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Local area variation in health visiting contacts across England for children under age 5: a cross-sectional analysis of administrative data in England 2018–2020

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Abstract

Background
The health visiting service in England leads the government's Healthy Child Programme (HCP) for children under five years. Local authorities and their provider partners deliver this service differently across England.

Objective
To describe local authority variation in the delivery of health visiting to children under five years in England (2018-2020).

Methods
We used publicly available statistics on mandated health visiting contacts, and administrative data from the Community Services Dataset (CSDS) on duration, location, and medium of contacts. We mapped population coverage of mandated contacts (new birth visit, 6-8-week review, one-year review, and 2-2½ -year review) and described the frequency and characteristics of mandated and additional contacts across local authorities.

Results
Based on publicly available data, almost all eligible children received their new birth visit, 6-8-week review and one-year review (89%–99%), with substantial variation across local authorities in children receiving the 2-2½ -year review: median 81%, range 33%–98%. Based on CSDS, 80% of local authorities (n=46/57) delivered more additional than mandated contacts: a median of 1.6 additional contacts (range: 0.1–8.5) were delivered for each mandated contact. There was also significant variation in the duration of contacts and the percentage of contacts delivered face-to-face and at home.

Conclusions
Despite decreases in funding and workforce since 2015, in 2018–2020, health visiting teams reached nearly all babies and most children face-to-face via mandated contacts, and conducted over one and a half times the number of additional contacts relative to mandated contacts, with variation between local areas. This represents a significant public health infrastructure to support the health and development of babies and children and the wellbeing of their families in the critical period before school. Our study highlights the importance of taking into account additional contacts. Further work is needed to understand variation, including in the way additional contacts are used.

Keywords
health visiting; healthy child programme; early years; public health service; proportionate universalism

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Introduction

The health visiting service in England leads the delivery of the government's Healthy Child Programme (HCP) for children under five. The HCP comprises a universal preventative service along with targeted support for families with higher need [1–4]. Health visiting teams are made up of health visitors (specialist community public health nurses), community staff nurses, nursery nurses, health care assistants, and other specialist health professionals [2–4].

In England, health visiting teams are mandated to provide five universal health reviews: during the third trimester of pregnancy (health promoting visit), when the child is age 10-14 days (new birth visit), 6-8 weeks (6-8-week review), 12 months (one-year review), and 2-2$^1/_2$ years (2-2$^1/_2$ -year review), each with a schedule of health promotion activities and with a review of health and development of the child within their family context (Supplementary Material A, Appendix Table 1) [3]. These mandated contacts provide an opportunity for health visiting teams to identify children and families in need of additional support [3], which can comprise additional contacts and/or referrals of the child and family to specialist services [2, 3]. Additional contacts might include support for the continuation of breastfeeding, advice on safer sleep, support for nutrition and accident prevention, or advice on managing minor illnesses [3].

From 2015, the responsibility for commissioning public health services for children aged 0–5, including health visiting, was transferred from the NHS to local authorities [5]. Local authorities and their provider partners have faced funding cuts, low numbers of health visiting staff and high levels of family need, putting pressure on the service [4, 6–8]. Case studies and surveys have shown that local authorities have responded differently to these challenges, leading to variations in models of service delivery, priorities, and capacity [2, 7, 9].

NHS Digital established the Community Service Dataset (CSDS) in 2015, an individual, population-level dataset on the provision of all publicly funded community health services in England to individuals of all ages. Data collected in CSDS includes patients' personal and demographic characteristics, social circumstances, immunisations, breastfeeding and nutrition, care and screening activities, diagnoses (including long-term conditions and disabilities), scored assessments, and weight management services [10]. CSDS provides detailed information on how health visiting contacts are delivered, including the medium (e.g., face-to-face or over the phone), location (e.g., in health centres or at home), and duration of contacts [11], but previous studies have shown that data in CSDS is incomplete and submitted inconsistently over time in some local authorities [12].

To date, there have been two analyses of health visiting using CSDS. One study focused on variation in coverage and average number of health visiting contacts for children aged 2 years in 2018–19, by child-level characteristics (ethnicity, deprivation, and child vulnerability markers) [13]. This study found that children living in the most deprived neighbourhoods or with vulnerability markers (e.g. Looked After Child) were less likely to receive their 2–2$^1/_2$ year health and developmental review than other children but when all additional contacts were included, the pattern was reversed (deprivation) or disappeared (Looked After Children). There were no clear patterns by ethnicity and no analyses of local authority variation [13]. The second study reported similar results, based on a wider age range of children (birth to 3 years) and for two years of data (2018-20) and also reported high variation between local authorities in the proportion of mandated contacts conducted at home [14].

However, evidence is scarce on the variation in delivery of additional contacts and the medium, location, and duration of health visiting contacts across local authorities. Our study aims to provide this evidence for children under five years in England between 2018 and 2020.

Methods

Data sources

Health visiting service delivery metrics (Health visiting metrics)

Health Visiting metrics are published by the Office for Health Improvement and Disparities (OHID), who report local authority-level, quarterly experimental statistics on health visiting service delivery, including the number of each mandated contact delivered and the number of eligible children [15–17]. These quarterly, aggregate data are collected from commissioners of health visiting services in each local authority [18]. Health Visiting metrics provide the most accurate figures on the coverage of mandated contacts by local authorities but do not include information on additional contacts or the format and duration of contacts. For each of the four postnatal mandated contacts, we extracted the number completed and the number of eligible children in each local authority in England for the two financial years from April 2018 to March 2020. As these data are experimental, we carried out additional validation and cleaning to correct reporting errors [19]. We derived coverage of mandated contacts based on these Health Visiting metrics data.

Community services dataset

We used the patient demographic characteristics and health visiting activity data available in the CSDS [17, 20]. Data for the earliest years of this newly collected dataset are largely incomplete, so we extracted data from CSDS for the two financial years from April 2018 to March 2020 [21]. While data were also available between April 2020 and March 2021, we did not analyse these data due to the impact of the COVID-19 pandemic on both service delivery and data recording. We identified mandated health visiting contacts using the "Activity Type" flag entered by the practitioner [19]. Where the Activity Type was missing (30% of records), we identified any health visiting contact that took place within a plausible time window for each mandated contact (Supplementary Material A, Appendix Table 2). Additional contacts (i.e., health visiting contacts not defined as mandated) were identified for children up to 5 years old using the "Service or Team Type" variable indicating the health visiting service. We excluded contacts that were not attended.

We assessed the completeness of CSDS at the local authority-quarter level by comparing the aggregate number of each type of postnatal mandated contact to the Health

Visiting metrics (i.e., using the Health Visiting Metrics as reference data). In previous work, we have found that the Health Visiting Metrics data is consistent with locally held records, supporting our assumptions about its accuracy [12, 13]. We selected those local authority-quarters for which all four mandated contacts had high agreement (within $+/-15\%$) between the Health Visiting metrics and the CSDS to create an analysis dataset [19]. There were 149 local authorities (health visiting in City of London is delivered by Hackney and Isles of Scilly by Cornwall), each contributing up to 8 quarters of data, resulting in a maximum of 1,192 local authority quarters possible for analysis. We identified 57 local authorities (contributing 164 quarterly data points) that had high agreement with the Health Visiting metrics and were therefore included in the analysis dataset (Supplementary Material A, Appendix Table 3). This means that we have "snapshot" data by quarter for local authorities (Supplementary Material A, Appendix Figure 1). Further data cleaning is described in Supplementary Material B.

Indicators of health visiting delivery

We derived a set of local authority-level indicators for each type of health visiting contact (Table 1). For local authorities with multiple quarters included in the study sample, we pooled data across quarters and then described the median and range of these indicators across local authorities. Most of the indicators require individual-level data to be derived and were therefore only available for the 57 local authorities in our study sample. Due to missing data, we could not derive indicators for some local authorities, as highlighted in Table 1.

Analysis

We mapped the geographical distribution of the coverage of mandated contacts and plotted the number of additional contacts per mandated contact against the estimated number of children under five years in mid-2019 published by the Office for National Statistics (ONS) [22]. We used box plots to visualise variation in the medium (face-to-face or telephone) and locations (at home, health and social settings, or children's centres) of health visiting delivery for both mandated and additional contacts across local authorities. All counts of contacts from CSDS have been rounded to the nearest 5 to comply with NHS statistical disclosure rules for subnational data [23].

Results

Study sample

Information on coverage of health visiting contacts was available for all 149 local authorities in England. Other contact characteristics were available for 57 local authorities with complete CSDS data on health visiting (the analysis dataset). These 57 included local authorities were similar to those not included, based on region, urban/rural status, and level of deprivation (Table 2).

There were 4,172,835 mandated contacts delivered to children aged 0-5 years between April 2018 and March 2020 in the 149 local authorities, recorded in the Health Visiting metrics (Supplementary Material A, Appendix Table 4). In the study sample for the same period, we included 1,779,155 contacts from 57 local authorities (Supplementary Material A, Appendix Table 4).

Coverage of mandated contacts (Health visiting metrics)

Coverage of the new birth visit was highest (median coverage of 98.5%, range: 89.9%–100.0%), followed by the 6-8-week review (median: 88.6%, range: 17.9%–100.0%) and one-year review (median: 88.8%, range: 19.9%–98.9%; Figure 1). The 2-2$^1/_2$ -year review had relatively lower coverage (median: 81.4%, range: 33.1%–97.5%). For 29 (19.5%) local authorities, $>$20% of eligible children were not recorded as receiving the 6-8-week review. For 26 (17.4%) local authorities, $>$20% of eligible children were not recorded as receiving the one-year review. For 68 (45.6%) local authorities, $>$20% of eligible children were not recorded as receiving the 2-2$^1/_2$ -year review and in 5 local authorities, $>$50% of eligible children were not recorded as having the 2-2$^1/_2$ -year review.

Additional contacts (analysis CSDS data)

Most local authorities (n = 46/57, 80%) reported conducting more additional contacts than mandated contacts, with a median of 1.6 additional contacts delivered per mandated contact and wide variation across local authorities (range 0.1–8.5, Figure 2). The number of additional contacts per mandated contact varied between 0.6–2.8 in 80% of local authorities, indicating that this variation was not due to a small number of outlying local authorities.

Medium (analysis CSDS data)

The majority ($>$96%) of mandated contacts were delivered face-to-face (Figure 3). Most additional contacts were also delivered face-to-face (median 82.7%, range: 47.6%–99.5%). About half of local authorities (n=23, 44.2%) offered $>$20% of additional contacts virtually. Phone calls were also used to deliver additional contacts: 34 local authorities (65%) delivered $>$10% of additional contacts through phone calls. Other mediums, including telemedicine, email, and messages, were rarely used for mandated or additional contacts, with $<$3% delivered through these mediums.

Location (analysis CSDS data)

New birth visits and 6-8-week reviews predominantly took place in the home setting, but there was substantial variation in the location of one-year reviews, 2-2$^1/_2$ -year reviews and additional face-to-face contacts (Figure 3).

Duration (analysis CSDS data)

Mandated contacts were typically longer than additional contacts (Table 3), but high variation existed across local authorities. Face-to-face contacts were longer than phone call contacts. In half of the local authorities with available data on duration (25 out of 50), 65% of new birth visits were at least an hour long, but most local authorities delivered more

Table 1: Description of local authority level indicators of health visiting delivery

Indicator	Description	Number of local authorities with available data	Data source
Coverage of mandated contacts			
Coverage of mandated contacts	The number of eligible children who received the mandated contact divided by the number of children eligible for this mandated contact. This indicator is calculated separately for the new birth visit, 6-8-week review, one-year review and 2-2½ -year review.	149	Health Visiting metrics
Number of additional contacts per mandated contact			
Number of additional contacts per mandated contact	The number of additional contacts divided by the number of mandated contacts	57	CSDS
Medium			
Percentage of contacts that are face-to-face	The number of face-to-face contacts divided by the total number of health visiting contacts*	52	CSDS
Percentage of contacts that are phone calls	The number of phone call contacts divided by the total number of health visiting contacts*	52	CSDS
Location			
Percentage of face-to-face contacts conducted at home	The number of face-to-face contacts conducted at home divided by the total number of face-to-face contacts*	49	CSDS
Percentage of face-to-face contacts conducted at healthcare or social settings	The number of face-to-face contacts conducted at healthcare or social settings divided by the total number of face-to-face contacts*	49	CSDS
Percentage of face-to-face contacts conducted at children's centres	The number of face-to-face contacts conducted at children's centres divided by the total number of face-to-face contacts*	49	CSDS
Duration			
Median duration	The median duration of all contacts*	50	CSDS
% contacts 1–29 min	The number of contacts in each duration category divided by the total number of contacts*	50	CSDS
% contacts 30–44 min		50	CSDS
% contacts 45-59 min		50	CSDS
% contacts ≥60 min		50	CSDS
Use of group sessions			
Percentage of contacts that are delivered in a group session	The number of group session contacts divided by the total number of contacts*	48	CSDS

*This indicator is calculated separately for the new birth visit, 6-8-week review, one-year review, 2-2½ -year review, and additional contacts.

than half of other mandated contacts in 30-59 minutes. A considerable percentage of mandated contacts were recorded as lasting under 30 minutes (median 4.6%–7.9%) or 30-44 minutes long (median 12.3%–29.6%). Additional contacts were generally short: on average, 36.2% of additional contacts were completed in under 30 minutes. The duration of both mandated and additional contacts showed large variations across local authorities.

Use of group sessions (analysis CSDS data)

Group sessions were rarely used for mandated contacts. Of the 48 local authorities with information on group sessions, only five (10%) local authorities delivered >2% of new birth visits, 6-8-week reviews, and one-year reviews in group sessions. The use of group sessions also varied by local authority and type of contact.

Discussion

Key findings

Between April 2018 and March 2020, the new birth visit was delivered with almost universal coverage but variation across England existed in the coverage of the 6-8-week, one-year,

Table 2: The distribution of region, urban/rural status, and level of deprivation in local authorities included and not included in the analysis dataset, N (%)

Characteristics	149 local authorities in England	57 local authorities included in analysis CSDS dataset	92 local authorities not included in analysis CSDS dataset	P value comparing local authorities included with those not included in analysis CSDS dataset
Region				
East Midlands	9 (6.0)	4 (7.0)	5 (5.4)	
East of England	12 (8.1)	4 (7.0)	8 (8.7)	
London	32 (21.5)	8 (14.0)	24 (26.1)	
North East	12 (8.1)	6 (10.5)	6 (6.5)	
North West	23 (15.4)	8 (14.0)	15 (16.3)	0.79
South East	18 (12.1)	8 (14.0)	10 (10.9)	
South West	14 (9.4)	7 (7.6)	7 (12.3)	
West Midlands	14 (9.4)	6 (10.5)	8 (8.7)	
Yorkshire and The Humber	15 (10.1)	6 (10.5)	9 (9.8)	
Urban/rural status				
Predominantly rural	20 (13.4)	9 (15.8)	11 (12.0)	
Predominantly urban	108 (72.5)	40 (70.2)	68 (73.9)	0.79
Urban with significant rural	21 (14.1)	8 (14.0)	13 (14.1)	
Income Deprivation Affecting Children Index (IDACI) quintiles				
Lowest quintile	30 (20.1)	12 (21.1)	18 (19.6)	
2nd quintile	30 (20.1)	10 (17.5)	20 (21.7)	
3rd quintile	30 (20.1)	11 (19.3)	19 (20.7)	0.92
4th quintile	30 (20.1)	11 (19.3)	19 (20.7)	
Highest quintile	29 (19.5)	13 (22.8)	16 (17.4)	

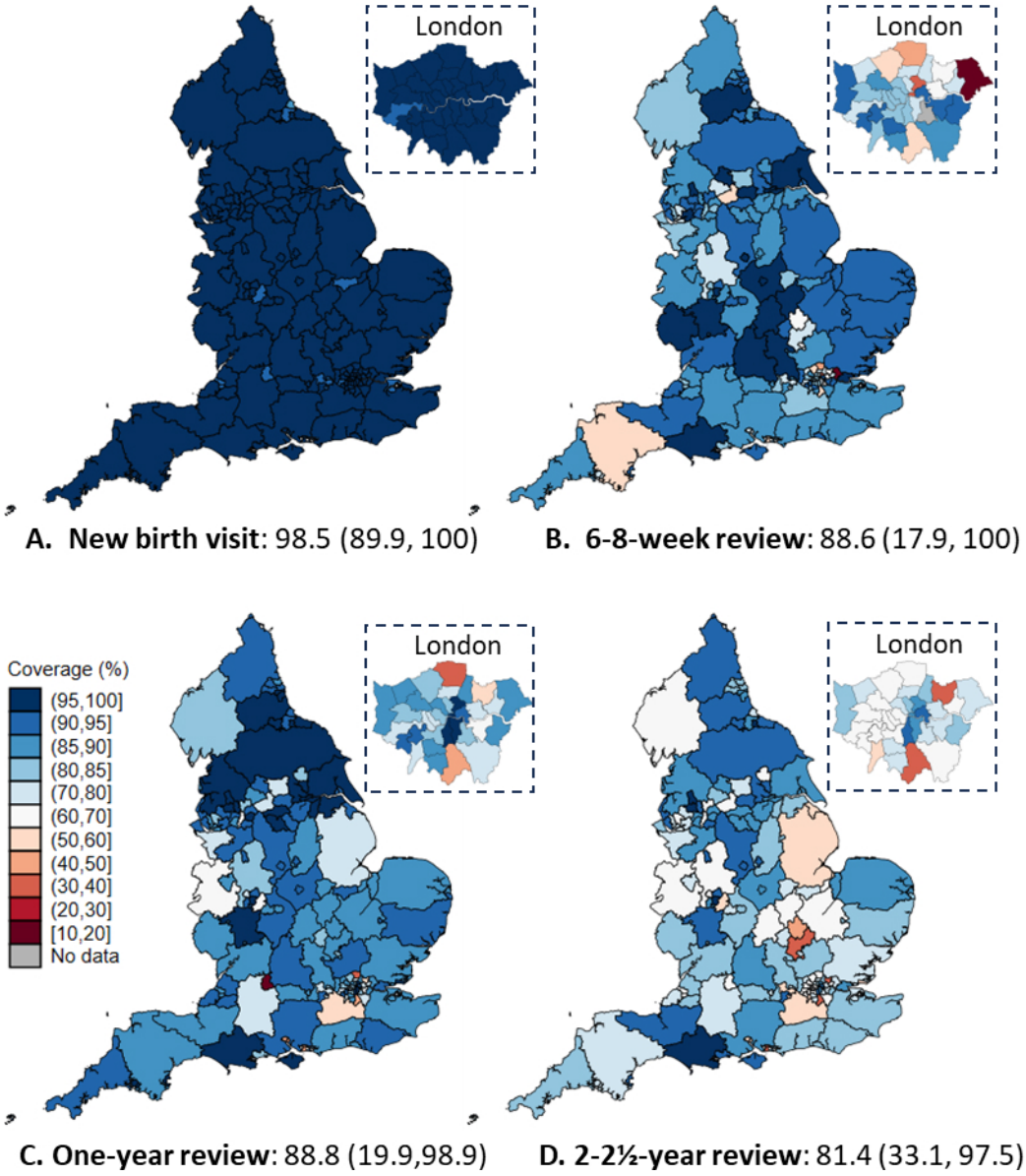
Note: There are a total of 149 local authorities in the analysis as City of London is combined with Hackney and Isles of Scilly is combined with Cornwall.

Table 3: Duration of health visiting contacts in minutes, median duration or median percentage (range across local authorities, N = 50)

	New birth visit	6-8-week review	One-year review	2-2½ -year review	Additional contact
Overall median duration	60 (30, 120)	45 (10, 60)	45(20, 60)	45 (30, 90)	30 (5, 90)
Median duration by medium (minutes)					
Face-to-face	60 (30, 120)	45 (10, 60)	45 (20, 60)	45 (30, 75)	30 (5, 105)
Phone calls	17.5 (5, 60)	30 (5, 60)	25 (5, 120)	22.5 (5, 75)	15 (5, 30)
Other	52.5 (12.5, 120)	45 (5, 95)	40 (10, 60)	42.5 (5, 90)	24.5 (5, 60)
Median duration by locations for face-to-face contacts (minutes)					
Home	60 (30, 120)	45 (30, 60)	60 (30, 60)	60 (35, 75)	45 (30, 60)
Healthcare & social settings	60 (10, 120)	30 (10, 60)	45 (10, 60)	45 (30, 90)	25 (3, 120)
Children's centre	30 (3, 60)	30 (3, 120)	40 (10, 75)	45 (20, 90)	30 (3, 120)
Other	60 (10, 75)	30 (10, 75)	45 (3, 60)	45 (30, 90)	45 (3, 120)
Median percentage of contacts in duration categories (%)					
0–29 minutes	4.6 (0.2, 32.5)	7.9 (0.2, 92.8)	7.8 (0.5, 84.9)	5.7 (0.3, 29.8)	36.2 (3.8, 83.0)
30–44 minutes	12.3 (0.6, 88.5)	29.6 (0.7, 89.0)	21.1 (1.7, 83.3)	14.8 (1.1, 87.3)	13.4 (4.0, 54.9)
45–59 minutes	8.5 (0.3, 40.1)	15.2 (0.5, 84.6)	28.0 (0.8, 85.1)	25.9 (0.9, 89.6)	5.8 (1.0, 16.7)
≥60 minutes	65.0 (4.1, 96.4)	31.1 (0.9, 94.4)	19.5 (1.4, 89.5)	31.7 (2.2, 91.2)	30.2 (4.6, 80.7)

and 2-2½ -year reviews. The high coverage of new birth visits and lower coverage of 2-2½ -year reviews are consistent with previous studies using CSDS [13, 14]. However, our results also demonstrate that much of the reported activity was being delivered outside of mandated contacts, with 80% of local authorities delivering more additional than mandated

Figure 1: Coverage of mandated health visiting contacts across all 149 local authorities in England based on Health Visiting Metrics, April 2018-March 2020; median (range)



contacts. The duration and way in which these additional contacts are delivered, for example by telephone or face-to-face, also varied across areas, which has not previously been described.

Implications

There have been many years of austerity, cuts and a depleted workforce: since 2015 the real term value of the public health grant (from which health visiting is commissioned) has fallen by 26% [24] and the health visiting workforce has decreased by 37% from 11,193 in 2015 to 7,030 in 2022 [25]. Despite this, during our study period (April 2018 to March 2020) health visiting teams reached nearly all babies and most children face-to-face, and conducted over one and a half times the number of additional contacts relative to mandated contacts. This represents a significant public health infrastructure to support the health and development of babies and children and the wellbeing of their families in the critical period before school.

Our study highlights the importance of taking into account additional contacts when measuring health visiting activity. Additional contacts, to address identified needs, were the most frequent type of contact (though shorter and more likely to be on the phone than the mandated reviews) in our analysis. This is consistent with other evidence about significant health visiting activity outside the mandated contacts in England, including a birth cohort study (of children born in 2020) which reported that 27% of 8,628 families had four or more contacts with the health visiting team in the first 9 months of their child's life [26]. However, we found substantial variation in the frequency, duration and medium of additional contacts, which is unlikely to be completely explained by differences in underlying need of the families across areas. Other factors that may have contributed to this variation include local service specifications and service priority, budgets, personnel capacity, and the availability of other local services [27].

Figure 2: The number of additional contacts per mandated contact according to the number of children aged under 5 in each local authority, grouped by provider type (N = 57)

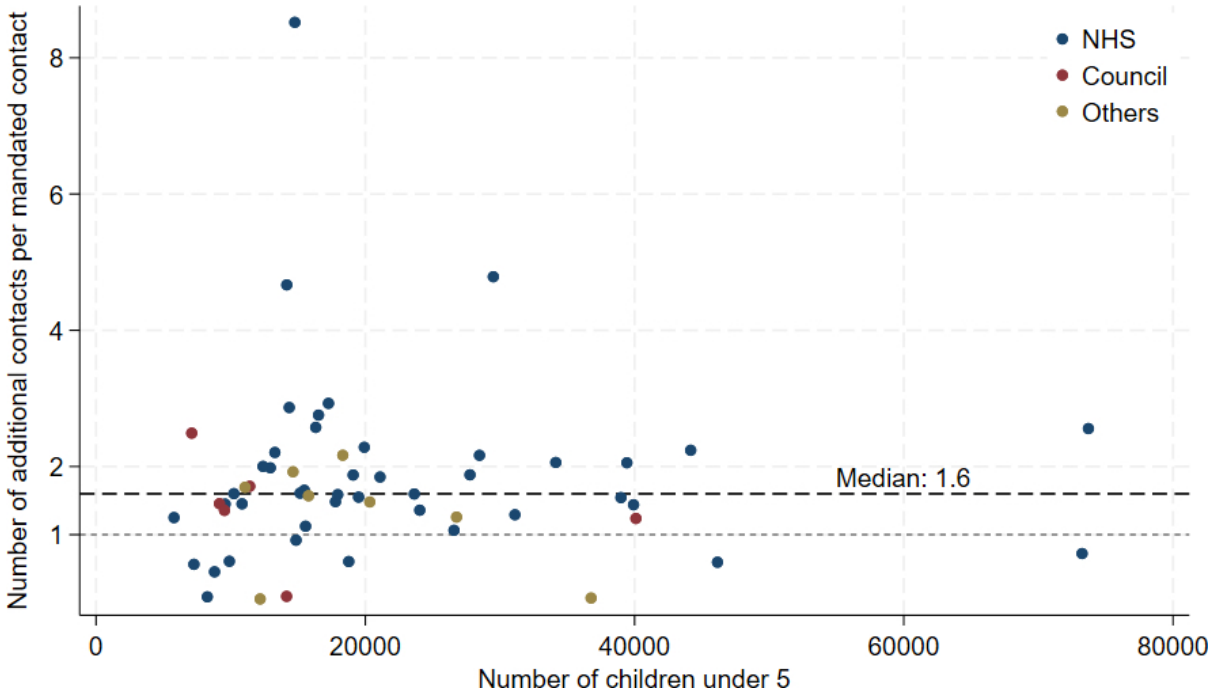
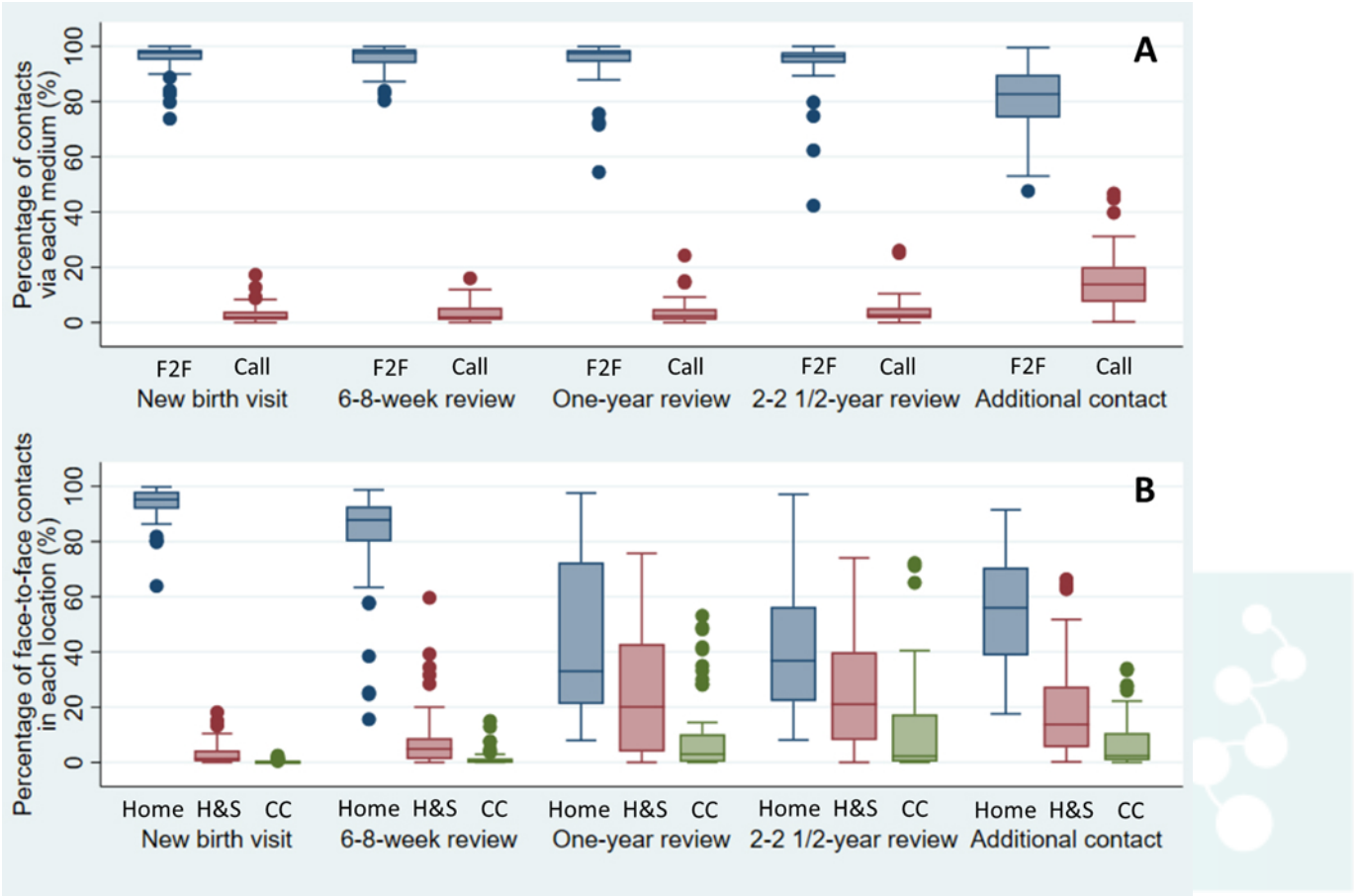


Figure 3: Variation across local authorities in the delivery of health visiting contacts by A: Medium of delivery (N = 52) and B: Location of face-to-face contacts (N = 49), using analysis CSDS data



F2F: face-to-face contacts; Call: phone call contacts; H&S: healthcare and social setting; CC: children's centre.

Other evidence suggests that despite substantial additional contacts, not all identified needs can be followed up by the health visiting team: in a survey of 1,186 health visitors, 45% reported that mandated contacts were prioritised over targeted or specialist support and 79% said that the service lacked capacity to offer a package of support to all children with identified needs [28]. Further qualitative work with parents and professionals is needed to understand the experiences and perceived purpose and impact of different types of additional contacts, as well as why models of additional contact are so different across areas.

Our results can inform conversations at the national and local level about the parameters of a 'good' health visiting service during a time when early years is a priority area, with targeted funding and innovation (e.g., Start for Life and Family Hubs [29]). For example, our findings raise a question about whether a mandated review can be adequately conducted in less than 45 minutes, given that it should include direct observation of the child and significant health promotion activity. We found that a median of 5%–8% of mandated contacts were recorded as under 30 minutes (Table 3), which should be treated with caution. This is because some of these contacts may have been mislabelled as mandated contacts but were in fact initial conversations to schedule or prepare for a longer contact outside of the 14-day window in which this mandated contact is supposed to take place. However, there was still a median of 12–30% of mandated contacts recorded as lasting between 30–44 minutes (Table 3).

Providers, commissioners and national policy teams should consider how far features of delivery such as <30 minute or <45 minute mandated contacts are consistent with the way health visiting is theorised to work. In other words, is there a minimum time feasibly needed for health visitors or members of their team to build relationships with parents (including those with a mistrust of services), work in partnership with families, undertake health promotion work and conduct a holistic needs assessment of the whole family and family environment? It is possible that some features of service delivery, such as the shorter mandated contacts, are a service response to resource pressure which have the unintended consequence of undermining the mechanisms by which health visiting is thought to work and influence family outcomes. The next steps in building the evidence base for national and local decision-makers include understanding local authority variation in the delivery of health visiting services to different types of families, including those living in deprivation or with other indicators of vulnerability, and the impact of decisions about service delivery on outcomes [30, 31]. As our study involved the use of data that were collected in the pre-pandemic era, we also now need to investigate how far the service delivery has 'bounced back' or has been permanently changed following the partial stop of health visiting services and widespread redeployment of staff and a change to virtual contacts [21, 32–34].

Strengths and limitations

A strength of our study is that we used a subset of nationally representative data with high levels of completeness to monitor and measure the medium, location, and duration of health visiting contacts, the delivery of additional contacts, and the use of group sessions. For estimates of coverage of mandated visits, we used aggregate Health Visiting metrics that cover every local authority in England. For the other characteristics of health visiting service delivery, we only included local authorities that correlated with health visiting activity recorded in the Health Visiting metrics (analysis CSDS data). This means that the misclassification of non-health visiting activity as mandated contacts for records with missing values on "Activity Type" is likely to be marginal.

Data quality remains an issue. Firstly, we may not have identified all health visiting contacts in the CSDS, due to missing data in the "Service or Team Type" variable. This was likely a bigger issue for additional contacts because we had no alternative method of identifying these (unlike mandated contacts for which we could use the "Activity Type" variable) [19]. However, our study found a higher number of additional contacts than reported by other analyses of CSDS, which found 0.17 additional contacts per mandated contact for children under three years between April 2019–March 2020 (compared to 1.6 for children under five years in our study sample) [35]. This may be explained by different ways of cleaning and curating the data: our analysis data described health visiting on a subset of local authorities with more complete health visiting data, which may be associated with higher health visiting activity. There might also be misclassification between mandated and additional contacts: some local authorities offer more than five mandated contacts to every child and these extra "mandated contacts" will be identified as additional contacts in our analysis. Results about the use of additional contacts thus need to be interpreted with caution.

Secondly, we could only report on 57 local authorities included in our analysis and we cannot assume that these findings are generalisable to local authorities with incomplete CSDS data [13]. However, these local authorities were similar to the whole of England based on region, urban/rural status, and deprivation quintiles (Table 2). We included data at a local authority-quarter level, meaning our findings are largely based on a few months of data within each area, as more than half of local authorities (n=31/57, 54.4%) included in the study sample only contributed one or two quarters of data. The sample selection largely depended on good reporting of data, which might be associated with better service delivery. However, the coverage of mandated contacts is similar between our study sample and the whole dataset (Supplementary Material A, Appendix Figure 2) and the median duration of 45–60 minutes for mandated contacts and 30 minutes for additional contacts is consistent with the average duration of 42 minutes pooling mandated and additional contacts together reported by health-visiting providers in a survey [36].

Thirdly, we were unable to conduct longitudinal analyses in our study sample, as a result of using the quarterly Health Visiting metrics as a reference to assess the completeness of CSDS. This means we were unable to describe the average number of contacts per child or patterns of contacts over early childhood.

Finally, as this study describes different aspects of service delivery independently, the association between them is not clear. For example, we do not yet know whether local authorities with high coverage of mandated contacts had more additional contacts per mandated contact, or whether those

who offered more additional contacts per mandated contact generally had shorter contacts. Further exploration of models of service delivery combining different aspects will help draw a more comprehensive picture of health visiting service delivery in England.

Conclusion

This study demonstrates substantial variation in the delivery of health visiting across England, with potential unmet needs in some local authorities. Further work is needed to explore whether this trend has continued in more recent years, and if so, the reasons for (for example, local specification and staff capacity) and determinants of (for example, urban/rural status and deprivation) this variation; it also provides a natural opportunity to exploit this variation to understand the impact of different models of service delivery on family outcomes.

This national picture of health visiting should be used by local authorities to review their own practice based on data in local systems, compare their practice with the national statistics and identify areas for improvement [31]. Such comparisons would generate hypotheses about the causes of outliers in terms of whether this is due to commissioning decisions or to the level of need and availability of other services in the area.

We demonstrate that with careful validation and cleaning, administrative data can be used to create a national picture of health visiting that can be used for research, monitoring and evaluation. However, we also highlight the need for data reporting and transfer systems to be strengthened in order to improve the completeness and representativeness of these data to support future analyses.

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Statement on conflicts of interest

The authors declare no conflicts of interest.

Ethics statement

This study has been approved by University College London Institute of Education (UCL IOE) Research Ethics Committee (1531).

Data availability statement

Access to the CSDS was approved and provided by NHS England (NIC-393510 and NIC-381972). Health Visiting Service Delivery Metrics data are published by the Office for Health Improvement and Disparities and are openly available: data for 2018/19 [15] can be found at https://www.gov.uk/government/statistics/health-visitor-service-delivery-metrics-2018-to-2019 and data for 2019/20 [16] can be found at https://www.gov.uk/government/statistics/health-visitor-service-delivery-metrics-experimental-statistics-2019-to-2020-annual-data.

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Abbreviations

CC:	Children's centre
CSDS:	Community Services Dataset
F2F:	Face-to-face
H&S:	Healthcare and social setting
HCP:	Healthy Child Programme
Health Visiting metrics:	Health Visiting Service Delivery Metrics
LA:	Local authority
OHID:	Office for Health Improvement and Disparities
ONS:	Office for National Statistics
SMS:	Short message service

Supplementary Appendices

Supplementary Material A. Tables and Figures

Appendix Table 1: Focuses of each universal health review

Health review	Age window	Focuses
Antenatal review	28 weeks pregnancy	Breastfeeding, safer sleep, smoke free pregnancy, immunisation status, maternal and partner mental health
New birth review	10-14 days after birth	Breastfeeding support, safer sleep, transition to parenthood, parent-child interaction, smoke free home
6-8-week review	6-8 weeks old	Breastfeeding support, family mental health, immunisation status, safer sleep, communication and interaction
One-year review	9-12 months old	Immunisation status, nutrition, safer sleep, oral health, accident prevention, physical activity, speech, language, communication
2-2$^1/_2$ -year review	2-2$^1/_2$ years old	Immunisation status, physical activity, nutrition, oral health, accident prevention, school readiness, speech, language, communication

Appendix Table 2: Coding of date-derived mandated health visiting contacts in the community service dataset

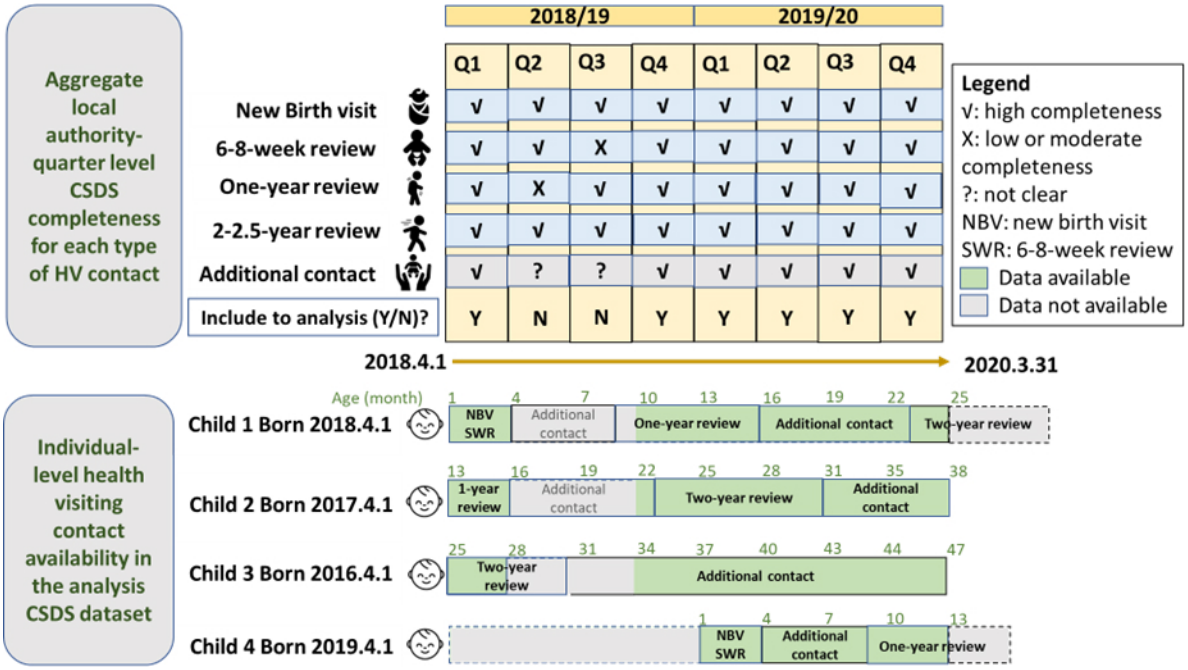
Variable name	Relevant time period	Mandated contact
ContactBetween8_14Days_Flag	8–14 days	New birth visit
ContactBetween15_30Days_Flag	2–4 weeks	New birth visit
ContactBetween42_56Days_Flag	6–8 weeks	6-8-week review
ContactBetween42_63Days_Flag	6–9 weeks	6-8-week review
ContactBetween270_366Days_Flag	9–12 months	One-year review
ContactBetween270_457Days_Flag	9–15 months	One-year review
ContactBetween691_914Days_Flag	23–30months	2-2$^1/_2$-year review

Appendix Table 3: Local-authority-quarters included in the analysis CSDS dataset

Number of quarters a local authority contributed				Number of local authorities contributing to each quarter			
Number of quarters	Number of LAs	Percent (%)	Cum percent (%)	Fiscal Quarter	Number of LAs	Percent (%)	Cum percent (%)
1	15	26.3	26.3	2018/19 Q1	15	9.2	9.1
2	16	28.1	54.4	2018/19 Q2	16	9.8	18.9
3	11	19.3	73.7	2018/19 Q3	22	13.4	32.3
4	4	7.0	80.7	2018/19 Q4	22	13.4	45.7
5	3	5.3	86.0	2019/20 Q1	24	14.6	60.4
6	5	8.8	94.7	2019/20 Q2	22	13.4	73.8
7	1	1.8	96.5	2019/20 Q3	23	14.0	87.8
8	2	3.5	100	2019/20 Q4	20	12.2	100
Total	57	100		Total	164	100	

Note: There are a total of 149 local authorities in the analysis as City of London is combined with Hackney and Isles of Scilly is combined with Cornwall. LA: local authority. Cum percent: cumulative percentage.

Appendix Figure 1: Illustration of the selection of the analysis CSDS dataset in an imaginary local authority

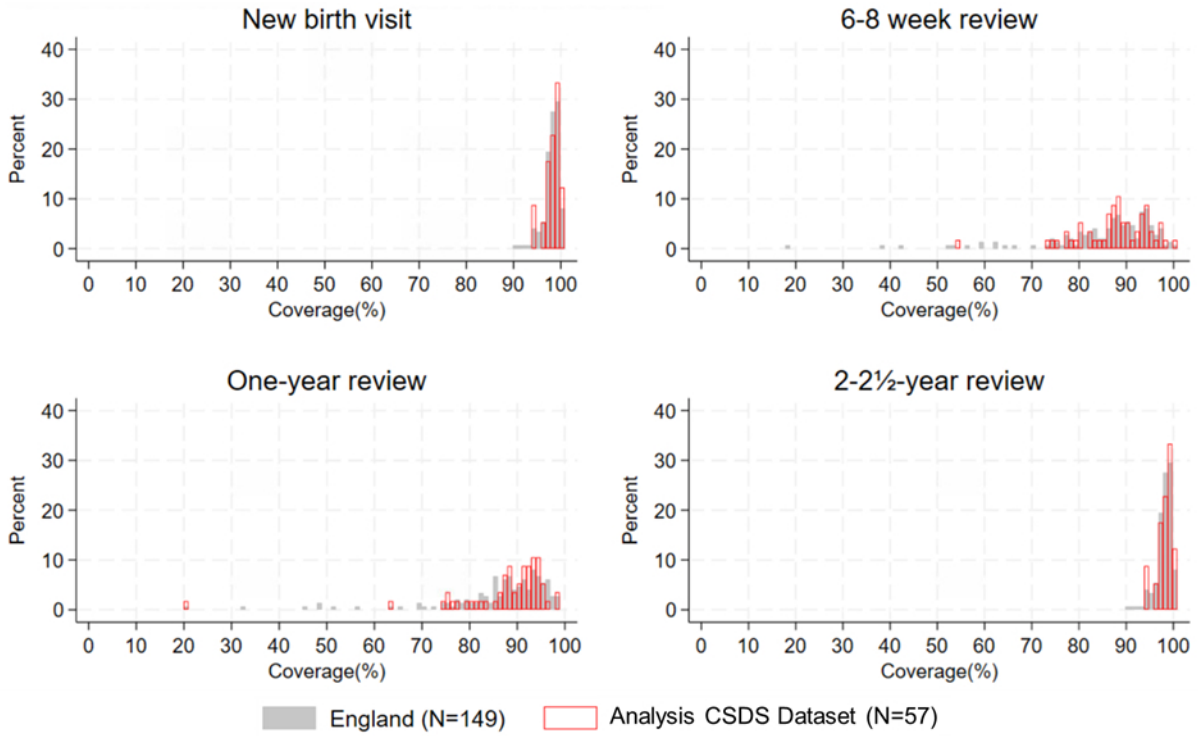


Appendix Table 4: Characteristics of the study sample in the analysis CSDS dataset and Health Visiting metrics

Characteristic	Analysis CSDS dataset	Health visiting metrics
Number of local authorities-quarters (local authorities)	164 (57)	1,192 (149)
Average number of quarters per local authority (range)	2.9 (1, 8)	8 (8, 8)
Number of local authorities by main provider (%)		
HS	43 (75.4%)	–
Council	6 (10.5%)	–
Others (e.g., private company)	8 (14.0%)	–
Number of contacts (%)	1,779,155	4,172,835
New birth visits	167,425 (9.4%)	1,135,310 (27.2%)
6-8-week-review	157,130 (8.8%)	1,006,025 (24.1%)
One-year review	169,495 (9.4%)	1,041,825 (25.0%)
2-2$^1/_2$ -year review	165,680 (9.3%)	989,680 (23.7%)
Additional contacts	1,119,420 (62.9%)	–

Note: There are a total of 149 local authorities in the analysis as City of London is combined with Hackney and Isles of Scilly is combined with Cornwall.

Appendix Figure 2: Distribution of coverage of mandated contacts at the local authority level, comparing analysis CSDS dataset and the whole dataset of England, April 2018-March 2020



Supplementary Material B. Data cleaning and management process

We checked the overall level of missing values for variables in Community Services Dataset (CSDS) that are relevant to health visiting delivery (Supplementary Material B, Appendix Table 1). Locations were only applicable for face-to-face contacts. We include variables that are conceptually relevant and have an acceptable level of missing values (<20%): medium, location, whether delivered in a group setting, organisation identifier, and clinical duration. Some important variables were excluded due to a high level of missing data, for example, staff type and occupation type.

We then cleaned and re-categorised the variables we included. For categorical variables, we checked errors. We speculate the true value where possible. For example, the location variable was coded with organisation codes in some contacts, and we replaced the location variable with the corresponding location categories for these contacts. Where such speculation cannot be made, we set the errors to missing.

Categorical variables were then re-categorised into broader groups (Supplementary Material B, Appendix Table 2). Provider organisations were grouped into three types: NHS providers, council providers, and other providers (including private organisations). Provider type was obtained by searching organisation identifier in CSDS on NHS Digital Organisation/Practitioner Search platform. The type of provider recorded for more than 80% of the Health Visiting contacts in a local authority was considered the main provider in this local authority. The medium of contact was grouped into face-to-face, phone calls, and others. We only looked at the location of face-to-face contacts. Contact locations were grouped into home, health and social care settings, children's centres, and others.

For the duration of contacts, we checked extreme values. Duration of zero minute was set to missing and durations that are longer than eight hours were set to eight hours. Health visiting contacts are assigned into one of the following duration groups: 1-29 min, 30-44 min, 45-59 min, ≥60 min.

We further assessed the missingness of these variables at the local authority level. If a local authority had more than a quarter of data missing in a certain variable across all quarters within the dataset, we set the entire variable missing for this local authority as the quality of data is not reliable for this variable this local authority. This means that we may have lost some information on certain variables for some local authorities.

Appendix Table 1: Missingness in variables relevant to Health Visiting service delivery in the analysis CSDS dataset

Variable	% contacts have missing values prior to cleaning	Comments
Medium (face-to-face, telephone, email, etc.)	7.1%	Include
Locations for face-to-face contacts (home, health centre, child centre, others)	12.8%	Include
Group therapy (yes/no)	5.8%	Include
Organisation identifier	0%	Include
Clinical duration (minutes)	9.4%	Include
Initial/follow-up contact	11.8%	Exclude: 1) most of the initial contacts are new birth visits and other mandated and additional contacts are follow-up contacts. 2) The analysis CSDS dataset is not longitudinal, so the initial contacts of the included follow-up contacts may not appear the analysis dataset.
Distance from home to contact location		Exclude: due to high levels of missing data
Home visit contacts	82.0%	
In health care and social settings	68.3%	
In children's centres	89.7%	
Days referral to care contact	0%	Exclude: although no missing values, it is not clear what this variable means.
Registration body (General medical council, General dental council, Health and care professions council, Nursing and midwifery council, etc.)	77.4%	Exclude: due to high levels of missing data
Mandated contacts	74.8%	Exclude: due to high levels of missing data
Additional contacts	78.9%	Exclude: due to high levels of missing data
Staff type (Each type of therapist, Health care worker or assistant, General medical practitioner, Community midwife, Health visitor, Staff nurse, Other nurses)	79.2%	Exclude: due to high levels of missing data
New birth visit	73.8%	Exclude: due to high levels of missing data
6-8 week review	74.4%	Exclude: due to high levels of missing data
One year review	78.6%	Exclude: due to high levels of missing data
Two-year review	81.5%	Exclude: due to high levels of missing data
Additional contact	80.4%	Exclude: due to high levels of missing data
Occupation type (Admin staff, Health care assistants & support staff, Nursing & midwifery & health visiting staff, Nursing & midwifery & health visiting learners, etc.)	96.8%	Exclude: due to high levels of missing data
Job role (Medical & dental, students, Specialist nurse, Staff nurse, Community practitioner, etc.)	77.9%	Exclude: due to high levels of missing data
Mandated contacts	75.5%	Exclude: due to high levels of missing data
Additional contacts	79.4%	Exclude: due to high levels of missing data
Service/team type (Health visiting service, School nursing service, etc.)**)**	1.9%	Exclude: this variable was used to identify Health Visiting contacts

Appendix Table 2: Recategorisation of the medium and location of contacts

Categories in raw CSDS		Categories used in analysis	
Code	**Category**	**Code**	**Category**
Medium			
01	Face-to-face communication	1	Face-to-face contact
02	Telephone	2	Phone call
03	Telemedicine	3	Others
04	Talk type for a person unable to speak		
05	Email		
06	Short Message Service (SMS) – Text Messaging		
07	Online Triage		
08	Online Instant Messaging		
98	Other (not listed)		
Location			
A01-A04	A01 patient's home; A02 carer's home; A03 patient's workplace; A04 other patient related location	1	Home
B01-B02	B01 primary care health centre; B02 polyclinic	2	Health and social care settings
C01-C03	C01 general medical practitioner practice; C02 dental practice; C03 ophthalmic medical practitioner premises		
D01-D03	D01 walk in centre; D02 out of hours centre		
E01-E099	E01 out-patient clinic; E02 ward; E03 day hospital; E04 emergency care department or minor injuries department; E99 other departments		
H01	day centre		
J01	resource centre		
F01	hospice		
G01-G04	G01 care home without nursing; G02 care home with nursing; G03 children's home; G04 integrated care home without nursing and care home with nursing		
K01-K02	K01 sure start children's centre; K02 child development centre	3	Children's centre
L01-L99	L01 school; L02 further education college; L03 university; L04 nursery premises; L05 other childcare premises; L06 training establishments; L99 other educational premises	4	Others
M01-M07	M01 prison; M02 probation service premises; M03 police station / police custody suite; M04 young offender institution; M05 immigration removal centre;		
N01-N03	N01 street or other public open space; N02 other publicly accessible area or building; N03 voluntary or charitable agency premises		
X01	other locations not elsewhere classified		