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A MARKET IN MEALTIMES: SOCIAL AND ECONOMIC FACTORS ASSOCIATED WITH MEAL PROVISION IN EARLY CARE AND EDUCATION (ECE) SERVICES

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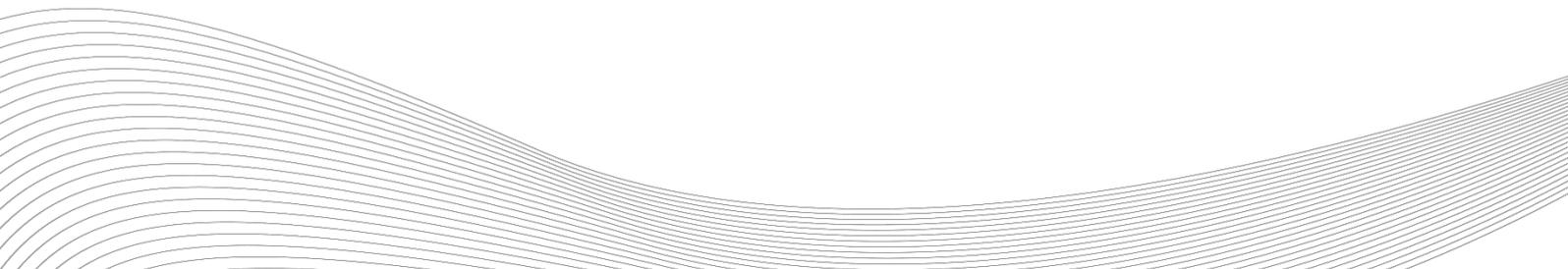
NON-TECHNICAL SUMMARY

Across developed economies attendance at an early care and education program is now almost universal. In this study, we asked whether early childhood education and care services are realising their potential to support child nutrition, particularly for those living in communities at high risk of food insecurity. We utilised public administrative data (2018-2020) to examine associations between meal provision in Early Care and Education services, service fee structure, community-level socioeconomic disadvantage, market competition and child development outcomes (derived from the Australian Early Development Census). The study included administrative data from Early Care and Education services located, across remote, regional and metropolitan locations in Queensland, Australia.

We found that services in the most disadvantaged areas were less likely to provide food and more likely to have lower fees. Higher market competition, occurring in metropolitan areas, was associated with increased likelihood of meal provision in disadvantaged communities, yet in these disadvantaged communities, parent ability to pay constrains fees. This raises important questions about decisions that offset cost. Is food quality poorer? Is the general quality of service provision affected?

There was little association between meal provision and rates of children's developmental vulnerability in the community, however, provision of breakfast was associated with higher levels of developmental problems suggesting that breakfast provision is a response to disadvantage in the small number of services where breakfast is provided.

We conclude that the competitive market works contrary to the potential for Early Care and Education services to promote public health and support child nutrition. Children living in disadvantaged communities, where food insecurity is inevitably higher, are least likely to have meals provided by their service. Whilst market competition increases the likelihood of meal provision in disadvantaged communities, investigation of food quality in this context is required. Against a background of pressure to constrain fees in communities under economic stress, a question then arises about how budgets are managed. The findings indicate the need for systemic change to enable high quality food provision in Early Care and Education services located in communities at high risk of food insecurity.



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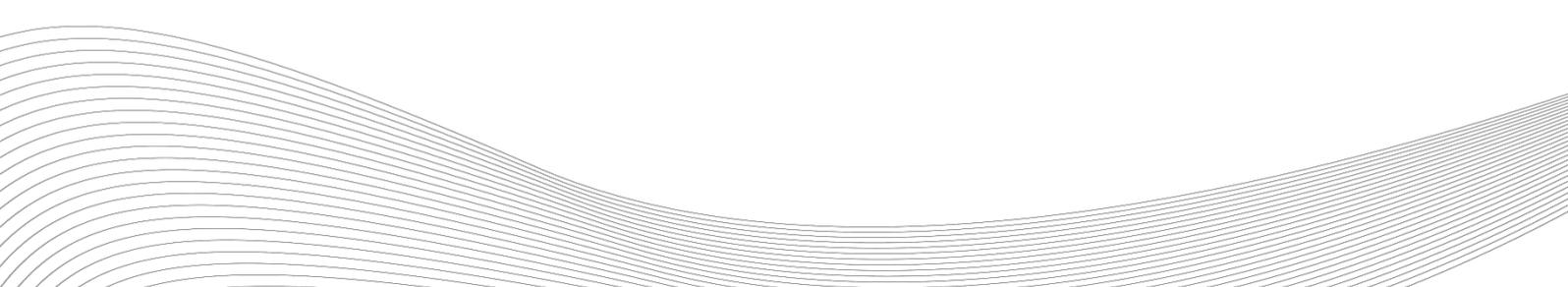
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ABSTRACT

The objective of this study was to assess the way in which the competitive economic market of Early Care and Education programs is associated with mealtime provision across communities with varying risk for food insecurity. We conducted correlation and regression analyses of data extracted from public data sets (2018-2020) to assess the association, at community level, of meal provision in ECE services with child development outcomes, population indices of disadvantage, ECE fee structure and market competition. The study was undertaken in the State of Queensland, Australia in which there is a diverse population of approximately 5 million people and 1623 ECE services located, across remote, regional and metropolitan locations. Data from all ECE services in Queensland Australia where full data was available was utilised (N=1601).

We found that ECE services in socially disadvantage communities were less likely to provide food and more likely to have lower fees. Higher market competition, occurring in metropolitan areas, was associated with increased likelihood of meal provision in disadvantaged communities but with continued constraint on fees. We conclude that the competitive market works contrary to the potential for ECE services to promote public health and support child nutrition. Children living in disadvantaged communities, where food insecurity is inevitably higher, are least likely to have meals provided by their ECE service. Market competition increases likelihood of meal provision yet in disadvantaged communities parent ability to pay constrains fees. Investigation of food quality in this context is required. The findings indicate the need for systemic change to enable high quality food provision in ECE services located in communities at high risk of food insecurity.

Keywords: child nutrition; food insecurity; disadvantage; early education and care; market competition.

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1. Introduction

Background

Across developed economies attendance at an early care and education (ECE) program is now an almost universal experience for young children (OECD, 2017, 2019b). Prior to school entry nearly all children attend at least one year of ECE; the majority spend some time in the most common form, centre based childcare, during their first five years (OECD, 2017, 2019b). Some children enter childcare from their first year of life, spending up to 10,000 hours in this environment before they commence school (Thorpe et al., 2020). Care of children in early childhood, therefore, is commonly shared across home and ECE settings. So too, then, is the responsibility for young children's physical and emotional development at a period of time that is foundational for lifetime trajectories of health and wellbeing.

As public services, ECE settings not only present the potential to promote the health and development of all children but are also positioned to redress inequities for those who live in circumstances of disadvantage (Fox, Levitt, & Nelson, 2010; Heckman, 2011; Knudsen, Heckman, Cameron, & Shonkoff, 2006; Shonkoff, 2012). With significantly increasing professionalisation of the workforce and regulation to assure the quality of provision, childcare services are increasingly identified as sources of professional information and educational support for families, and also as agencies for direct intervention to support optimal child development and health (Ladner, Suskind, & Leung, 2019; OECD, 2019a; Pölkki & Vornanen, 2016; Karen Thorpe et al., 2020). As services most commonly provided by agencies outside the publicly-funded, formal education system they compete for market share; a circumstance that, at least in theory, should be an incentive to deliver well (Adamson & Brennan, 2014; Brennan, 2014; Penn, 2012). Yet childcare services are costly as well as competitive. Many are businesses that operate for profit. Being within a competitive economic market presents tensions that become particularly salient in communities where family ability to pay is more limited (Adamson & Brennan, 2014; Brennan, 2014; Penn, 2012). In this study we ask how these circumstances play out in one area of practice that has significant implications for children's health, wellbeing and learning: meal provision. We aim to identify whether ECE services work to support child nutrition in communities at higher risk of food insecurity and sub-optimal development.

Community risk and food insecurity

Despite the ready availability of nutritious foods in developed economies, not all children have equal access to these foods and, for some, security of access is not guaranteed. Poverty

and a diverse array of family adversity can constrain children's access to adequate nutrition. Many families live in circumstances of food insecurity, in which there is precarious, *access to sufficient, safe and nutritious food that meet their dietary needs and food preferences to support an active and healthy life* (FAO, 1996).

In the USA it is estimated that one in four families with children experience food insecurity (Coleman-Jensen, 2015). In Australia, the site of the current study, there is limited monitoring of food insecurity and, therefore, unreliable estimates of the prevalence of food insecurity. The most recent data from the 2014 Health Survey indicates a prevalence of four percent (Australian Bureau of Statistics, 2014) but the measure used to estimate this figure has been found to underestimate prevalence (McKechnie, Turrell, Giskes, & Gallegos, 2018). Research undertaken in areas of disadvantage have estimated prevalence rates of one in four households (Kleve, Booth, Davidson, & Palermo, 2018; Ramsey, Giskes, Turrell, & Gallegos, 2012), a figure consistent with those in the USA, while national charity Foodbank estimate one in six Australian children are going hungry (Foodbank, 2018). Given the *stigmatised* and *intermittent* nature of food insecurity, and attendant difficulties of measurement and identification, a focus on high risk communities provides one strategy to understand public health response (Tarasuk, Fafard St-Germain, & Loopstra, 2019). In the current paper we take this strategy focussing on geographic distribution of socio-economic advantage and children's access to food through provisions in ECE settings.

Nutrition, Food insecurity and Children's development

Nutrition in childhood is a key environmental factor affecting ongoing health and wellbeing across the life course (Tanner & Finn-Stevenson, 2002). Early nutrition is associated with ongoing weight status, risk of chronic disease and quality of life (Gooze, Hughes, Finkelstein, & Whitaker, 2012; Gundersen & Kreider, 2009; Jyoti, Frongillo, & Jones, 2005; Killedar et al., 2020; Sarlio-Lähteenkorva & Lahelma, 2001; Thomas, Miller, & Morrissey, 2019). Poor nutrition, whether in terms of quantity or quality of food accessed, is strongly implicated in population health costs, both human and economic (Hamilton, Dee, & Perry, 2018).

A growing body of research data identifies profound effects of food insecurity on children's ongoing life chances (Alaimo, Olson, & Frongillo, 2001; Ashiabi, 2005; Belsky, Moffitt, Arseneault, Melchior, & Caspi, 2010). A particular concern is the effects of food insecurity in the early years of life (conception to five years) (Johnson & Markowitz, 2018). Early childhood is a critical period in human development during which environmental experiences serve to shape neurological architecture and set the foundations for lifetime trajectories of

behaviour, social functioning and learning (Fox et al., 2010). The experience of food insecurity in early childhood presents developmental risk in two key ways. First, effects are direct. Sub-optimal nutrition in early childhood can affect health (Thomas et al., 2019), brain development (Tanner & Finn-Stevenson, 2002) and attendant capacity for learning (Ashiabi, 2005; Melchior et al., 2014; Rose-Jacobs et al., 2008; Slopen, Fitzmaurice, Williams, & Gilman, 2010; Zaslow et al., 2009). Hunger and sub-optimal nutrition increase fatigue and capacity for attention, increase irritability and reduce capacity for exploration and discovery (Jirout et al., 2019; Jirout, V.; Zumbunn, S., 2018). Second, food insecurity has indirect effect mediated by impact on family functioning. Children from food insecure homes are less likely to access required medical care and medications with attendant adverse wellbeing (Ma, Gee, & Kushel, 2008). Food insecurity is a source of parent stress associated with poor mental health and reduced capacity for responsive parenting (Bronte-Tinkew, Zaslow, Capps, Horowitz, & McNamara, 2007; Johnson & Markowitz, 2018; Melchior et al., 2009), including parenting associated with mealtimes (Rosemond et al., 2019). In the early years of life responsiveness of adults is critical in promoting social-emotional and cognitive development.

Consistent with the complexity of developmental risks associated with sub-optimal nutrition, food insecurity has been found to predict a host of adverse developmental outcomes. In the early years the most consistent findings relate to behavioural outcomes in which children experiencing food insecurity have been found to have a range of behavioural problems, both internalising and externalising (Melchior et al., 2014; Rose-Jacobs et al., 2008; Slopen et al., 2010). Although there is evidence that living in a food insecure household is associated with poor cognitive functioning and lower educational achievement among school-aged children, the evidence relating to younger children is more limited (Alaimo et al., 2001; Belsky et al., 2010; Jyoti et al., 2005). One newly emerging study, however, presents findings consistent with those for older children, suggesting reduced cognitive functioning. A recent comprehensive population study, analysing the Early Childhood Longitudinal Study - Birth cohort (ECLS-B), found significant association between food insecurity and children's social and cognitive functioning, with greatest effect when food insecurity occurred in infancy and toddlerhood (Johnson & Markowitz, 2018). The collective findings on the impact of food insecurity underscore the imperative for intervention. This most recent study pinpoints the ECE years as a particularly potent point for intervention.

Early Care and Education programs as sites to support child nutrition

A range of studies have demonstrated that educational programs are readily accessible and effective sites for intervention to support children's access to nutritional foods. Most data come from programs in formal schooling. Effective interventions include direct food provision (e.g. breakfast clubs) (Ecker & Sifers, 2013; Huang & Barnidge, 2016; Rodgers & Milewska, 2007) and indirect programs including parent education programs (Williams et al., 2015) and those in which children and families make input into food production (e.g. community gardens (Stephens & Oberholtzer, 2020)).

Evidence on interventions in early childhood education programs are less numerous. Studies of the Child and Adult Care Food Program (CACFP) in the USA provide the most robust population-level evidence of the potential for ECE services to address food insecurity (e.g. (Copeland & Johnson, 2016; Heflin, Arteaga, & Gable, 2015; Korenman, Abner, Kaestner, & Gordon, 2013; Zaltz et al., 2020)). This program, unlike many that provide foods directly to families, provides cash reimbursements to services, including Headstart programs and non-Headstart childcare centres, to supply high quality foods to children. Funding provided to services is scaled commensurate with the household incomes of participating families. The aim is to provide children from low income homes access to nutritious food while also reducing childcare costs charged to parents. This program has been found to have a dual effect. First, the program has been shown to directly improve the adequacy and quality of child nutrition. Both Heflin, Arteaga and Gable (2015) and Zaltz et al (2020) report that centres participating in the CACFP provide higher quality food than those not participating. Specifically, Zaltz et al (2020) identify that CACFP reduces cost to the centre, the greatest barrier to provision of high quality food. Copeland and Johnson (2016) compared the food consumption of children when attending Head Start services participating in CACFP with food consumption at home. They found that children who consumed meals at home and in centres were more likely to meet the recommended dietary allowances for all major food components when compared with children who only ate meals at home. They also consumed more calories and were more likely to consume the recommended amount of fruit and vegetables in a day in comparison to children who did not attend. Second the program has been shown to improve family nutrition. Heflin, Arteaga and Gable (2015) report that participation in the CACFP program led to a reduction in household food insecurity for families whose children attended CACFP-participating childcare centres and proposed the mechanism is that fee reduction liberates more income in the household to buy food for the family.

One potential limitation of ECE sites as places for intervention is that participation is not compulsory and the stigma of poverty, and associated food insecurity, may prevent family engagement with ECE programs. Poverty and the associated experience of food insecurity has been found to limit educational engagement initiating a double disadvantage for those living in financially-stressed families. Food insecurity is associated with children disengaging with the school system (Duke, 2020; Rebecca Ramsey, Giskes, Turrell, & Gallegos, 2011) and lower uptake of ECE programs (Fenech & Skattebol, 2019; Leske, Sarmardin, Woods, & Thorpe, 2015; Skattebol, 2016; Thorpe, Vromans, & Bell-Booth, 2011). Additionally, children from families living in poverty and therefore at greater risk of experiencing food insecurity, have lower rates of attendance (Early Childhood Australia, 2019) when enrolled in an ECE program. One study identifies ‘shame’ as a barrier to attendance (Thorpe, Bell-Booth, & Vromans, 2011). A notable feature of the successful CACFP program in the USA is the adoption of a social justice framing. IN CACFP there is not direct provision of food to families, but rather a mechanism of fee reduction and food provision within the ECE program that reduces attendance costs to families and removes the stigma of “food handouts”.

In Australia, there are individual services that successfully engage with families living in circumstances of extreme financial stress. Fenech and Skattebol (2020) detail a study of five such services. In this study educators provided accounts of inclusive practices that serve to enrol, engage and include families, in a way that that is socially just and mindful of averting stigma. Redistributive strategies, such as scaling of fee structure to parent’s ability to pay and provision of financial scholarships were identified as successful in engaging families. In contrast, affirmative policies in which financial support required ‘special application’ acted as barriers. While not specifically focused on meal provision the findings of this study identify the importance of overcoming financial barriers without the stigma of ‘handouts’ or the barrier of shame. The study also identifies structural provisions such as universal supply of nappies and meals as meaningful supports for families. The extent to which provision of meals is standard practice in Australian ECE services, and how such provision maps to community need, is not known and was the focus of this study.

Are Australian ECE services supporting communities at risk of food insecurity?

Two policy documents guide meal provision in Australian ECE. *Get Up and Grow* (Australian Government Department of Health and Aging, 2015), Australia’s national guidelines for early childhood nutrition provides guidance on recommended dietary intake for children, while the *National Quality Standard for Early Childhood Education and Care* (Australian Children’s Education & Care Quality Authority, 2020) provides guidance to ECE services on the quality

of food that should be consumed within ECE services and appropriate food behaviours at mealtimes. There is, however, no actionable policy framework that requires ECE services to provide food. Meal provision, therefore, is either provided by services or brought from the home setting. Given the findings that meal provision is an important intervention in supporting children and families experiencing financial stress, we sought to understand whether ECE services located in low income communities where the risk of food insecurity is high, serve to realise the potential for socially just intervention. We examine meal provision in ECE and analyse population data to ask three key questions:

1. Are patterns of meal provision in ECE services associated with population indices of child health and development outcomes?
2. Does meal provision in ECE services vary according to the socio-economic characteristics of the communities in which they are located?
3. Is meal provision associated with the degree of competition in the local market?

2. Materials and Method

Design

This study draws upon linkage of data extracted from public data sets (2018-2020) to assess the association, at community level, of meal provision in ECE services with child development outcomes, population indices of disadvantage, ECE fee structure and market competition. In the absence of recent and reliable population data on food insecurity we focus on community risk using indices of disadvantage.

Measures

From administrative data sets we derive seven key variables:

Meal provision: data were derived from the *My Child* website website (Australia Government Department of Education and Training, 2020) (Australian Department of Education, Skills and Employment). This data set provides information on all childcare services in Australia including their quality rating, fees, and service provisions. Data on meal provision was available for 1061 childcare services.

Child health and development: data were derived from the Australian Early Development Census (AEDC) (AEDC, 2019). The AEDC is a triennial assessment of children's health and developmental status as they enter school. The data are collected in the first term of school

and are teacher reports on each child's status in five developmental domains: Physical health, Social competence, Emotional maturity, Language and cognitive skills and Communication skills. Indices of community child development include scores on the 5 developmental domains. These data are aggregated to provide a summary of developmental status for small local areas (equivalent to a single suburb). Additionally, two indices of vulnerability are derived; expressed as percentage of children/area who are in bottom quartile for (a) any single developmental domain or (b) any two developmental domains.

Social and economic advantage: data were derived from the Australian Bureau of Statistics, Socio-Economic Index for Area (SEIFA) scores (66) provided for each postcode and was represented in this study as a SEIFA decile. The areas that ranked in the lowest 10% for socio-economic advantage are scored 1 while the highest level of advantage is scored as 10.

Community Remoteness: The Australian Department of Health Rural, Remote, and Metropolitan Area scores (RRMA) (Australian Government Department of Health, 2020) classification was applied as another index of disadvantage as a higher level of community remoteness is associated with poorer community access to resources and supports. The RRMA classifies Australian communities into seven classes of remoteness ranging from 1 (metropolitan) to 7 (very remote).

ECE quality: data were derived from the *Australian Children's Education and Care Quality Authority (ACECQA)* records of quality assessment under the National Quality Framework (Australian Children's Education & Care Quality Authority, 2020). ACECQA rates childcare services on a 5-point scale: 1 = Significant Improvement required, 2 = working towards standard, 3 = meeting standard, 4 = exceeding standard and 5 = excellent

ECE Market Competition: data were derived from *AEDC* (AEDC, 2019) mapping of ECE services and was expressed an index of the density of ECE services/ population in a defined community area.

ECE Fees: data were derived from the *My Child* website (Australia Government Department of Education and Training, 2020) (Australian Government Department of Education, Skills and Employment). As staffing structure and costs vary by the age of the child, we assess fee structure by age group (Birth-12, 13-24 months, 25-36 months, >36 months).

Analyses

R Studio was used for statistical analysis that assessed the statistical association of respective community measures. Pearson correlation assessed the statistical association while regression analyses, both multiple regression and ANOVA were employed to assess relative effects. Analyses were conducted for all services and for metropolitan areas separately as high market competition is concentrated with metropolitan areas.

3. Results

Association of disadvantage (SEIFA) and community indices of child health and development (AEDC): To check the assumption that social disadvantage is associated with poorer child outcomes in the context of the state of Queensland, we first examined the association of SEIFA with vulnerability and each developmental domain on the AEDC. Results, presented in Table 1, confirmed moderate correlations (range 0.32- 0.54) in which social disadvantage was associated with poorer child outcomes across all domains.

Table 1: Association of social advantage (SEIFA) and child developmental vulnerability (AEDC)

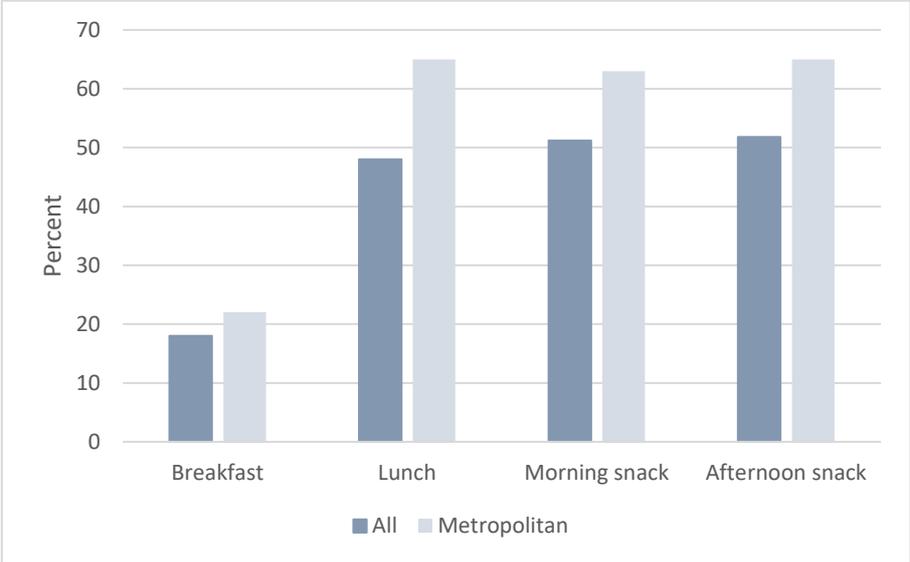
	Child Developmental Vulnerability (AEDC)					
	One or more domains	Physical domain	Social domain	Emotional domain	Language domain	Communication domain
SOC. ADVANTAGE (SEIFA)						
Correlation	-0.455	-0.426	-0.371	-0.324	-0.542	-0.394
P-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Food provision: Figure 1 summarises data on meal provision in all services and those located in metropolitan areas only. Approximately half of ECE centres provided at least one meal. Most common were morning and afternoon snacks, with slightly fewer providing lunch. In metropolitan areas provision was higher across all meal types. Breakfast was not typically provided; approximately 20% of services indicating they provide breakfast.

Association of meal provision with community indices of disadvantage (SEIFA,): Correlation between percentage of ECE services providing meals and levels of social advantage (SEIFA)

was statistically significant ($r=0.19$, $p<0.004$), indicating that meal provision was less likely in the services sited in the most disadvantaged locations. The one exception was breakfast in which provision was more likely in more disadvantaged locations (All $r=0.19$ $p<0.01$; Metropolitan $r=0.1$, $p<0.01$). Similarly, there was a significant correlation between remoteness of location and meal provision ($r=-0.15$, $p<0.001$), in which more remote locations was associated with less meal provision.

Figure 1: Meal provision (%) for all ECE services (N=1061) and metropolitan locations (N=926)



Association of meal provision with community indices of child development and health: Table 2 presents the correlations between the community index of child health and development, the AEDC, and meal provision for each meal type. These show a weak positive association with provision of breakfast, but not other meal types across the total sample, and show that provision of breakfast was associated with higher levels of developmental vulnerability. In metropolitan locations with the exception of association with vulnerability in the communication domain the patterns of association remain the same. WE note, however, that the association of breakfast provision with developmental vulnerability is stronger for vulnerability in any one domain and across social, emotional and language domains.

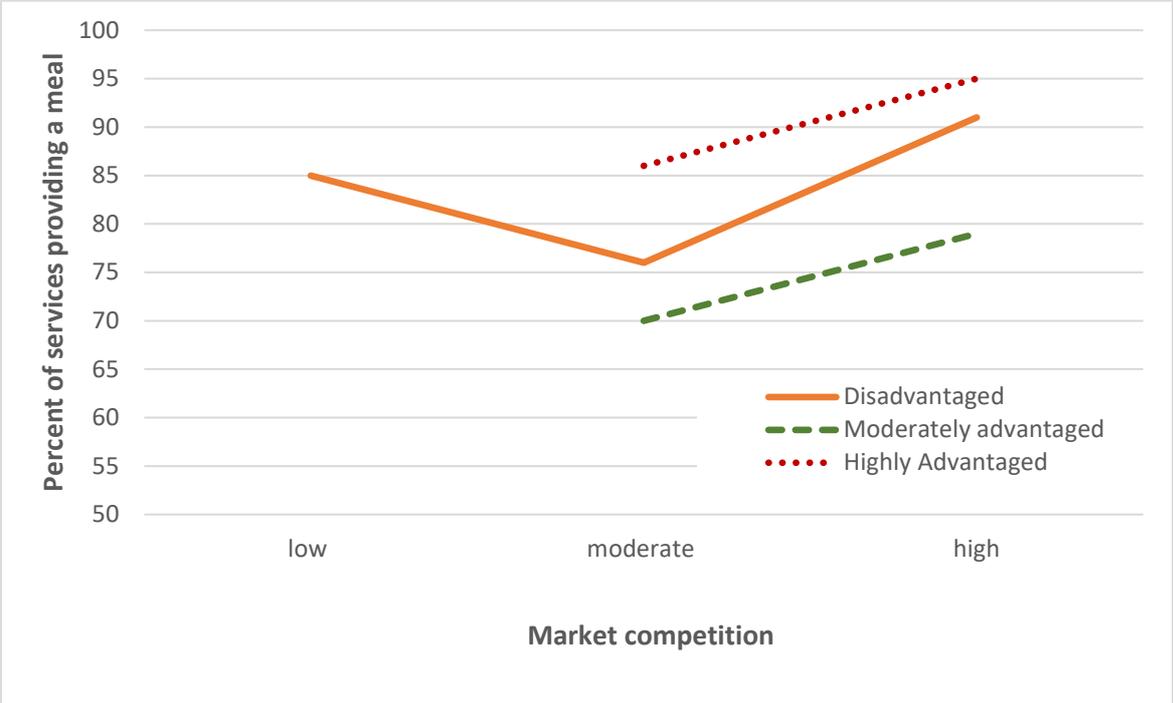
Table 2: Association of meal provision and vulnerability in child health and development

	Developmental vulnerability					
	Vulnerability in 1 or more domains	Physical Domain	Social Domain	Emotional Domain	Language Domain	Communication Domain
Meal is Provided	0.046 ns	0.030 ns	0.023 ns	0.072 ns	0.051 ns	0.080 ns
Breakfast						
All centres	0.119 p< 0.01	0.084 ns	0.150 p- < 0.01	0.140 p- <0.01	0.116 p<0.01	0.092 P<0.05
Metro only	0.132 p< 0.02	0.036 ns	0.199 p< 0.001	0.179 p< 0.01	0.130 p< 0.03	0.073 ns
Morning Tea	0.049 ns	0.038 ns	0.028 ns	0.060 ns	0.038 ns	0.080 ns
Lunch	0.035 ns	0.010 ns	-0.014 ns	0.031 ns	-0.013 ns	0.070 ns
Afternoon Tea	0.055 ns	0.061 ns	0.013 ns	0.071 ns	0.056 ns	0.081 ns

Association of meal provision with characteristics of ECE setting: Analyses of the association between assessed quality of the ECE service and meal provision was not significant though showed a trend towards more likelihood of provision in services rated as higher quality ($r=0.05$, $p\text{-value}=0.09$). Analyses of association of fees by ECE location, indicate that lower fees are associated with higher level of social disadvantage and remoteness while meal provision is associated with higher fees. Interestingly, in metropolitan locations the association of total meal provision and cost is not statistically significant.

Indices of market competition show a statistically significant association in which higher density of services/population was associated with a higher likelihood of meal provision ($r=0.16$, $p\text{-value}=0.017$). Analysis of variance assessed the group difference in meal provision (no vs yes) by social advantage, market competition and the interaction of market competition and social advantage. While social advantage no longer predicted food provision, market competition and market competition x social advantage were associated with meal provision. Figure 2 presents the interaction and shows that in the least disadvantaged communities market competition significantly increases likelihood of food provision relative to moderately and highly advantage communities. In both highly advantaged and disadvantaged communities the level of food provision, under market competition, approaches universal.

Figure 2: Percent of ECE services providing at least one meal by socio-economic advantage of the community served.



Note: Low market competition only occurs in disadvantaged communities

4. Discussion

ECE services are accessed by the majority of children in the years prior to school and, therefore, present significant opportunity for public health intervention to support children’s health and development. This role is particularly important in the context of disadvantaged communities where families experience a complex array of stressors and have less resource to support optimal child development (Knudsen et al., 2006; Shonkoff, 2012). In this study, using public data sets for an entire population sample we focussed on the role of ECE in supporting child nutrition. Specifically, we examined the association of meal provision with indices of community disadvantage. We also examined the association of meal provision with characteristics of the ECE service including fee structure and market competition. Our aim was to assess the way in which the complexities of the competitive economic market of ECE payout in supporting communities at higher risk of food insecurity and sub-optimal child outcomes.

Our analyses confirmed an association of social disadvantage with adverse child health and development outcomes at community level but also showed that the association with meal

provision in ECE services, across different levels of social advantage, was complex. We found a significant association between meal provision and two indices of disadvantage: remoteness and community levels of socioeconomic advantage. In both cases disadvantage was associated with *less* likelihood of ECE services providing meals. There was little association between meal provision and rates of children's developmental vulnerability in the community, however, provision of breakfast was associated with higher levels of developmental problems suggesting that breakfast provision is a response to disadvantage in the small number of centres where breakfast is provided. Breakfast programs are among common strategies used to support low income families (Jirout et al., 2019; Rodgers & Milewska, 2007). Meal provision was also associated with market competition. In areas where there was a high market competition, meals were more likely to be provided and the association with community disadvantage weakens to become statistically non-significant. The association with market competition is particularly marked in disadvantaged areas where, despite constraint on fees, there is a significant increase in food provision. As indicated by Fenech and Skattebol (2020), in low income communities provisions such as meals and nappies are meaningful enablers for families. In a competitive market such provisions may be more salient in parents' decisions to participate and in their choice of service.

Our data indicate that the competitive market in the Australian ECE context works contrary to the ideal of ECE services as places of public health promotion and support. Despite the evidence that meal provision in ECE and school settings can improve child nutrition (Heflin et al., 2015; Jirout et al., 2019; Korenman et al., 2013; Zaltz et al., 2020), and a range of attendant health and learning outcomes (Alaimo et al., 2001; Ashiabi, 2005; Belsky et al., 2010; J. Jirout et al., 2019; Johnson & Markowitz, 2018) in communities characterised by disadvantage this potential is not being realised. Children living in disadvantaged communities, where food insecurity is inevitably higher, are those least likely to have meals provided by their ECE service. In metropolitan locations, market competition places pressure on services to provide food, including in disadvantaged communities where a steep increase in meal provision is evidenced. Against a background of pressure to constrain fees in communities under economic stress, a question then arises about how budgets are managed. There are likely implications for general quality of provision and, specifically, for the quality of food provided. Recent evidence from the USA suggests cost is the major barrier to provision of high quality food in ECE (Zaltz et al., 2020).

5. Study limitation and Conclusion

While the strength of our study is in the size of sample and our whole-of-population approach there are a number of limitations associated with dependence on publicly available data. Notably, there are limitations of measurement precision. Our analyses were dependent on socio-economic characteristics of communities as an index of risk of family food insecurity rather than on direct measurement. Similarly, our measure of children's access to food was meal provision, a limited indication of nutritional security. Meal provision cannot provide detail of the quantity or quality of the food available to children, whether provided by the ECE service or from home. Our current work, focussing on low income communities, is undertaking a smaller but intensive study of food nutritional quality and quantity in ECE services examining both ECE-provided and home-provided foods across the ECE day. Finally, our study was also limited to correlational analysis and did not allow conclusions regarding causation or mechanism. Our data do, however, flag the need to investigate further the apparent contrary mechanisms of a competitive market that limits the potential of supporting children's health and development. Intervention studies have demonstrated the effectiveness of improving child nutrition in communities with high prevalence of food insecurity. Programs to facilitate high quality food provision in ECE services is one potential action that can effect change (Gallegos & Chilton, 2019). However, system changes that focus on respectful and equitable access free of stigma, are preferable (Fenech & Skattebol, 2019; Gallegos & Chilton, 2019) and likely most effective for children and families. Strategies to reduce costs of ECE (Fenech & Skattebol, 2019) for parents, and to remove barriers to provision of high quality food in ECE services are both required to effectively support child nutrition. Available evidence identifies such strategies as effective in averting adverse outcomes for children. They are also optimal in engaging and sustaining family engagement with ECE services because they enable attendance and protect family dignity.

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