related to health issues than to traditional poverty issues. Second, a noteworthy set of findings arose for the relationships between maternal health and chronic absenteeism. First, there was a main effect of maternal depression on school absenteeism as consistent with Claessens et al. (in press), thereby stressing the importance of mental health in boosting the family's ability to establish and maintain routines. Second, there was an indirect effect of maternal health on absenteeism. Maternal depression is linked to children's internalizing symptoms (Hebra et al., 2013). Internalizing symptoms were found to be linked to chronic absenteeism in this study. Prior work has found that attending center-based care reduces the link between maternal depression and children's internalizing symptoms (Hebra et al., 2013). Interpreting both main and indirect effects together, attending center-based childcare seems to be especially critical for children in families facing mental health issues, though it might be those same issues that are reducing the odds of attending center-based care to begin with. If parental mental health is linked to child mental health (and both directly link to early chronic absenteeism), future policy might focus on where and when on this pathway mental health supports and interventions are most effective to ensure that children go to prekindergarten and attend school once in kindergarten.

Third, this study contributes new insight by considering if there is a role of multiple years of center-based care. However, given that significant effects only arose on prekindergarten care, researchers, policymakers, and practitioners might consider two avenues of inquiry. First, future questions could delve into which factors of prekindergarten care were distinct enough to have influenced chronic absenteeism in contrast to years of center-based care. Perhaps as Claessens (2012) suggests, center-based care before/after kindergarten hours was less effective (on achievement) because it simply reinforced what children were already learning during the actual kindergarten school day. Second, inquiry might address why multiple years of exposure to a program, policy, or practice was not effective at boosting early chronic absenteeism. Knowing which years are critical and which are not are crucial to developing policy: The story remains incomplete when extrapolating early schooling outcomes based on one year of center-based care.

Finally, in regards to the fact that this study focused on outcomes during this first year of formal schooling, there are implications. Early educational experiences can set students' schooling and developmental trajectories over a lifetime (Duncan et al., 2007). As it has been established that chronic absence in early schooling years has the potential to influence children's short- and long-term prospects (Gottfried, 2014), identifying how programs and practices can potentially reduce chronic absenteeism may shed light on ways to provide young children at the onset of schooling with strong foundations to be successful throughout the educational pipeline.

### *Limitations and further study*

In sum, this study provided new insight in the intersection on research in center-based care and on research in chronic absenteeism. There are several avenues for future research grounded in limitations of this study. First, as mentioned, measures of quality are important when evaluating child-care (Anders et al., 2011; Camilli, Vargas, Ryan, & Barnett, 2010; Vandell, Belsky, Burchinal,

Steinberg, & Vandergrift, 2010). However, quality measures were not developed by NCES for the ECLS-K data. Thus, this study calls for additional research to delve into the moderating role of quality. This may be accomplished with other large-scale datasets (though at present, none are as recent as the one utilized in this study). Or, this may be accomplished through smaller-scale site studies.

Second, absence reasons were not provided in the dataset. Thus, while it was possible to determine if a student was chronically absent, it is not possible to determine why. Thus, future research might rely on additional data to examine these relationships. For instance, district datasets contain coded reasons for absences. Therefore, future research can provide more depth into the care-absenteeism relationship, as well as test the generalizability of this study's findings.

Third, while the dataset included an exceptional array of child and household variables, the data were nonetheless non-experimental. Therefore, the fixed effects analyses only accounted for preexisting differences related to location (school, county, state) and the propensity score analysis only accounted for preexisting differences (e.g., family selection bias) on the variables included in the matching algorithm and not on other possible explanations. A smaller, experimental study would eschew these issues and could provide additional confidence in this study's findings. A related limitation of this dataset was that its large size may have increased the possibility of finding statistically-significant effect sizes. Though the effect sizes were consistent with or larger than prior studies that also used non-experimental data to evaluate center-based care (e.g., Bassok, 2010; Claessens, 2012; Loeb et al., 2007; Turney & Kao, 2009; Yamauchi & Leigh, 2011), they were nonetheless smaller than those derived from experimental work on center-based care (e.g., Yoshikawa et al., 2013). Again, this urges for future experimental work to consider chronic absenteeism as an outcome in order to compare to the findings in this study.

Fourth, this study raised potential mechanisms (e.g., transitions, family logistics, health) as to why center-based prekindergarten would influence chronic absenteeism, but it was not possible to identify the relative importance of one mechanism over the other. Further inquiry, perhaps through qualitative methods, could identify the critical pathways by which the relationship between center-based prekindergarten care and reduced chronic absenteeism in kindergarten had arisen. In doing so, it will be possible to develop practices that target and support those mechanisms that seem to be strongest in linking center-based care and chronic absenteeism. For instance, knowing if family logistics is a critical issue in prekindergarten will aid in streamlining how to address the needs of children and their families.

Finally, this study importantly evaluated the role of center-based care on early schooling outcomes. It would be as important to determine if there are longer-term effects of center-based care on chronic absenteeism, given the fact that this behavior is present across the K-12 pipeline. Therefore, with an appropriate set of data, future research could determine how center-based care sets children on both short- and long-term trajectories based on a range of critical outcomes.

## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.ecresq.2015.04.002

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