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BMC Public Health Caregivers' perceptions of the impact of an Early Childhood Education and Care intervention on child and caregiver outcomes: a cross-sectional survey

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Abstract

Background

Early years interventions are critical in reducing health and developmental inequalities, yet access and uptake remain uneven across disadvantaged communities. In Luton, a high percentage of children live in areas among the 40% most deprived in England, therefore, ensuring equitable access to Early Childhood Education and Care (ECEC) services is a pressing priority. This study explored caregiver-perceived outcomes of an ECEC intervention, quantifying caregiver perceptions, providing insight into the impact, barriers to access, and predictors of outcomes.

Methods

A cross-sectional survey captured caregiver-reported outcomes across nine child domains and eight caregiver domains, measured using five-point Likert scales. A convenience sample of caregivers of children aged 0–5 years was recruited through intervention sessions, community events, social media, and local service networks. Data were collected via Qualtrics and analysed in SPSS using independent samples *t*-tests, ANOVA, and multiple linear regression to compare service users with non-users and identify predictors of outcomes. In total, 132 caregivers participated, of whom n = 87 (65.9%) reported accessing the service.

Results

Mean caregiver-reported outcomes were high across both groups, with most domains exceeding four on a five-point scale. However, non-service users reported significantly higher scores for child emotional development ($p = .006$), caregiver physical health ($p < .05$), confidence ($p < .05$), motivation ($p < .05$), and capability ($p < .05$). Regression analyses indicated caregiver sex, education, and area-level deprivation were consistent predictors of outcomes. Reported barriers to service use included lack of awareness (51%), time constraints (24%), and uncertainty about eligibility (18%), alongside less common challenges such as transport (9%), language (7%), and accessibility (2%).

Conclusions

Caregivers reported generally positive outcomes regardless of service use, though higher scores among non-service users suggest potential baseline differences in need, resilience, or access to informal support. Findings underscore the importance of raising awareness, clarifying eligibility, and addressing structural barriers to enhance equitable uptake. Incorporating objective developmental and health measures alongside caregiver-reported outcomes will strengthen future evaluations. This study provides evidence to optimise ECEC provision, inform co-designed interventions, and support Family Hub development in socioeconomically diverse contexts.

Background

Early childhood represents a critical time period for cognitive, physical, social, and emotional development, with lifelong implications for health, educational attainment, and socioeconomic outcomes[1,2]. The first five years of life present a window of heightened neuroplasticity, during which environmental influences such as nurturing care, early learning experiences, and supportive parenting practices can alleviate or mitigate the effects of disadvantage and improve long-term trajectories[3,4]. Evidence consistently demonstrates that targeted early years interventions can improve developmental trajectories, strengthen parent–child relationships, and reduce health inequalities[5,6,7]. Consequently, high-quality Early Childhood Education and Care (ECEC) services are increasingly recognised as vital components of public health and social policy, offering benefits that extend beyond individual children to families and communities. Despite this, access to and engagement with ECEC services remain uneven, particularly among socially deprived and ethnically diverse populations[8]. Structural barriers such as socioeconomic disadvantage, limited service awareness, cultural and linguistic differences, and mistrust of statutory services can all contribute to disparities by impeding equitable access. This raises concern as children in lower-income and lower-educated families are more likely to experience developmental delays, poorer educational attainment, and worse health outcomes throughout the life course[9,10,11].

Addressing inequalities in the early years is therefore a key public health priority, with potential to reduce long-term social, educational, and health disparities. National strategies such as the *Women's Health Strategy for England*[12] and the *Core20PLUS5* approach[13] emphasise the importance of culturally responsive, person-centred services that address social determinants of health and promote early intervention. ECEC provision also aligns closely with the objectives of the NHS *Long Term Plan*[14], which prioritises prevention, health protection, and the reduction of inequalities across the life course. These priorities are particularly relevant in Luton, an ethnically diverse town characterised by significant socioeconomic challenges[15]. Luton presents a significant opportunity for examining early years intervention effectiveness and accessibility. The town is characterised by high levels of ethnic diversity, transience, and socioeconomic inequality, with half of the childhood population living in areas within the 40% most deprived in England[15]. Furthermore, low birthweight, obesity, and developmental vulnerabilities at school entry are all above the national average[15]. These factors intersect to create complex needs that require responsive, culturally sensitive, and accessible service provision to effectively meet these needs. Locally delivered ECEC interventions aim to address these challenges by supporting children's development, improving parental confidence and capability, and promoting protective health behaviours through group-based and individualised interventions. As a result, understanding caregiver perceptions of ECEC services is essential for optimising service delivery, improving access, and informing future interventions. Caregivers are often the primary decision-makers regarding service engagement, and their beliefs, experiences, and perceived outcomes can significantly shape utilisation patterns and intervention effectiveness[16]. However, subjective caregiver perceptions do not always

align with objective indicators of child health and development. Research has shown that caregivers frequently overestimate their child's physical activity levels[17], dietary quality[18], and developmental milestones[19], which may obscure unmet needs and limit opportunities for early support. Caregiver engagement is a central determinant of ECEC intervention success. Parents and caregivers shape children's early learning environments and act as mediators of intervention effectiveness. Evidence suggests that caregiver perceptions of service relevance, accessibility, and impact strongly influence their decision to engage and sustain participation[20]. Understanding caregiver perspectives is therefore essential for optimising service design, delivery, and communication strategies. It also provides valuable insight into perceived benefits and limitations of current provision, which can inform co-designed approaches to improve reach and equity.

While numerous studies have evaluated ECEC interventions using developmental or educational outcomes, fewer have explored outcomes from the perspective of caregivers themselves. Such perspectives are crucial, not only for understanding perceived child-level changes, but also for examining broader caregiver-related outcomes such as confidence, motivation, physical health, and parenting capability. These factors are often overlooked yet are critical to the sustainability and scalability of early years interventions. Moreover, caregiver-reported outcomes can shed light on perceived barriers to engagement and areas for service improvement that may not be evident through quantitative child assessments alone. The current study addresses this gap by quantitatively assessing caregiver-perceived outcomes of an ECEC intervention in Luton, with a focus on both child and caregiver domains. By exploring outcomes, barriers, and predictors of service engagement, this research aims to enhance understanding of how caregivers experience ECEC provision, support more equitable service delivery, and generate evidence to guide ECEC intervention optimisation in a highly diverse and socioeconomically complex context.

Methods

Study Design

This study utilised a quantitative design through an analytical cross-sectional survey investigating the score differences in nine caregiver-perceived child outcomes, and eight self-reported caregiver outcomes, each assessed through a five-point Likert scale, whereby 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. An analytical cross-sectional survey was selected as this design enables the researcher to obtain a "snapshot" of the target population at a singular point in time[21]. Likert-scale answers were selected to demonstrate participants' level of agreement with the statement made through their opinions, attitudes or behaviours[22,23]. The construction of this approach exists to address the measurement of a phenomenon by obtaining the participants' perceptions towards a singular variable[24]. The Likert scale has been scrutinised previously, particularly regarding the use of a symmetric scale by employing a 'neutral' option, also coined a middle anchor, due to it increasing the likelihood of selecting the neutral option when the answer is unknown or the participant is unfamiliar with the survey item[22]. However, symmetric scaling provides greater independence to the participant by not enforcing the selection of one side or the other[25]. Furthermore, a five-point Likert scale has been deemed as both the optimal and most commonly adopted approach for response options[26]. A five-point response option was selected due to previous research highlighting that more response options require greater mental effort, thus potentially diminishing the consistency in the quality of responses[27]. For this study, a continuum-based bipolar Likert scale was selected due to this approach enabling the participant to respond both from a 'positive' and a 'negative' viewpoint with the inclusion of a neutral midpoint[28]. The study design was guided by the Critical Appraisal Tool for Cross-Sectional Studies (CAT-CSS)[29].

Recruitment and Eligibility

The study was powered using *G*Power software version 3* to determine medium-sized effects (0.15) by estimating at least 0.80 power and a one-tailed significance level of 0.05. As a result of the calculation performed, the power analyses indicated a minimum sample requirement of N = 114. In order to achieve the minimum required sample size of 114, participants were recruited through a convenience sampling strategy. This approach was selected as it enables the focus to be on one geographical location (Luton), ensuring that potential participants are therefore easily accessible and meet the eligibility criteria. To partake, participants had to be an adult primary caregiver to a child aged 0-5 years that resided in a Luton postcode. A primary caregiver was defined as an adult who provides the majority of the fundamental childcare when at home[30]. Recruitment was conducted through numerous means. Flying Start Luton staff introduced the study to potential participants in each of their sessions either before or after delivery. A digital and physical flyer were created to advertise the study, and these were posted on relevant social media pages, Flying Start Luton intervention delivery locations, local libraries, hospital maternity services, local child nursing team, local general practice surgeries, the University of Bedfordshire campuses and Active Luton/ Total Wellbeing Luton locations. The flyer had a QR code with a link to the online survey, and the contact details of the research team to obtain further information if required. In addition, the survey was advertised at the 'Picnic in the Park' event in Luton, where potential participants who fit the eligibility criteria were in attendance. This event aimed to gain participants who had not accessed the Flying Start Luton intervention.

Procedures and Materials

All data was collected through Qualtrics. The survey was initially piloted with N = 14 individuals. The pilot attempted to include a variety of individuals to represent the general population as closely as possible. This included key stakeholders, academics and individuals who met the inclusion criteria, encompassing different age ranges, ethnicities, education levels, and learning difficulties. Following this pilot testing, feedback was collated and the question regarding number of people within the household was amended by adding a text box to complete this instead of a drop-down list to select from. Once this amendment was made and the survey was published, with a link and QR code being generated and deployed on all advertisements of the study. The data collected through the pilot testing was deleted prior to the commencement of the study and was therefore not included in the final sample Following on from the participant reading the participant information form, and successful completion of the participant consent form providing informed consent, participants demographic data was collected. This data pertained to caregivers age, child age, caregivers' sex, child's sex, household size, caregivers' employment status,

annual household income, caregivers' ethnicity, caregivers' highest level of education completed and household postcode. From the household postcode, the Index of Multiple Deprivation (IMD) was used, reported by quintile (Q1 = highest deprivation, Q5 = lowest deprivation) and decile (D1 = highest deprivation, D10 = lowest deprivation). The proceeding survey items have been detailed in Supplementary Appendix 3. These questions pertained to access to Flying Start Luton intervention, influential factors to engagement with the intervention, and self-reported outcomes for themselves and their perceptions of their child. Responses to these were provided utilising a five-point Likert scale.

The initial recruitment strategy was employed and remained open for 9 months. To ensure recruitment met the target determined through the *G*Power* calculation, the survey link was also downloaded onto the iPads within the ECEC centres, and participants were able to complete this during or after attending any ECEC session. Staff within the ECEC centres were also introduced to the study through their staff team meetings. To obtain participants who were not service users, the researcher attended local events to promote participation in the study and to recruit participants. An iPad was used at the event where participants could complete the survey. In addition, regular social media posts were uploaded and key contacts within the community were emailed on a bi-monthly basis to increase the visibility of the survey to non-service-users.

Ethics

Throughout the process, both the National Health Service National Research Ethics Service Guidance, the Declaration of Helsinki, and the General Data Protection Regulation 2018 were adhered to. The strengthening the Reporting of Observational Studies in Epidemiology (STROBE) 22-item checklist guidance was also followed throughout the reporting[31]. A participant information form and consent form were provided to the participant at the beginning of the survey. Informed consent was provided by all participants. The survey, consent and information document were all administered through Qualtrics, which was accessed through either an online link or a QR code that was automatically generated. No attempts were made to capture any information that was not voluntarily supplied within the online survey; however, all questions were required to be answered to complete the survey. Participants were unable to move forward in the survey until all questions on that page had been completed and a 'prefer not to say 'option was provided. In the event of the participant partially completing the survey, they were removed. Each page of the survey included the option to withdraw from the survey, and participants were able to but not enforced to supply a reason for withdrawal. Upon withdrawal, the data for that participant was removed from the study and deleted immediately. Withdrawing from the survey did not impact the standard of care received. No participants withdrew from the survey. All data supplied by participants was anonymised and a Participant ID was assigned to each dataset to ensure it was non-identifiable.

Data analysis and outcome measures

Data analysis was conducted using *IBM SPSS Statistics version 27*[32]. Statistical significance was set at $p < 0.05$. A between groups analysis of those who have accessed Flying Start Luton's intervention compared to those who have not accessed the intervention was conducted using a two-tailed independent samples *t*-test[33]. In addition, a within group analysis of those who have accessed the Flying Start Luton intervention was conducted to investigate the predictors of caregiver outcomes with nine characteristics (caregiver age, caregiver sex, employment status, ethnicity, postcode, child sex, child age, length of intervention use, number of interventions accessed). This was conducted using a multiple linear regression[32]. The reported barriers to access were deductively coded to the Theoretical Domains Framework (TDF)[34] domains, and then to the relevant Capability, Opportunity, and Motivation to Behaviour (COM-B)[35] model, providing a theory-informed understanding of factors influencing engagement. This was then utilised to identify potential targets for the intervention to focus on to enhance uptake and engagement, informed through the appropriate behaviour change strategies.

Participant characteristics

A total of N = 268 participants responded to the survey. There were n = 123 participants who only partially completed the survey, and n = 13 did not provide a recognisable Luton-based Postcode. Therefore, a total of N = 132 primary caregivers completed the survey and were included in the analysis, exceeding the *G*Power* calculation target of N = 114. The participant characteristics are displayed in Table 1. The sample comprised of n = 87 (65.9%) who had accessed the service, and n = 45 (34.1%) who self-reported to have not used the service. Caregivers had a mean age of 34.4 ± 5.9 years, and their children had a mean age of 2.87 ± 1.64 years with no statistically significant difference between service users and non-service users ($p = .122$ and $p = .495$ respectively). Caregivers were primarily female (92.4%), with an observed statistically significant difference between service users and non-service users (97.7% and 82.2% respectively; $p < .001$). Almost half of the children were female (45.5%), with no statistically significant differences between service users and non-service users ($p = .416$). Regarding caregivers' education levels, 65.15% of the sample held above a Level 4 qualification (≥ foundation degree), with no significant difference between groups. 44.7% of caregivers identified as White, 39.4% as Asian, 5.30% as Black/African/Caribbean, and 6.08% as Mixed. Caregivers' annual income levels were varied but over half of participants (56.8%) reported an annual household income below £40,000. Mean Index of Multiple Deprivation (IMD) scores reflected moderate levels of deprivation (mean decile = 4.37 ± 2.04; mean quintile = 2.47 ± 1.07), with no significant differences between service users and non-service users. Most caregivers were employed (67.43%) or a stay-at-home caregiver (23.48%). Household occupancy averaged 3.72 ± 1.30 individuals, all of which included at least one child aged 0-5 years.

Table 1. Participant Characteristics

Characteristic	Total (N = 132)	Used FSL (n = 87)	Not used FSL (n = 45)	*p* value
Age				
Caregivers, years	34.44 (5.94)	34.46 (5.24)	34.41 (7.18)	.122
Child, years	2.87 (1.64)	2.92 (1.67)	2.53 (1.52)	.495
Sex				
Caregivers, Female	122 (92.42%)	85 (97.70%)	37 (82.22%)	<.001
Child, Female	60 (45.45%)	38 (43.68%)	22 (48.89%)	.416
Caregivers Education				
< High School	1 (0.76%)	1 (1.15%)	0 (0.00%)	
High School Graduate	10 (7.58%)	6 (6.90%)	4 (8.89%)	
Some College	12 (9.09%)	7 (8.05%)	5 (11.11%)	
College Graduate	23 (17.42%)	15 (17.24%)	8 (17.78%)	
Foundation Degree	8 (6.06%)	5 (5.75%)	3 (6.67%)	
Undergraduate Degree	41 (31.06%)	29 (33.33%)	12 (26.67%)	
Postgraduate Degree	34 (25.76%)	22 (25.29%)	12 (26.67%)	
Doctorate	3 (2.27%)	2 (2.30%)	1 (2.22%)	
Ethnicity				
Asian	52 (39.39%)	27 (31.03%)	25 (55.56%)	
Black/African/Caribbean	7 (5.30%)	4 (4.60%)	3 (6.67%)	
Mixed	8 (6.08%)	7 (8.05%)	1 (2.22%)	
Other	3 (2.27%)	2 (2.30%)	1 (2.22%)	
Prefer not to say	3 (2.27%)	2 (2.30%)	1 (2.22%)	
White	59 (44.70%)	45 (51.72%)	14 (31.11%)	
Annual Household Income				
< £20,000	36 (27.27%)	21 (24.14%)	15 (33.33%)	
£20,000 - £39,999	39 (29.55%)	24 (27.59%)	15 (33.33%)	
£40,000 - £59,999	27 (20.45%)	19 (21.84%)	8 (17.78%)	
£60,000 - £99,000	22 (16.67%)	16 (18.39%)	6 (13.33%)	
≥ £100,000	8 (6.06%)	6 (6.90%)	2 (4.44%)	
Index of Multiple Deprivation				
Postcode Decile (n = 119)	4.37 (2.04)	4.38 (2.10)	4.34 (1.92)	.194
Postcode Quintile (n = 119)	2.47 (1.07)	2.47 (1.09)	2.46 (1.01)	.314
Caregivers Employment Status				
Employed Full Time	51 (38.64%)	34 (39.08%)	17 (37.78%)	
Employed Part Time	38 (28.79%)	24 (27.59%)	14 (31.11%)	
Unemployed Looking for Work	3 (2.27%)	2 (2.30%)	11 (2.22%)	
Unemployed Not Looking for Work	6 (4.55%)	4 (4.60%)	2 (4.44%)	
Student	3 (2.27%)	1 (1.15%)	2 (4.44%)	
Stay-at-home Caregiver	31 (23.48%)	22 (25.29%)	9 (20.00%)	
Household Occupancy				
No. ≥ 50% of the time	3.72 (1.30)	3.52 (1.16)	4.11 (1.47)	.072

Data reported as mean (SD) or n (%).

Results

Reported barriers to service use

Among the caregivers who had not accessed the service, a wide range of barriers to accessing the service were reported. The most commonly reported barrier was awareness of the service (51% - TDF-Knowledge; COM-B-Capability). Perceived time constraints (24% (TDF-Behavioural Regulation; COM-B-Capability) and uncertainty regarding eligibility (18% - TDF-Knowledge; COM-B-Capability) were also frequently cited as influential factors. Other reasons included perceptions that they would not benefit from attending (13% - TDF- Beliefs about Consequences; COM-B Motivation), anxiety about attending (11% - TDF- Emotions; COM-B Motivation), lack of access information (11% - TDF-Knowledge; COM-B-Capability), and absence of peer attendance (11% - TDF-Social Influences; COM-B-Opportunity). Other barriers that were less commonly cited but still present included transportation difficulties (9% - TDF-Environmental Context and Resources; COM-B-Opportunity), language barriers (7% - TDF-Environmental Context and Resources; COM-B-Opportunity), and physical accessibility issues (2% - TDF-Environmental Context and Resources; COM-B-Opportunity). Notably, 7% of non-users reported no intentions (TDF-Intentions; COM-B-Motivation) to engage with support services, highlighting possible attitudinal as well as structural barriers.

Perceived child and caregiver outcomes

Analysis of caregiver-reported outcomes indicated significant differences between service users and non-service users. Several outcomes were reported more favourably by non-service users compared to service users. Specifically, child emotional development scores were significantly higher among non-service users compared to service users (p = .006). Among caregiver outcomes, physical health (p = .046), healthy weight (p = .041), capability (p = .048), confidence (p = .003), and motivation (p = .040) were significantly greater among non- service users (see Table 2).

Table 2. Caregiver-perceived outcomes

Caregiver-Reported Outcome	Used FSL (n = 87)	Not used FSL (n = 45)	P value
Child Oral Health	4.30 (1.02)	4.47 (0.73)	.144
Child Healthy Weight	4.47 (0.95)	4.38 (0.96)	.904
Child Physically Active	4.63 (0.82)	4.47 (0.99)	.067
Child Emotional Wellbeing	4.57 (0.76)	4.62 (0.72)	.883
Child Physical Development	4.60 (0.91)	4.53 (1.04)	.400
Child Emotional Development	4.38 (1.09)	4.69 (0.60)	.006**
Child Social Development	4.25 (1.27)	4.44 (0.99)	.161
Child Language Development	4.10 (1.37)	4.38 (1.25)	.308
Caregiver Mental Health	3.98 (1.15)	4.47 (0.82)	.111
Caregiver Physical Health	3.64 (1.15)	4.13 (0.94)	.046*
Caregiver Healthy Weight	3.21 (1.36)	3.73 (1.21)	.041*
Caregiver Role Understanding	4.76 (0.68)	4.80 (0.41)	.358
Caregiver Knowledge	4.64 (0.72)	4.71 (0.59)	.491
Caregiver Capability	4.75 (0.70)	4.76 (0.68)	.048*
Caregiver Confidence	4.62 (0.74)	4.82 (0.39)	.003**
Caregiver Motivation	4.75 (0.74)	4.87 (0.34)	.040*
Caregiver Opportunity	4.71 (0.70)	4.82 (0.44)	.087
Caregiver-Child Relationship	4.79 (0.67)	4.89 (0.32)	.073
Caregiver-Child Positive Interactions	4.78 (0.67)	4.80 (0.66)	.809

Data reported as mean (SD)

The Analysis of variance (ANOVA) further revealed significant group effects for outcomes including child oral health (p = .018), child healthy weight (p = .007), child physical activity (p = .003), child emotional wellbeing (p = .016), and child physical development (p = .011). Additionally, caregiver outcomes such as capability (p < .001), confidence (p < .001), motivation (p = .001), opportunity (p < .001), and caregiver-child positive interactions (p < .001) demonstrated significant differences favouring non-service users (see Table 3). Although these differences were statistically significant, it should be noted that the magnitude of difference was relatively small, with mean scores for all outcomes exceeding 4 on a 5-point scale across both groups, and that service use was self-reported and may not be accurate.

Table 3. ANOVA statistics of caregiver-perceived outcome data

ANOVA Variable	F Value	*p* value
Child Oral Health	2.305	.018*
Child Healthy Weight	2.657	.007*
Child Physically Active	2.998	.003**
Child Emotional Wellbeing	2.399	.016*
Child Physical Development	2.491	.011*
Child Emotional Development	1.478	.160
Child Social Development	1.437	.177
Child Language Development	1.091	.388
Caregiver Mental Health	1.257	.271
Caregiver Physical Health	1.074	.403
Caregiver Healthy Weight	0.989	.476
Caregiver Role Understanding	3.669	<.001**
Caregiver Knowledge	3.530	<.001**
Caregiver Capability	3.128	.002**
Caregiver Confidence	3.294	.001**
Caregiver Motivation	3.217	.001**
Caregiver Opportunity	3.880	<.001**
Caregiver-Child Relationship	4.078	<.001**
Caregiver-Child Positive Interactions	4.168	<.001**

Sociodemographic and Service User Predictors

The multiple linear regression analyses were restricted to caregivers who had accessed the service (n = 87) to explore sociodemographic and service use predictors of caregiver-perceived outcomes. Higher levels of area deprivation measured through were associated with better caregiver-reported outcomes for child oral health through both the IMD quintile (β = 1.498, 95% CI [0.292, 2.341], p = .013) and IMD decile (β = -1.554, 95% CI [-1.290, -0.180], p = .010). Caregiver sex was a consistent predictor of outcomes across multiple outcomes. Female caregivers were associated with significantly lower reports of child oral health (β = -0.440, p < .001), child healthy weight (β = -0.472, p < .001), child physical activity (β = -0.469, p < .001), child emotional wellbeing (β = -0.510, p < .001), child physical development (β = -0.460, p < .001), child social development (β = -0.314, p = .019), child language development (β = -0.316, p = .019), caregivers physical health (β = -0.287, p = .038), caregivers role understanding (β = -0.571, p < .001), caregivers knowledge (β = -0.498, p < .001), caregivers capability (β = -0.542, p < .001), caregivers confidence (β = -0.498, p < .001), caregivers motivation (β = -0.498, p < .001), caregivers opportunity (β = -0.513, p < .001), caregivers relationship with child (β = -0.573, p < .001) and caregivers positive interactions with child (β = -0.590, p < .001). Caregivers' education was also a predictor of better caregiver reported outcomes for child healthy weight (β = -0.324, p < .013), and child physical activity (β = -0.290, p < .022). Other sociodemographic variables including caregivers' age, child age, employment status, ethnicity, and household occupancy, household income, service use duration and number of services used demonstrated no consistent pattern of association with outcomes. Regression coefficients for all predictors are displayed in Table 4.

Table 4. Predictors of caregivers-perceived outcomes

Characteristic	C.Age	ChAge	Occupancy	IMD-D	IMD-Q	Income	C.Sex	Ch.Sex	Ethnicity	Education	Employment	FSL Dur
Oral Health												
Beta Value	0.099	-0.036	0.173	-1.554	1.498	-0.158	-0.440	-0.080	0.182	0.170	0.058	-0.0
95% CI Lower	-0.034	-0.169	-0.073	-1.290	0.292	-0.371	-5.320	-0.662	-0.032	-0.051	-0.097	-0.0
95% CI Upper	0.072	0.127	0.352	-0.180	2.341	0.125	-1.548	0.342	0.185	0.242	0.153	0.0
P Value	0.473	0.777	0.193	0.010**	0.013*	0.322	<0.001**	0.524	0.161	0.197	0.658	0.8
Healthy Weight												
Beta Value	-0.003	-0.061	0.254	-0.493	0.510	-0.055	-0.472	0.091	0.146	0.324	0.009	0.0
95% CI Lower	-0.050	-0.173	-0.001	-0.745	-0.528	-0.273	-5.321	-0.296	-0.042	-0.038	-0.113	-0.0
95% CI Upper	0.049	0.105	0.397	0.295	1.392	0.191	-1.788	0.645	0.161	0.313	0.121	0.0
P Value	0.984	0.625	0.051	0.389	0.371	0.723	<0.001**	0.460	0.244	0.013*	0.945	0.6
Physically Active												
Beta Value	-0.062	0.127	0.132	-0.137	0.115	0.154	-0.469	0.069	0.047	0.290	0.169	0.1
95% CI Lower	-0.059	-0.063	-0.089	-0.556	-0.818	-0.108	-5.122	-0.318	-0.078	0.023	-0.035	-0.0
95% CI Upper	0.036	0.201	0.290	0.433	1.008	0.334	-1.761	0.577	0.115	0.284	0.188	0.0
P Value	0.634	0.299	0.291	0.805	0.836	0.311	<0.001**	0.563	0.698	0.022*	0.173	0.4
Emotional Wellbeing												
Beta Value	0.030	-0.151	-0.023	-0.367	0.322	0.174	-0.510	0.028	0.054	0.025	0.183	-0.0
95% CI Lower	-0.040	-0.200	-0.197	-0.620	-0.630	-0.095	-4.998	-0.380	-0.073	-0.113	-0.031	-0.0
95% CI Upper	0.050	0.051	0.165	0.324	1.113	0.326	-1.790	0.474	0.112	0.137	0.182	0.0
P Value	0.829	0.240	0.859	0.531	0.580	0.277	<0.001**	0.825	0.676	0.849	0.160	0.9
Physical Development												
Beta Value	-0.044	0.060	0.162	0.311	-0.224	0.096	-0.460	0.125	0.015	0.103	0.185	0.0
95% CI Lower	-0.057	-0.104	-0.074	-0.375	-1.132	-0.159	-5.118	-0.231	-0.094	-0.032	-0.032	-0.0
95% CI Upper	0.041	0.169	0.319	0.651	0.762	0.299	-1.631	0.697	0.106	0.106	0.199	0.0
P Value	0.747	0.636	0.215	0.592	0.697	0.542	<0.001**	0.318	0.904	0.425	0.151	0.6
Emotional Development												
Beta Value	-0.001	-0.102	0.039	-0.262	0.190	0.090	-0.371	-0.011	-0.021	0.124	0.257	0.0
95% CI Lower	-0.065	-0.247	-0.223	-0.817	-1.060	-0.223	-5.581	-0.637	-0.142	-0.099	-0.012	-0.0
95% CI Upper	0.065	0.114	0.295	0.536	1.439	0.382	-0.981	0.588	0.122	0.258	0.293	0.0
P Value	0.996	0.460	0.783	0.679	0.762	0.600	0.006**	0.937	0.878	0.377	0.070	0.9
Social Development												
Beta Value	-0.132	-0.143	-0.051	-0.220	0.107	0.044	-0.314	-0.105	-0.069	0.179	0.060	0.0
95% CI Lower	-0.113	-0.330	-0.369	-0.956	-1.377	-0.317	-6.101	-1.023	-0.199	-0.079	-0.144	-0.0
95% CI Upper	0.043	0.105	0.255	0.673	1.632	0.411	-0.562	0.452	0.120	0.252	0.233	0.0
P Value	0.376	0.303	0.717	0.728	0.866	0.797	0.019*	0.441	0.620	0.208	0.666	0.5
Language Development												
Beta Value	-0.175	-0.124	-0.108	-0.506	0.508	-0.017	-0.326	-0.162	-0.087	0.173	0.094	0.0
95% CI Lower	-0.136	-0.347	-0.475	-1.257	-1.022	-0.424	-6.802	-1.293	-0.231	-0.097	-0.138	-0.0
95% CI Upper	0.037	0.137	0.220	0.557	2.327	0.386	-0.637	0.348	0.123	0.382	0.270	0.0
P Value	0.259	0.389	0.465	0.442	0.438	0.926	0.019*	0.253	0.544	0.239	0.517	0.7

C. Mental Health												
Beta Value	-0.141	-0.047	0.108	0.337	-0.642	0.160	-0.227	-0.061	0.123	0.121	0.135	0.0
95% CI Lower	-0.107	-0.237	-0.183	-0.563	-2.114	-0.185	-4.805	-0.843	-0.084	-0.116	-0.091	-0.0
95% CI Upper	0.039	0.170	0.401	0.961	0.702	0.496	0.380	0.537	0.214	0.286	0.263	0.0
P Value	0.354	0.740	0.457	0.602	0.319	0.363	0.093	0.658	0.386	0.401	0.347	0.8
C. Physical Health												
Beta Value	-0.231	-0.054	0.139	-0.118	0.023	-0.043	-0.287	0.085	0.139	0.264	0.045	0.0
95% CI Lower	-0.127	-0.239	-0.152	-0.823	-1.370	-0.378	-5.291	-0.477	-0.076	-0.019	-0.143	-0.0
95% CI Upper	0.018	0.164	0.426	0.688	1.419	0.296	-0.157	0.890	0.219	0.380	0.197	0.0
P Value	0.139	0.709	0.347	0.858	0.972	0.808	0.038*	0.546	0.336	0.075	0.754	0.6
C. Healthy Weight												
Beta Value	-0.163	-0.147	0.134	0.028	-0.224	0.084	-0.138	0.007	-0.049	0.096	0.156	0.2
95% CI Lower	-0.127	-0.349	-0.182	-0.850	-1.875	-0.298	-4.441	-0.766	-0.198	-0.155	-0.091	-0.0
95% CI Upper	0.040	0.114	0.483	1.330	1.330	0.478	1.459	0.805	0.141	0.304	0.299	0.0
P Value	0.299	0.312	0.367	0.966	0.734	0.643	0.315	0.960	0.733	0.516	0.290	0.1
C. Role Understanding												
Beta Value	-0.135	0.074	0.140	0.230	-0.293	0.064	-0.571	0.023	0.106	0.120	0.163	0.1
95% CI Lower	-0.057	-0.071	-0.061	-0.304	-0.916	-0.135	-4.769	-0.316	-0.041	-0.050	-0.026	-0.0
95% CI Upper	0.017	0.137	0.236	0.472	0.517	0.212	-2.131	0.387	0.110	0.155	0.148	0.0
P Value	0.283	0.525	0.241	0.665	0.578	0.657	>0.001**	0.841	0.365	0.311	0.168	0.1
C. Knowledge												
Beta Value	-0.132	-0.029	0.164	0.534	-0.613	0.073	-0.498	-0.048	0.208	0.076	0.214	0.0
95% CI Lower	-0.060	-0.122	-0.049	-0.204	-1.186	-0.136	-4.513	-0.446	-0.009	-0.073	-0.009	-0.0
95% CI Upper	0.018	0.095	0.263	0.610	0.319	0.228	-1.744	0.291	0.150	0.142	0.175	0.0
P Value	0.295	0.801	0.174	0.321	0.252	0.615	<0.001**	0.675	0.081	0.526	0.075	0.6
C. Capability												
Beta Value	-0.137	0.059	0.134	0.334	-0.412	0.105	-0.542	-0.009	0.118	0.104	0.160	0.1
95% CI Lower	-0.061	-0.084	-0.073	-0.290	-1.060	-0.121	-4.800	-0.392	- 0.042	-0.063	-0.032	-0.0
95% CI Upper	0.019	0.139	0.246	0.543	0.479	0.252	-1.967	0.362	0.121	0.157	0.155	0.0
P Value	0.291	0.622	0.279	0.545	0.452	0.483	<0.001**	0.938	0.329	0.396	0.194	0.3
C. Confidence												
Beta Value	-0.185	0.020	0.096	0.488	-0.657	0.146	-0.498	-0.109	0.001	0.069	0.220	0.1
95% CI Lower	-0.070	-0.104	-0.098	-0.233	-1.257	-0.096	-4.640	-0.561	-0.082	-0.080	-0.008	-0.0
95% CI Upper	0.011	0.122	0.226	0.613	0.306	0.283	-1.763	0.205	0.205	0.144	0.182	0.0
P Value	0.152	0.869	0.432	0.372	0.228	0.325	<0.001**	0.355	0.994	0.570	0.072	0.3
C. Motivation												
Beta Value	0.025	-0.016	0.113	0.252	-0.432	0.053	-0.498	-0.177	0.087	0.149	0.180	0.0
95% CI Lower	-0.038	-0.125	-0.090	-0.338	-1.134	-0.161	-4.795	-0.595	-0.055	-0.045	-0.025	-0.0
95% CI Upper	0.046	0.110	0.246	0.540	0.489	0.231	-1.808	0.200	0.117	0.187	0.173	0.0
P Value	0.845	0.895	0.357	0.646	0.429	0.723	<0.001**	0.323	0.471	0.224	0.141	0.7
C. Opportunity												
Beta Value	-0.058	0.043	0.189	0.100	-0.175	0.064	-0.513	-0.148	0.180	0.087	0.189	0.0
95% CI Lower	-0.046	-0.085	-0.029	-0.354	-0.845	-0.136	-4.504	-0.588	-0.016	-0.065	-0.016	-0.0

95% CI Upper	0.029	0.124	0.271	0.429	0.602	0.214	-1.841	0.121	0.137	0.142	0.160	0.0
P Value	0.639	0.707	0.112	0.848	0.737	0.653	<0.001**	0.192	0.121	0.458	0.106	0.7
Relationship												
Beta Value	-0.148	0.042	0.143	0.301	-0.393	0.039	-0.573	-0.115	0.165	0.200	0.068	0.0
95% CI Lower	-0.058	-0.082	-0.055	-0.268	-0.965	-0.145	-4.748	-0.519	-0.020	-0.013	-0.060	-0.0
95% CI Upper	0.014	0.120	0.234	0.488	0.431	0.192	-2.180	0.165	0.128	0.187	0.110	0.0
P Value	0.255	0.708	0.221	0.561	0.445	0.782	<0.001**	0.303	0.149	0.086	0.552	0.7
Positive Interactions												
Beta Value	-0.164	0.083	0.142	0.504	-0.576	0.061	-0.590	-0.001	0.132	0.136	0.099	0.1
95% CI Lower	-0.059	-0.062	-0.054	-0.187	-1.061	-0.128	-4.729	-0.333	-0.030	-0.039	-0.047	-0.0
95% CI Upper	0.011	0.134	0.227	0.547	0.295	0.200	-2.233	0.331	0.144	0.155	0.119	0.0
P Value	0.179	0.459	0.221	0.328	0.262	0.659	<0.001**	0.996	0.243	0.237	0.384	0.2

Discussion

Summary of evidence

This study aimed to explore caregiver-reported outcomes in relation to service use of an Early Childhood Education and Care intervention in Luton. Participant characteristics indicated that except from caregiver sex, there were no significant differences in participant characteristics between caregivers who had accessed the service and those who had not, with a greater proportion of male caregivers among the non-service users' group. This indicates that although the sample size differed between groups, demographic profiles were generally comparable, thus minimising the likelihood that differences in outcomes were attributable to sociodemographic variables. In addition, 65% of the sample held above a Level 4 qualification (≥ foundation degree), which is higher than both the national and Luton levels of 33.8% and 29.8% respectively reported by the Office for National Statistics in 2023. The high proportion of caregivers with higher education may have influenced the results due to the ever-present correlations between caregiver education attainment and child health and development outcomes[16,36,37].

Although the groups are relatively homogeneous regarding demographic profiles, the circumstantial factors between the groups and the individual circumstances of each participant were not captured. In particular, the mean caregiver-reported outcomes were relatively high across both service users and non-users, with mean scores exceeding four out of five on the Likert scale for the majority of child and caregiver outcomes. While this finding suggests good outcomes for families regardless of service engagement, this is conflicting to a multitude of objective data previously reported in Luton which indicated low levels of child health and development. However, this discrepancy aligns with previous research, which demonstrates that caregivers' perceptions do not always accurately reflect objective child outcomes, with consistent prevalence of misalignment and discrepancies. For example, one study identified that 87% of parents whose 5–6-year-old children did not meet the physical activity guidelines believed their child was sufficiently active, thus overestimating their activity levels[38]. Another study emphasized parents' perceptions of their child's diet to be inaccurate reflections of the child's actual intake and quality[39]. For child developmental outcomes, further research demonstrated that almost 50% of parents overestimated their 16-42-month-old child's developmental abilities when using parents' perception through a ladder ranking scale compared to their children's outcomes from the Ages and Stages Questionnaire: Inventory[40]. As a result, the use of caregiver-reported data may introduce positive bias, potentially masking the underlying needs in this location for support and interventions and potentially justifying the high mean caregiver-reported outcomes. However, this could simultaneously suggest that those who perceive themselves to have a high level of need by accessing an intervention, have similar perceived outcomes to those who perceive themselves to not require an intervention, thus through this lens, would be an indication of a positively impactful intervention.

Regarding ethnicity representation, it is key to note that whilst the composition of the study sample generally reflects the ethnic diversity of Luton, this vastly differed from the national averages, therefore supporting the contextual relevance of the findings due to Luton being a highly transient and diverse Town[15]. Caregivers identifying as White, or Mixed were proportionately represented, but Asian caregivers were slightly overrepresented (39.4% vs 32.7%) and Black/African/Caribbean caregivers were slightly underrepresented (5.3% and 9.8%) in relation to the population of Luton. A nominal percentage of the sample (2.3%) stated they would prefer not to disclose their ethnicity; however, this is unlikely to have impacted the representativeness.

Moreover, the finding that non-service users reported more favourable outcomes than service users is contradictory and therefore warrants further investigation. The findings highlighted that several outcomes (child emotional development, caregiver physical health, caregiver healthy weight, caregiver capability, caregiver confidence and caregiver motivation) were significantly greater in non-service users than service users. One possible explanation may be that the need for support in service users is greater than those who have not used the service. Those who have used the service may have been experiencing greater challenges and therefore lower self-reported outcomes at the time of the survey. It is also possible that the non-service users may have had greater existing support networks or resilience that enabled them to maintain higher levels of wellbeing without intervention. This highlights the importance of accounting for baseline differences in need when interpreting comparative outcomes between service users and non-service users.

One key consideration from these findings is the self-reported nature of service use. Awareness of the service was stated as the most common barrier to access among non-users, with over half reporting limited knowledge of the service. This elicits the potential that some caregivers may have accessed and attended aspects of the intervention without recognising them as part of the services offer, leading to possible misclassification when self-reporting. Service awareness as a barrier to accessing a service is reflected in other research across this specific location, ranging from service use of an integrated obesity and mental health programme[41], to service use of an integrated care programme for older people with frailty[42].

Furthermore, the caregivers use of a different ECEC or other type of intervention, service or support was not considered. This, in turn, may have influenced the between-group comparisons conducted in this study and further accentuates the challenges of utilising participants self-report to determine service exposure. It is also possible that families perceiving fewer developmental concerns may have been less likely to seek out services or support, which was apparent in the barriers to service use, whereby 7% of non-service users reported having no intention of accessing support. This therefore may more greatly reflect the self-selection bias as opposed to a representative reflection of the intervention's effects. This therefore limits the extent to which studies of this nature utilising self-reported outcomes in specific geographical locations can be generalised to the wider population.

The barriers reported by caregivers have been interpreted through the COM-B[34] model and TDF[33], identifying how limitations in capability, opportunity and motivation may influence engagement. The most prominent barriers were a lack of awareness of the service, uncertainty regarding eligibility, and lack of information on how to access the service, all of which were mapped to the capability domain in the COM-B model and the knowledge domain in the TDF. This suggests that utilising peer modelling, improving communication and increasing education about the service may enhance caregivers' knowledge to overcome this barrier. Furthermore, perceived time constraints were mapped to the behavioural regulation domain of the TDF, indicating challenges with integrating service use into existing routines. This indicates that supporting to restructure the local environment to make it easier to fit in and increasing enablement by supporting individuals with action planning and social support. Some perceived barriers were also mapped to the motivation domain of the COM-B model, including anxiety about participation, no intention of engaging and perceiving no benefits from the service. These could potentially be overcome with coercion, training, persuasion and credible sources. In addition, opportunity-related barriers were also reported, including the absence of peers attending, transport, language barriers and accessibility issues. These barriers could be overcome through incentivisation, education, and persuasion. Together, these findings demonstrate that barriers to service uptake are multifactorial and span across all components of COM-B, indicating that efforts to enhance uptake should utilise peer modelling, incentives, education, coercion, training, credible sources and persuasion.

The findings in this study should be interpreted with strong consideration to the prevalent real-world complexities of service delivery in the context of early childhood education and care[43,44]. ECEC interventions are influenced by a range of contextual, organisational, and individual factors that may not be fully captured in cross-sectional analyses, particularly so when giving additional consideration to the transient and socioeconomically diverse nature of Luton. The observed variations in service awareness, engagement, and perceptions, alongside the potential overlapping involvement in other services and support, emphasises that such interventions are rarely implemented with the absence of contextual influences. This reflects broader challenges previously highlighted within implementation science, where interventions are often influenced by changing local needs, competing interventions, and system-level restrictions including workforce capacity and funding[45,46,47].

This study raises several key considerations and recommendations for future research and practice. Firstly, future research should ensure to incorporate validated, objective measures of health and development indicators alongside caregiver-reported measures, using data triangulation offer a more nuanced insight into interventions effectiveness. In conjunction, continual integrated monitoring and feedback mechanisms should be employed to provide a more comprehensive insight over time as opposed to a cross-sectional design. ECEC services should aim to enhance the communication strategies to families, particularly by increasing awareness and visibility of the interventions, and clarifying the pathways, access points and eligibility criteria. In support of this, ensuring cross-collaboration with the Family Hub and geographical-bordering service providers could assist with reducing misconceptions and increasing caregivers' recognition of the services intervention components; this could also be improved by leveraging trusted community members to support uptake within the diverse and transient communities. Furthermore, the application of co-designing interventions, ensuring they are flexible and responsive to family's needs may mitigate or reduce the identified structural barriers to access such as transport and time constraints. Finally, caregiver's self-efficacy, including confidence, capability and motivation) could be an area of priority to target within intervention provision, given its potential to influence engagement and perceived outcomes.

Strengths and Limitations

This study offers valuable insights into service use patterns, perceived outcomes, and barriers to engagement within an ECEC context. The study employed a relatively large sample size which exceeded the power calculation target, supporting the reliability of group comparisons. This is the first study to explore caregivers-reported outcomes of an ECEC intervention in Luton through the lens of service optimisation. By including both service-users and non-service users, a broader reflection of access and perspectives on the service could be captured, illuminating barriers and comparing perceptual outcomes.

Albeit that this research provides valuable insight into caregivers' perceptions of an ECEC intervention's impact, there are several limitations that must be acknowledged. Firstly, there is a potential for bias within the results, as all outcome data were caregiver-reported and subjective in nature. This also reflects limitations surrounding the generalisability of the data due to being self-reported and in one geographical location. Also, the implementation of Likert scales, while a common practice when obtaining caregivers perceptions, may have increased the susceptibility to recall bias and social desirability bias. Additionally, the cross-sectional design of the survey limits the interpretation to a single time point, providing only a 'snapshot' into perceived effects rather than a more accurate longitudinal understanding and insight. Although considerable efforts were made to recruit a demographically representative sample of Luton, full representation cannot be guaranteed due to the utilisation of convenience sampling. Finally, while the survey instrument was co-developed with stakeholders and pilot-tested prior to deployment to ensure its efficacy, it does not constitute a validated tool, which may affect the generalisability and comparability of the findings.

Conclusion

This study provides new insights into caregiver-reported outcomes associated with an Early Childhood Education and Care intervention in Luton. Although no major differences in participant characteristics were observed between service users and non-users, aside from caregiver sex, the findings highlight barriers to and the complexity of accurately capturing service engagement and outcomes through self-report methods. Mean caregiver-reported outcomes were relatively high across both groups, contrasting with objective data reported elsewhere, and emphasizing the potential limitations and required considerations when utilising caregiver perceptions and self-reported evaluation measures. This study accentuates the importance of quality service outreach to improve caregivers' awareness and recognition of services, and the strengthening of objective outcome monitoring in service evaluations. Future research would benefit from incorporating validated, objective measurement tools and health indicators into evaluations alongside self-reported measures to build a more comprehensive understanding of the intervention effectiveness and validate the caregivers' perceptions.

Declarations

Ethics approval: Ethics approval from the University of Bedfordshire Research Ethics Committee was sought prior to any data being collected (IHREC1023).

Consent for Publication: Each participant provided informed consent as part of the survey

Availability of data: All data is available by contacting the corresponding author.

Competing Interests: The authors declare that they have no competing interests

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Author Contributions: JW completed the data collection, data analysis, and write-up. GR, AC and YP all contributed to the write-up and revisions

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