Trends in the coverage of 'universal' child health reviews: observational study using routinely available data

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Title

Trends in the coverage of 'universal' child health reviews: observational study using routinely available data

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RW	X	X	X	X
AS		X	X	X
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JC	X		X	X
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Competing interests
No author has any competing interest to declare in relation to this paper.

Data sharing
The routine data analysed for this study are held by NHS National Services Scotland Information Services Division (http://www.isdscotland.org/).

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Ethical approval
Ethical approval was not required for this study. Information Services Division staff adhered to NHS National Services Scotland Confidentiality Guidelines at all times when handling patient data.

Word count
2897

Article summary

Article focus

- A series of universally offered child health reviews providing assessment of children's health, development and wellbeing forms the backbone of the UK child health programme.
- The number of reviews offered per child has been reduced over recent years to increase capacity to provide effective, individualised support to families in need: equitable coverage of the remaining reviews is therefore particularly important.
- We used routinely available data to assess the coverage of the various child health reviews (overall and by deprivation) before and after the change in the number of reviews offered.

Key messages

- Coverage of reviews offered in early infancy is high but it progressively declines for reviews at older ages (around 99% coverage for the 10 day review and 86% for the 39-42 month review).
- Coverage is lower in the most deprived groups for all reviews and the discrepancy progressively increases for reviews at older ages (78% and 92% coverage for the 39-42 month review in most and least deprived groups).
- Coverage has not changed for the remaining reviews after reduction in the number of reviews offered: the inverse care law continues to operate in relation to provision of 'universal' child health reviews.

Strengths and limitations

- To our knowledge no quantitative assessment of the coverage of child health reviews offered in the UK has previously been published.
- This analysis involved large numbers of children: over 80,000 children eligible to receive their child health reviews in Scotland were included.
- Careful consideration must be given to data quality when analysing routinely available data: we conducted an audit of data quality to allow the uncertainty in the results to be quantified.

Abstract

Objectives
Universally offered child health reviews form the backbone of the UK child health programme. The reviews assess children's health, development, and wellbeing and facilitate access to additional support as required. The number of reviews offered per child has been reduced over recent years to allow more flexible provision of support to families in need: equitable coverage of the remaining reviews is therefore particularly important. This study assessed the coverage of universal child health reviews, with an emphasis on trends over time and inequalities in coverage by deprivation.

Design
Analysis of routinely available data using a cohort design supplemented by an audit of the quality of the routine data involving case note review for a sample of children with no record of receiving their reviews.

Setting
Scotland

Participants
Two cohorts of around 40,000 children each. The cohorts were born in 1998/99 and 2007/08 and eligible for the previous programme of five and the current programme of two reviews respectively.

Outcome measures
Coverage of the specified child health reviews for the whole cohorts and by deprivation.

Results
Coverage of the 10 day review is high (99%) but it progressively declines for reviews at older ages (86% for 39-42 month review). Coverage is lower in the most deprived groups for all reviews and the discrepancy progressively increases for reviews at older ages (78% and 92% coverage for the 39-42 month review in most and least deprived groups). Coverage has been stable over time: it has not increased for the remaining reviews after reduction in the number of reviews provided.

Conclusions
The inverse care law continues to operate in relation to 'universal' child health reviews. Equitable uptake of reviews is important to ensure maximum likely impact on inequalities in children's outcomes.

Word count: 288

Introduction

Children's early experiences profoundly shape their development and long term health and wellbeing.[1,2] The UK child health promotion programme aims to support children through their early years and help them attain their developmental and health potential.[3,4] The programme comprises screening, immunisation, developmental reviews, parental support and health promotion. A number of reviews are offered to all children at specified ages. The reviews are usually carried out by Health Visitors (HVs), sometimes alongside others such as General Practitioners (GPs), and focus on assessing children's growth, development, health and wider family wellbeing and thus determining the need for further professional input.

Professional guidance on the delivery of the child health programme issued in 2003[5] suggested that there was too much emphasis on provision of these 'routine' reviews leading to a relatively inflexible system that had done little to address persistent inequalities in children's outcomes.[6] Adoption of this guidance across the UK has led to a new emphasis on a 'progressive universalism' model of delivery, with a reduced programme of universal reviews complemented by more intensive, individualised care for those families in need of professional services.[7]

The Scottish Government took particularly decisive action in this regard. Policy issued in 2005 reduced the number of universal pre-school child health reviews from six (at 10 days, 6-8 weeks, and 8-9, 22-24, 39-42, and 48-54 months) to two (at 10 days and 6-8 weeks).[8] At the same time, a three category indicator of need (the Health Plan Indicator – core, additional, and intensive) was introduced to facilitate the identification of those children requiring enhanced support. The revised programme was implemented in different NHS Board areas between 2005 and 2010.

People who are most in need of health services are often the least likely to access them.[9] People from deprived areas are particularly disadvantaged in terms of access to preventive/proactive health care.[10,11] There is evidence from the US of marked inequalities in uptake of 'well child' care[12-14] but, to our knowledge, no information on inequalities in uptake of child health reviews in the UK has been published to date. Ambivalence towards, or disinclination to engage with, the child health programme has been documented however, particularly amongst families from deprived areas.[15-18]

For the programme to contribute to reducing inequalities in children's outcomes, it is essential that children from across the social spectrum participate in the universal reviews and hence have the opportunity to receive the level of input required to secure good outcomes. We therefore used routine Scottish data to explore the following questions:

- What proportion of children actually receives the universal child health reviews?
- How does review coverage vary by deprivation?
- How has (inequality in) review coverage changed over time, in particular before and after the reduction in number of reviews offered?

We also audited the quality of the relevant routine data to provide additional information not previously available.

Methods

Routine data sources used

All children in Scotland have a record created in the child health programme national information system. One element of the system, Child Health Surveillance Programme – Pre School (CHSP-PS), administers the child health reviews offered to pre-school children.[19] When a child is due for a review, CHSP-PS sends an appointment to the family and the appropriate paper review form (in triplicate) to the Health Visitor. After the review, one copy of the completed form is returned to the local child health department where administrative staff enter the findings into the CHSP-PS system; one copy is retained in the child's HV notes; and the third copy is inserted into the child's parent held record. The NHS Information Services Division (ISD) receives quarterly downloads from the system for analytical purposes.

Child health reviews included

Table 1 shows the reviews offered to all children in Scotland before and after implementation of the 2005 policy that are included in this study. It was not mandatory to record provision of the old 48-54 month review on CHSP-PS hence that review has been excluded. Health Visitors are solely responsible for provision of the 10 day review. The 6-8 week review usually involves an initial assessment by the HV followed by a medical examination by the GP. GP input into provision of reviews at older ages varied.

Table 1: Cohorts included in the analysis

Cohort	Date of birth range	Included child health reviews		Date of CHSP-PS extract used in analysis
		Review name	Upper age limit by which the review should be completed	
Old child health programme	1 November 1998 – 31 October 1999	10 day 6-8 week 8-9 month 22-24 month 39-42 month	None specified 12 weeks 10 months 26 months 44 months	November 2003
New child health programme	1 Jul 2007 – 30 Jun 2008	10 day 6-8 week	28 days 12 weeks	February 2009

Cohorts included in study

Table 1 also shows the two cohorts that were studied. The 'old child health programme' cohort had the opportunity to receive all five previously offered reviews whereas the 'new child health programme' cohort had the opportunity to receive the current reduced programme of two reviews. Children who were consistently registered to receive their child health programme in selected NHS Board areas from birth up to the date of the relevant CHSP-PS data extracts were included. Boards that were established users of the CHSP-PS system by November 1998 and had implemented the revised child health programme by the beginning of 2007 were selected. These were Argyll & Clyde; Ayrshire & Arran; Borders; Fife; Forth Valley; Greater Glasgow; Lanarkshire; Lothian; and Tayside. These areas together contain around 82% of the Scottish population aged under 5 years. The CHSP-PS downloads taken around 4 months after the upper age at which the children should have had the last included review were used for analysis.

Assessing coverage of universally offered child health reviews

All included children in each cohort were identified. Their postcode of residence at the time of data extract was used to derive their 2006 Scottish Index of Multiple Deprivation quintile and whether they lived in one of the 15% most or least deprived areas of Scotland.[20] Whether the children had a record on CHSP-PS of receiving each of the relevant reviews was then noted. Whether they received their reviews below the recommended upper age limit[21] (see Table 1) was also noted for all reviews except the 10 day review as the age of the child at this review is incompletely recorded. Coverage of the various reviews (at any age or where possible within the recommended age range) by deprivation level was calculated.

Differences in coverage were assessed by Chi squared tests with Yates' continuity correction.[22] Confidence intervals for differences in coverage between least and most deprived groups were calculated using the Newcombe-Wilson formula.[23] Finally, the total number of registered births occurring within the corresponding date ranges and NHS Board areas was noted to assess the number of children excluded due to dying or moving over the period of study.

Audit of CHSP-PS data quality

Due to the way the CHSP-PS system works, it may be that some children with no CHSP-PS record of a review did actually receive their review but the paper form went astray prior to data entry. To quantify this potential for underestimation of review coverage, we conducted an audit of CHSP-PS data.

ISD prepared a case listing of all children from the new child health programme cohort that were registered with a GP practice in two localities as at February 2010 who had no CHSP-PS record of receiving a 10 day and/or a 6-8 week review. The two localities (in Greater Glasgow and Fife) were selected as they both had review coverage rates similar to that seen for Scotland as a whole, included a range of deprived/affluent and urban/rural areas, and had HV managers who were enthusiastic to undertake the audit.

Individual audit forms for all children on the case listings were securely transferred to the relevant HV teams. The forms asked whether the apparently missing review had in fact been received and then either why it had been missed or why no record was available on CHSP-PS as appropriate. The HVs completed the forms after reviewing the children's clinical notes. All audit returns were entered into SPSS version 17.0. Two authors (AS and RW) agreed on appropriate coding of free text fields. Additional variables derived from the children's overall child health programme electronic records, specifically the child's sex, deprivation quintile, and most recently recorded Health Plan Indicator category were merged into the analysis file. The resulting data were analysed using simple descriptive statistics.

Results

Coverage of universally offered child health reviews

The number of children included in each cohort is shown in Table 2. The proportion of children born in the relevant Board areas that were excluded from the analysis is higher for the old child health programme cohort as these children had to remain resident in the same Board area for a longer period to be included. The proportion of children with an unknown deprivation category was low in both cohorts.

Table 2: Number of children in each cohort

Cohort	Total number of births in included Boards in relevant date range	Number (%) of children included in cohort	Number (%) of children in cohort with known deprivation status
Old child health programme	45,122	37,668 (83.5%)	37,325 (99.1%)
New child health programme	48,310	45,777 (94.8%)	45,624 (99.7%)

The proportion of children in each cohort that had a CHSP-PS record of receiving the various child health reviews is shown in Figure 1. In the old child health programme cohort, coverage declined for each subsequent review: 98.7% and 86.0% of children had a record of receiving their 10 day and 39-42 month reviews respectively. For each review, children living in the most deprived areas were significantly less likely to have a record of receiving the review than children living in the least deprived areas. The absolute difference in review coverage between deprived and affluent areas increased for each subsequent review: 77.8% and 92.4% of children from the most and least deprived areas had a record of receiving their 39-42 month review respectively. Coverage of the 10 day and 6-8 week reviews was very similar for the new child health programme cohort to that seen for the earlier cohort. The degree of inequality in coverage of these reviews also remained unchanged.

When coverage was assessed for all deprivation quintiles rather than just the least and most deprived groups, a clear deprivation gradient was found for all reviews except the 10 day review for each cohort (Figure 2). Coverage of the 10 day review was very high for both cohorts and although the most deprived quintile always had lower coverage than the least deprived quintile, no clear gradient was evident for the intermediate deprivation groups.

When only reviews conducted within the recommended age limit were included, overall coverage reduced by between 3.0% and 5.6%. Children from deprived areas were consistently more likely to have their reviews late hence inequalities in coverage of timely reviews were particularly wide. In the new child health programme cohort, 93.8% of children from the least deprived areas had a record of receiving a 6-8 week review before 12 weeks of age (96.5% at any age) compared to 87.8% of children from the most deprived areas (92.5% at any age).

Audit of CHSP-PS data

A total of 2,784 children were resident in the two audit areas and eligible for inclusion: 51 (1.8%) had no CHSP-PS record of a 10 day review and 131 (4.7%) had no record of a 6-8 week review. Six children were in both categories hence a total of

182 missing reviews for 176 children were included in the audit. The audit results are summarised in Figure 3. A very high rate of return (177/182, 97%) was achieved and in the large majority of cases (156/177, 88%) the child's clinical notes had been available to the HV hence the returned form was informative.

For 42 of the 45 (93%) children with no CHSP-PS record of a 10 day review (and who had an informative audit return), the clinical notes indicated that a review had actually taken place. By contrast, a review had only been provided to 59 of the 111 (53%) children with no record of a 6-8 week review. For 21 of the 52 (40%) children who had genuinely missed their 6-8 week review, the HV specifically indicated that this was due to being unable to contact the family or the family repeatedly not attending appointments. In a further 7 (13%) cases, the review was not provided due to the child being in hospital.

There was a clear tendency for children who genuinely missed their 6-8 week review (compared to those who received the review but had no CHSP-PS record) to have higher needs. For example, 41/52 (79%) of the children who missed their review lived in one of the two most deprived quintile areas compared to 23/59 (39%) of the children who did receive the review. Similarly, 35/52 (67%) of children who missed their review had 'additional' or 'intensive' as the most recently recorded Health Plan Indicator category on their overall child health programme electronic record compared to 20/59 (34%) of children who received their review.

HVs were asked whether they had had any contact with the children who genuinely missed their 6-8 week review when the children were aged between 4 and 12 weeks: in 45/52 (87%) cases, the HV indicated they had had at least one face to face or telephone contact with the child or parents; in 4 cases the HV indicated they had had no contact at all (and in all cases this was ascribed to the child being in hospital), and no response was provided in 3 cases.

Discussion

This analysis of routinely available data shows that not all children who are offered 'universal' child health reviews actually receive them. Coverage of the 10 day review is very high but it declines for each subsequent review. The 'inverse care law'[9] applies to coverage of child health reviews: children from more deprived areas are less likely to receive their reviews and the inequalities are wider for reviews offered at older ages. The level of inequality in coverage has been stable over time and (for the remaining reviews) has not changed following the implementation of a new child health programme offering a much reduced number of reviews.

A further two cohorts were examined to confirm the consistency of the findings. One cohort of children born November 2000 to October 2001 that had the opportunity to receive the old child health programme immediately before it was withdrawn and one born April 2006 to July 2006 who received the revised programme immediately after its implementation: (inequalities in) review coverage was very similar for these cohorts.

The audit of CHSP-PS data provides valuable information on the reliability of the findings. The audit shows that the reliance on transfer of paper forms before data entry does result in some data loss. The actual level of review coverage is therefore likely to be somewhat higher than the results suggest. For example, the overall percentage of children missing their 6-8 week review is likely to be closer to 2.5% than 5%. The general patterns observed are very likely to be real however. Indeed, the audit findings emphasise the association between missing child health reviews and greater vulnerability: the level of inequality in review coverage may therefore actually be wider than that presented.

For children born after the implementation of the revised child health programme, it has obviously only been possible to examine the coverage of the two remaining reviews, both of which are offered in early infancy. Implementation of the revised review schedule aimed to strengthen the programme's ability to consistently reach children in need of support, provide effective early intervention, and thus reduce inequalities in children's outcomes.[8] One would therefore have hoped and expected to see reduced inequality in coverage for the remaining reviews. The finding that there has been no change is disappointing.

It appears that a minority of families (with relatively high needs) still find it difficult to engage with child health reviews. The audit results provide reassurance that almost all children who genuinely missed their 6-8 week review had some kind of contact with their HV however, indicating that few if any children are completely unknown to services. Further qualitative work with HVs and parents will be required to more fully understand why some families do not participate in child health reviews and to develop innovative services that meet their needs. There has been a significant reduction in inequalities in breastfeeding rates in Scotland over recent years (driven mainly by increasing rates in more deprived groups)[24], giving cause for optimism that child health promotion activities can effectively engage deprived groups and reduce inequalities. Work looking at facilitation of, and barriers to, engagement of families in other child wellbeing services such as Sure Start may also hold valuable lessons for the child health programme.[25-27]

There has been debate in Scotland recently as to whether the core programme of universal child health reviews has been reduced too far. HVs have expressed unease at the lack of a 'safety net' opportunity for reassessment of children's needs after early infancy. The Scottish Government therefore issued guidance in early

2011 recommending a further review at 24-30 months of age[28] although this is yet to be fully implemented. It will be particularly important to strive for equitable coverage of this new review in light of the historical results presented here that show marked inequalities in uptake of reviews in this age group.

In England, despite an established policy to review all children at 24-30 months, there are still only 60% of Primary Care Trusts commissioning this.[29] A robust universal service is essential on which to base targeted professional input but this is not being uniformly achieved. It is clear that children who do not attend their child health reviews are likely to have relatively high needs and robust efforts should be made to assess their needs and engage them and their families with appropriate and sensitive services. It will remain important to monitor the coverage of universal child health reviews as an indicator of the performance of the child health programme and its likely impact on inequalities in children's outcomes.

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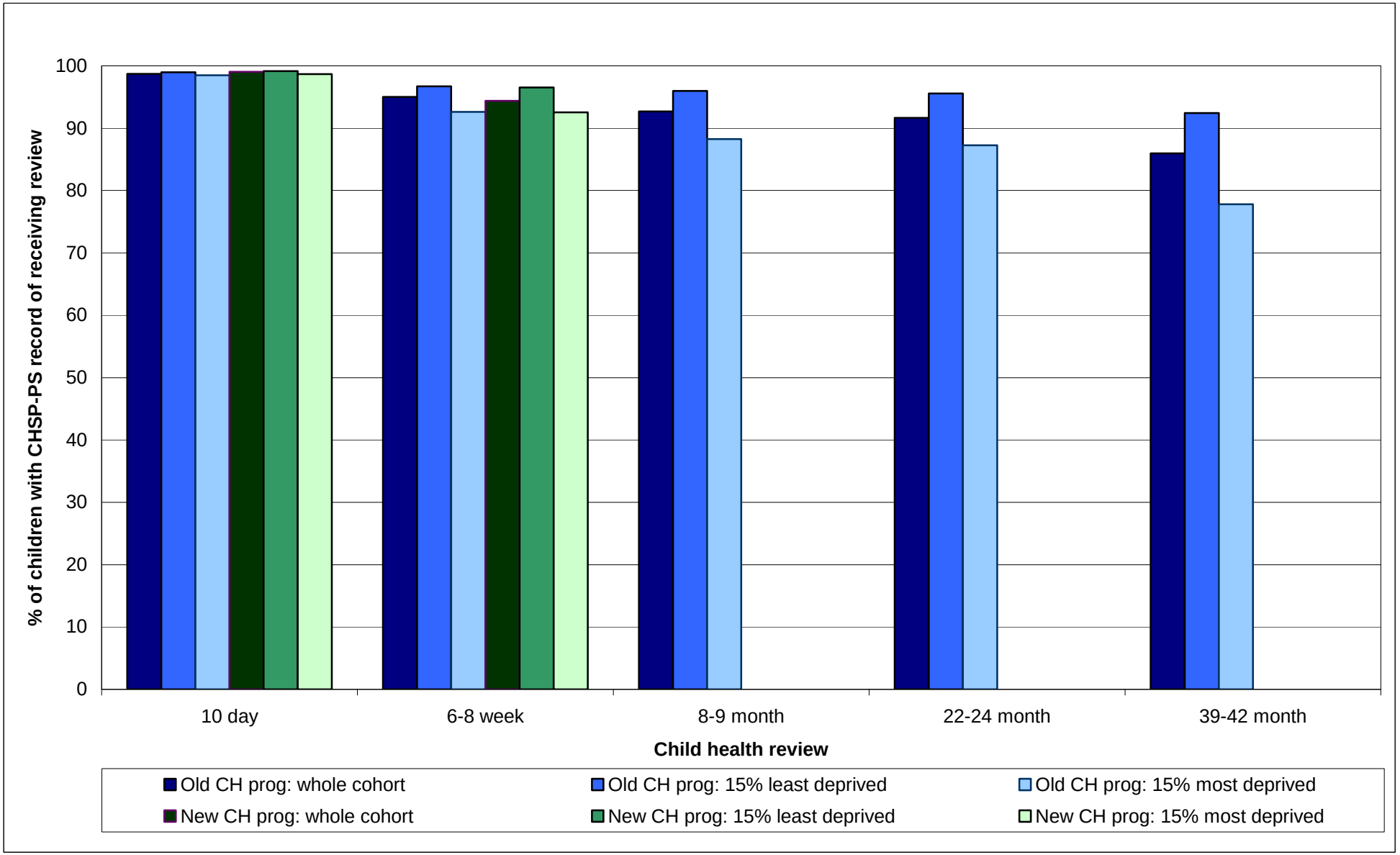
Figure 1: Coverage of universally offered child health reviews
Data for Figure 1

	Total number of children	Received 10 day review		Received 6-8 week review		Received 8-9 month review		Received 22-24 month review		Received 39-42 month review	
		N	%	N	%	N	%	N	%	N	%
Old child health programme whole cohort	37,668	37,185	98.7	35,795	95.0	34,913	92.7	34,520	91.6	32,382	86.0
Old child health programme least deprived	5,587	5,530	99.0	5,403	96.7	5,363	96.0	5,339	95.6	5,163	92.4
Old child health programme most deprived	7,322	7,210	98.5	6,781	92.6	6,462	88.3	6,390	87.3	5,697	77.8
New child health programme whole cohort	45,777	45,334	99.0	43,199	94.4						
New child health programme least deprived	5,726	5,678	99.2	5,528	96.5						
New child health programme most deprived	9,932	9,801	98.7	9,190	92.5						

Figure 2: Coverage of universally offered child health reviews by deprivation quintile (old child health programme cohort for illustration)
Data for Figure 2

Old child health programe cohort	Total number of children	Received 10 day review		Received 6-8 week review		Received 8-9 month review		Received 22-24 month review		Received 39-42 month review	
		N	%	N	%	N	%	N	%	N	%
Quintile 1 (least deprived)	7,333	7,257	99.0	7,076	96.5	7,018	95.7	6,988	95.3	6,760	92.2
Quintile 2	6,552	6,476	98.8	6,331	96.6	6,217	94.9	6,144	93.8	5,886	89.8
Quintile 3	6,111	6,027	98.6	5,818	95.2	5,732	93.8	5,651	92.5	5,317	87.0
Quintile 4	7,763	7,657	98.6	7,372	95.0	7,141	92.0	7,055	90.9	6,631	85.4
Quintile 5 (most deprived)	9,566	9,429	98.6	8,874	92.8	8,495	88.8	8,373	87.5	7,496	78.4

Figure 1: Coverage of universally offered child health reviews



Least and most deprived groups are children living in the 15% least and most deprived areas of Scotland respectively

Figure 2: Coverage of universally offered child health reviews by deprivation quintile (old child health programme cohort for illustration)

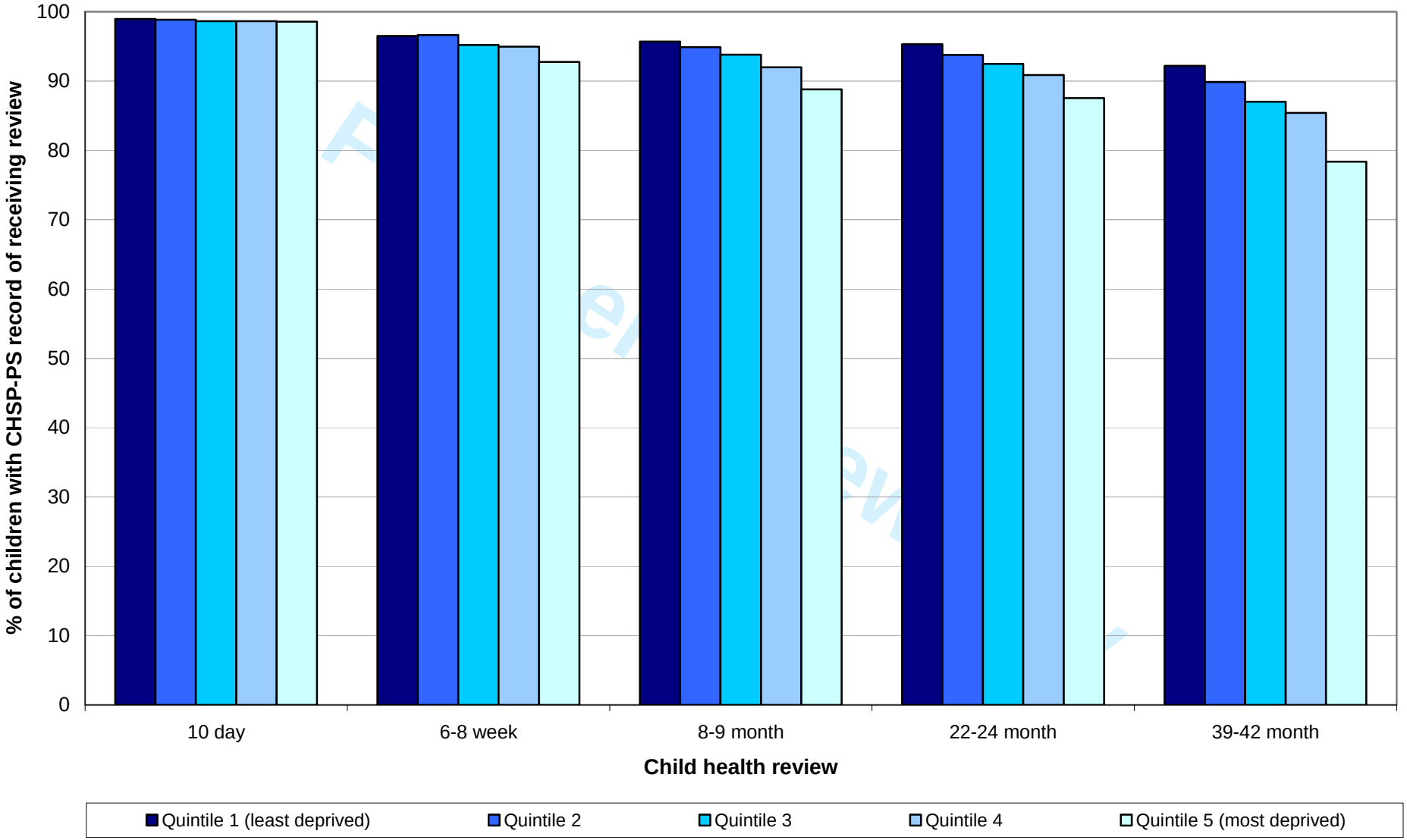
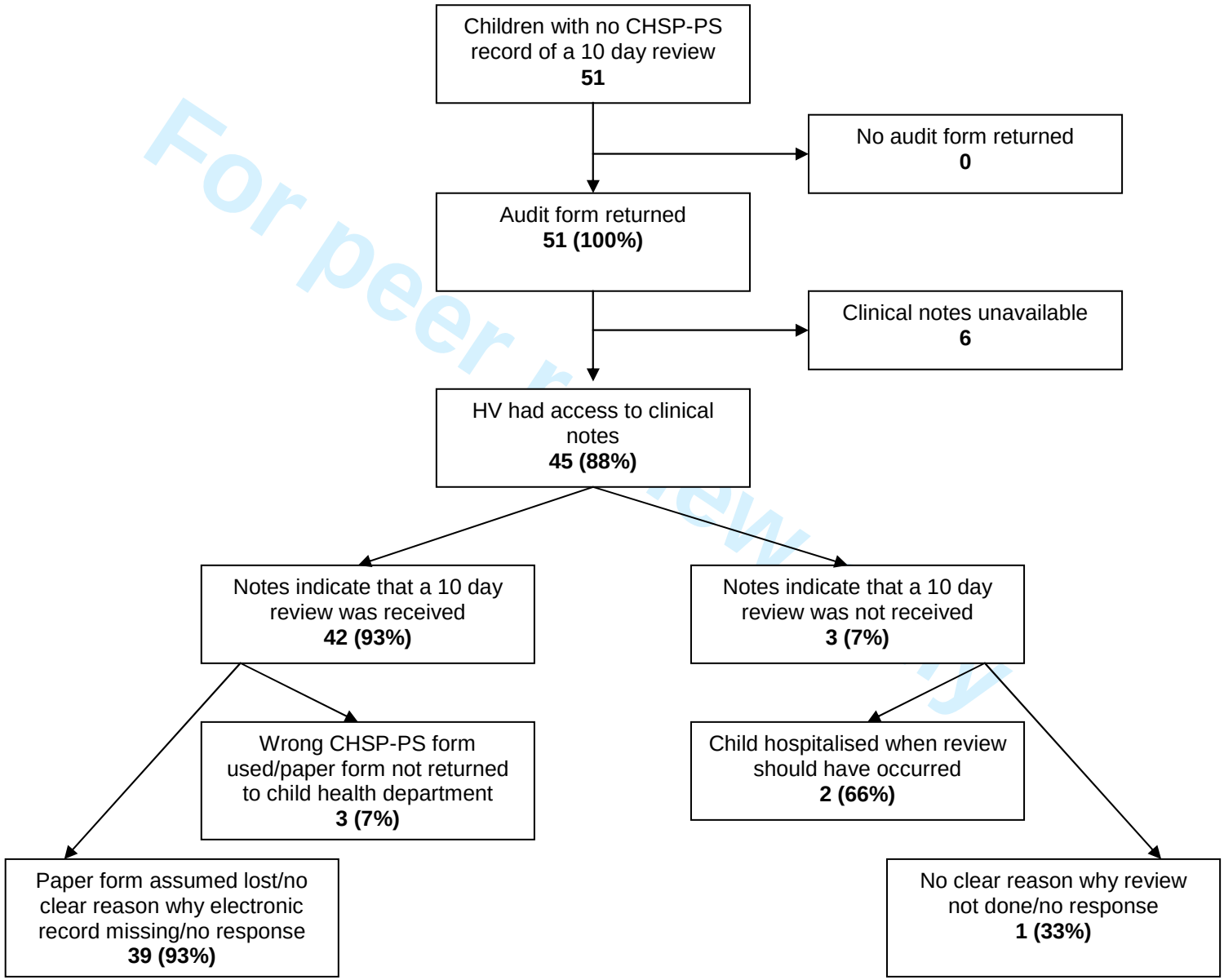
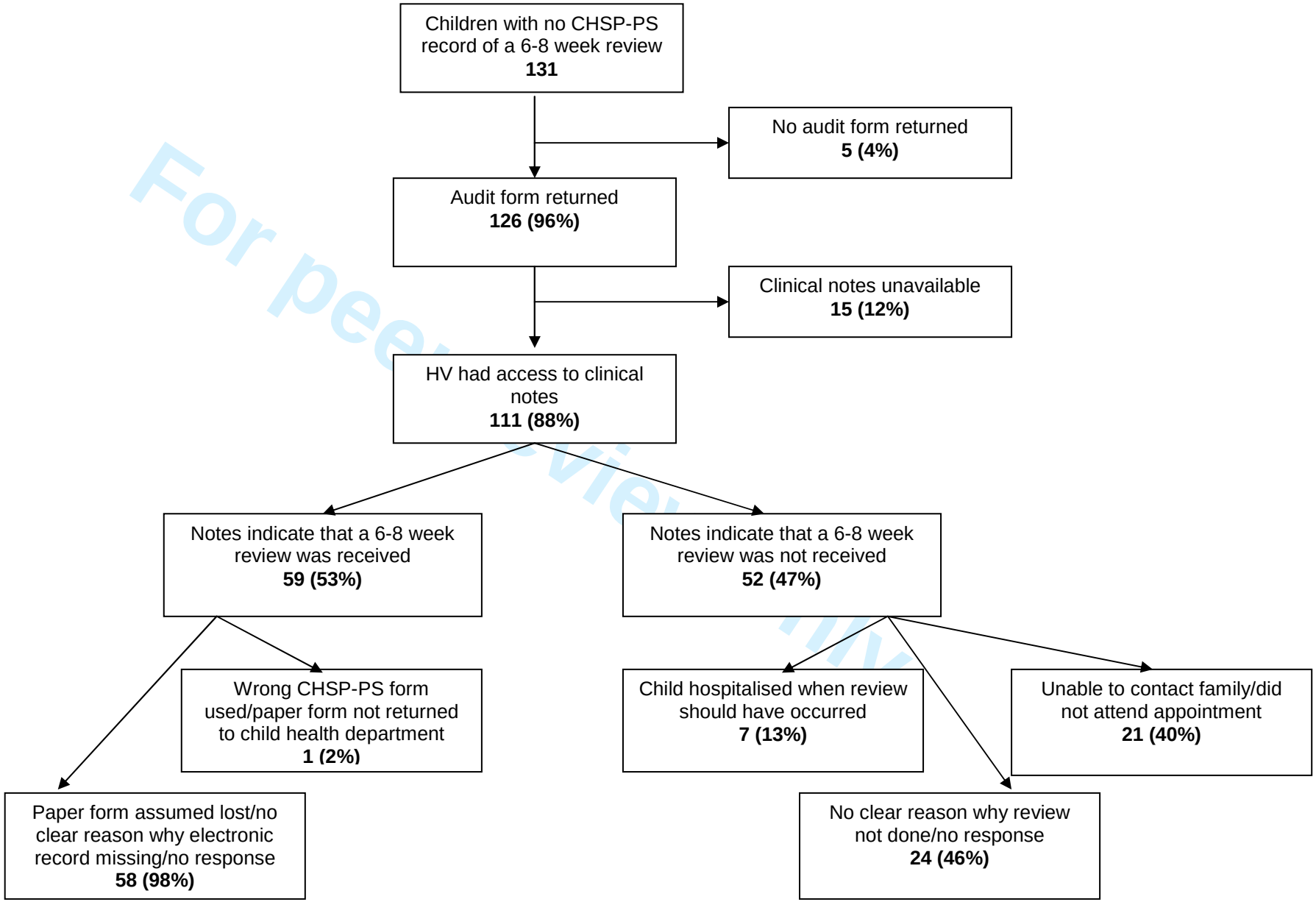


Figure 3: Results of audit of CHSP-PS data

3a: Children with no CHSP-PS record of a 10 day review



3b: Children with no CHSP-PS record of a 6-8 week review



759STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	4
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	4, 6-7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4, 6-7 (Table 1)
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	6-7
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6-7*
Bias	9	Describe any efforts to address potential sources of bias	7 (audit of data quality)
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		(*c*) Explain how missing data were addressed	8 (Table 2)
		(*d*) If applicable, explain how loss to follow-up was addressed	NA
		(*e*) Describe any sensitivity analyses	7 (audit of data

			quality)
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8 (Table 2)
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Not really relevant as study based on whole population birth cohort and analysis of routine data – cohorts fully described in methods as noted above
		(b) Indicate number of participants with missing data for each variable of interest	8 (Table 2)
		(c) Summarise follow-up time (eg, average and total amount)	6 (Table 1)
Outcome data	15*	Report numbers of outcome events or summary measures over time	8 and Figure 1 and 2
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8 and Figure 1 and 2
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7 and Figure 3 audit of data quality
Discussion			
Key results	18	Summarise key results with reference to study objectives	10
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10-11
Generalisability	21	Discuss the generalisability (external validity) of the study results	10

Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	2

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Trends in the coverage of 'universal' child health reviews: observational study using routinely available data

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Trends in the coverage of 'universal' child health reviews: observational study using routinely available data

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Competing interests
No author has any competing interest to declare in relation to this paper.

Data sharing
The routine data analysed for this study are held by NHS National Services Scotland Information Services Division (http://www.isdscotland.org/).

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Ethical approval
Ethical approval was not required for this study. Information Services Division staff adhered to NHS National Services Scotland Confidentiality Guidelines at all times when handling patient data.

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Article summary

Article focus

- A series of universally offered child health reviews providing assessment of children's health, development and wellbeing forms the backbone of the UK child health programme.
- The number of reviews offered per child has been reduced over recent years to increase capacity to provide effective, individualised support to families in need: equitable coverage of the remaining reviews is therefore particularly important.
- We used routinely available data to assess the coverage of the various child health reviews (overall and by deprivation) before and after the change in the number of reviews offered.

Key messages

- Coverage of reviews offered in early infancy is high but it progressively declines for reviews at older ages (around 99% coverage for the 10 day review and 86% for the 39-42 month review).
- Coverage is lower in the most deprived groups for all reviews and the discrepancy progressively increases for reviews at older ages (78% and 92% coverage for the 39-42 month review in most and least deprived groups).
- Coverage has not changed for the remaining reviews after reduction in the number of reviews offered: the inverse care law continues to operate in relation to provision of 'universal' child health reviews.

Strengths and limitations

- To our knowledge no quantitative assessment of the coverage of child health reviews offered in the UK has previously been published.
- This analysis involved large numbers of children: over 80,000 children eligible to receive their child health reviews in Scotland were included.
- Careful consideration must be given to data quality when analysing routinely available data: we conducted an audit of data quality to allow the uncertainty in the results to be quantified.

Abstract

Objectives
Universally offered child health reviews form the backbone of the UK child health programme. The reviews assess children's health, development, and wellbeing and facilitate access to additional support as required. The number of reviews offered per child has been reduced over recent years to allow more flexible provision of support to families in need: equitable coverage of the remaining reviews is therefore particularly important. This study assessed the coverage of universal child health reviews, with an emphasis on trends over time and inequalities in coverage by deprivation.

Design
Assessment of the coverage of child health reviews by area-based deprivation using routinely available data. Supplementary audit of the quality of the routine data source used.

Setting
Scotland

Participants
Two cohorts of around 40,000 children each. The cohorts were born in 1998/99 and 2007/08 and eligible for the previous programme of five and the current programme of two pre-school reviews respectively.

Outcome measures
Coverage of the specified child health reviews for the whole cohorts and by deprivation.

Results
Coverage of the 10 day review is high (99%) but it progressively declines for reviews at older ages (86% for 39-42 month review). Coverage is lower in children living in the most deprived areas for all reviews and the discrepancy progressively increases for reviews at older ages (78% and 92% coverage for the 39-42 month review in most and least deprived groups). Coverage has been stable over time: it has not increased for the remaining reviews after reduction in the number of reviews provided.

Conclusions
The inverse care law continues to operate in relation to 'universal' child health reviews. Equitable uptake of reviews is important to ensure maximum likely impact on inequalities in children's outcomes.

Word count: 288

Introduction

Children's early experiences profoundly shape their development and long term health and wellbeing.[1,2] The UK child health promotion programme aims to support children through their early years and help them attain their developmental and health potential.[3,4] The programme comprises screening, immunisation, developmental reviews, parental support and health promotion. A number of reviews are offered to all children at specified ages. The reviews are usually carried out by Health Visitors (HVs), sometimes alongside others such as General Practitioners (GPs), and focus on assessing children's growth, development, health and wider family wellbeing and thus determining the need for further professional input.

Professional guidance on the delivery of the child health programme issued in 2003[5] suggested that there was too much emphasis on provision of these 'routine' reviews leading to a relatively inflexible system that had done little to address persistent inequalities in children's outcomes.[6] Adoption of this guidance across the UK has led to a new emphasis on a 'progressive universalism' model of delivery, with a reduced programme of universal reviews complemented by more intensive, individualised care for those families in need of professional services.[7]

The Scottish Government took particularly decisive action in this regard. Policy issued in 2005 reduced the number of universal pre-school child health reviews from six (at 10 days, 6-8 weeks, and 8-9, 22-24, 39-42, and 48-54 months) to two (at 10 days and 6-8 weeks).[8] At the same time, a three category indicator of need (the Health Plan Indicator – core, additional, and intensive) was introduced to facilitate the identification of those children requiring enhanced support in addition to that offered through the universal programme. The revised programme was implemented in different NHS Board areas between 2005 and 2010.

People who are most in need of health services are often the least likely to access them.[9] People from deprived areas are particularly disadvantaged in terms of access to preventive/proactive health care.[10,11] There is evidence from the US of marked inequalities in uptake of 'well child' care[12-14] but, to our knowledge, no information on inequalities in uptake of child health reviews in the UK has been published to date. Ambivalence towards, or disinclination to engage with, the child health programme has been documented however, particularly amongst families from deprived areas.[15-18]

For the programme to contribute to reducing inequalities in children's outcomes, it is essential that children from across the social spectrum participate in the universal reviews and hence have the opportunity to receive the level of input required to secure good outcomes. We therefore used routine Scottish data to explore the following questions:

- What proportion of children actually receives the universal child health reviews?
- How does review coverage vary by deprivation?
- How has (inequality in) review coverage changed over time, in particular before and after the reduction in number of reviews offered?

We also audited the quality of the relevant routine data to provide additional information not previously available.

Methods

Routine data sources used

All children in Scotland have a record created in the child health programme national information system. One element of the system, Child Health Surveillance Programme – Pre School (CHSP-PS), administers the child health reviews offered to pre-school children.[19] When a child is due for a review, CHSP-PS sends an appointment to the family and the appropriate paper review form (in triplicate) to the Health Visitor. After the review, one copy of the completed form is returned to the local child health department where administrative staff enter the findings into the CHSP-PS system; one copy is retained in the child's HV notes; and the third copy is inserted into the child's parent held record. The NHS Information Services Division (ISD) receives quarterly downloads from the system for analytical purposes.

Child health reviews included

Table 1 shows the reviews offered to all children in Scotland before and after implementation of the 2005 policy that are included in this study. It was not mandatory to record provision of the old 48-54 month review on CHSP-PS (a situation that reflects a historical decision) hence that review has been excluded. Health Visitors are solely responsible for provision of the 10 day review. The 6-8 week review usually involves an initial assessment by the HV followed by a medical examination by the GP. GP input into provision of reviews at older ages varied.

Table 1: Cohorts included in the analysis

Cohort	Date of birth range	Included child health reviews		Date of CHSP-PS extract used in analysis
		Review name	Upper age limit by which the review should be completed	
Old child health programme	1 November 1998 – 31 October 1999	10 day 6-8 week 8-9 month 22-24 month 39-42 month	None specified 12 weeks 10 months 26 months 44 months	November 2003
New child health programme	1 Jul 2007 – 30 Jun 2008	10 day 6-8 week	28 days 12 weeks	February 2009

Cohorts included in study

Table 1 also shows the two cohorts that were studied. The 'old child health programme' cohort had the opportunity to receive all five previously offered reviews whereas the 'new child health programme' cohort had the opportunity to receive the current reduced programme of two reviews. Children who were consistently registered to receive their child health programme in selected NHS Board areas from birth up to the date of the relevant CHSP-PS data extracts were included. Boards that were established users of the CHSP-PS system by November 1998 and had implemented the revised child health programme by the beginning of 2007 were selected. These were Argyll & Clyde; Ayrshire & Arran; Borders; Fife; Forth Valley; Greater Glasgow; Lanarkshire; Lothian; and Tayside. These areas together contain around 82% of the Scottish population aged under 5 years. The CHSP-PS downloads taken around 4 months after the upper age at which the children should have had the last included review were used for analysis.

Assessing coverage of universally offered child health reviews

All included children in each cohort were identified. Their postcode of residence at the time of data extract was used to derive their 2006 Scottish Index of Multiple Deprivation quintile and whether they lived in one of the 15% most or least deprived areas of Scotland.[20] Whether the children had a record on CHSP-PS of receiving each of the relevant reviews was then noted. Whether they received their reviews below the recommended upper age limit[21] (see Table 1) was also noted for all reviews except the 10 day review as the age of the child at this review is incompletely recorded. Coverage of the various reviews (at any age or where possible within the recommended age range) by deprivation level was calculated.

Differences in coverage were assessed by Chi squared tests with Yates' continuity correction.[22] Confidence intervals for differences in coverage between least and most deprived groups were calculated using the Newcombe-Wilson formula.[23] Finally, the total number of registered births occurring within the corresponding date ranges and NHS Board areas was noted to assess the number of children excluded due to dying or moving over the period of study.

Audit of CHSP-PS data quality

Due to the way the CHSP-PS system works, it may be that some children with no CHSP-PS record of a review did actually receive their review but the paper form went astray prior to data entry. To quantify this potential for underestimation of review coverage, we conducted an audit of CHSP-PS data.

ISD prepared a case listing of all children from the new child health programme cohort that were registered with a GP practice in two localities as at February 2010 who had no CHSP-PS record of receiving a 10 day and/or a 6-8 week review. The two localities (in Greater Glasgow and Fife) were selected as they both had review coverage rates similar to that seen for Scotland as a whole, included a range of deprived/affluent and urban/rural areas, and had HV managers who were enthusiastic to undertake the audit.

Individual audit forms for all children on the case listings were securely transferred to the relevant HV teams. The forms asked whether the apparently missing review had in fact been received and then either why it had been missed or why no record was available on CHSP-PS as appropriate. The HVs completed the forms after reviewing the children's contemporaneous clinical notes. All audit returns were entered into SPSS version 17.0. Two authors (AS and RW) agreed on appropriate coding of free text fields. Additional variables derived from the children's overall child health programme electronic records, specifically the child's sex, deprivation quintile, and most recently recorded Health Plan Indicator category were merged into the analysis file. The resulting data were analysed using simple descriptive statistics.

Results

Coverage of universally offered child health reviews

The number of children included in each cohort is shown in Table 2. The proportion of children born in the relevant Board areas that were excluded from the analysis is higher for the old child health programme cohort as these children had to remain resident in the same Board area for a longer period to be included. The proportion of children with an unknown deprivation category was low in both cohorts.

Table 2: Number of children in each cohort

Cohort	Total number of births in included Boards in relevant date range	Number (%) of children included in cohort	Number (%) of children in cohort with known deprivation status
Old child health programme	45,122	37,668 (83.5%)	37,325 (99.1%)
New child health programme	48,310	45,777 (94.8%)	45,624 (99.7%)

The proportion of children in each cohort that had a CHSP-PS record of receiving the various child health reviews is shown in Figure 1. In the old child health programme cohort, coverage declined for each subsequent review: 98.7% and 86.0% of children had a record of receiving their 10 day and 39-42 month reviews respectively. For each review, children living in the most deprived areas were significantly less likely to have a record of receiving the review than children living in the least deprived areas. The absolute difference in review coverage between deprived and affluent areas increased for each subsequent review: for example, 77.8% and 92.4% of children from the most and least deprived areas had a record of receiving their 39-42 month review respectively (difference of 14.6%, 95%CI 13.4-15.8%, p<0.0001). Coverage of the 10 day and 6-8 week reviews was very similar for the new child health programme cohort to that seen for the earlier cohort. The degree of inequality in coverage of these reviews also remained unchanged.

When coverage was assessed for all deprivation quintiles rather than just the least and most deprived groups, a clear deprivation gradient was found for all reviews except the 10 day review for each cohort (Figure 2). Coverage of the 10 day review was very high for both cohorts and although the most deprived quintile always had lower coverage than the least deprived quintile, no clear gradient was evident for the intermediate deprivation groups.

When only reviews conducted within the recommended age limit were included, overall coverage reduced by between 3.0% and 5.6%. Children from deprived areas were consistently more likely to have their reviews late hence inequalities in coverage of timely reviews were particularly wide. In the new child health programme cohort, 93.8% of children from the least deprived areas had a record of receiving a 6-8 week review before 12 weeks of age (96.5% at any age) compared to 87.8% of children from the most deprived areas (92.5% at any age).

Audit of CHSP-PS data

A total of 2,784 children were resident in the two audit areas and eligible for inclusion: 51 (1.8%) had no CHSP-PS record of a 10 day review and 131 (4.7%) had

no record of a 6-8 week review. Six children were in both categories hence a total of 182 missing reviews for 176 children were included in the audit. The audit results are summarised in Figure 3. A very high rate of return (177/182, 97%) was achieved and in the large majority of cases (156/177, 88%) the child's clinical notes had been available to the HV hence the returned form was informative.

For 42 of the 45 (93%) children with no CHSP-PS record of a 10 day review (and who had an informative audit return), the clinical notes indicated that a review had actually taken place. By contrast, a review had only been provided to 59 of the 111 (53%) children with no record of a 6-8 week review. For 21 of the 52 (40%) children who had genuinely missed their 6-8 week review, the HV specifically indicated that this was due to being unable to contact the family or the family repeatedly not attending appointments. In a further 7 (13%) cases, the review was not provided due to the child being in hospital.

There was a clear tendency for children who genuinely missed their 6-8 week review (compared to those who received the review but had no CHSP-PS record) to have higher needs. For example, 41/52 (79%) of the children who missed their review lived in one of the two most deprived quintile areas compared to 23/59 (39%) of the children who did receive the review. Similarly, 35/52 (67%) of children who missed their review had 'additional' or 'intensive' as the most recently recorded Health Plan Indicator category on their overall child health programme electronic record compared to 20/59 (34%) of children who received their review.

HVs were asked whether they had had any contact with the children who genuinely missed their 6-8 week review when the children were aged between 4 and 12 weeks: in 45/52 (87%) cases, the HV indicated they had had at least one face to face or telephone contact with the child or parents; in 4 cases the HV indicated they had had no contact at all (and in all cases this was ascribed to the child being in hospital), and no response was provided in 3 cases.

Discussion

This analysis of routinely available data shows that not all children who are offered 'universal' child health reviews actually receive them. Coverage of the 10 day review is very high but it declines for each subsequent review. The 'inverse care law'[9] applies to coverage of child health reviews: children from more deprived areas are less likely to receive their reviews and the inequalities are wider for reviews offered at older ages. The level of inequality in coverage has been stable over time and (for the remaining reviews) has not changed following the implementation of a new child health programme offering a much reduced number of reviews.

A further two cohorts were examined to confirm the consistency of the findings. One cohort of children born November 2000 to October 2001 that had the opportunity to receive the old child health programme immediately before it was withdrawn and one born April 2006 to July 2006 who received the revised programme immediately after its implementation: (inequalities in) review coverage was very similar for these cohorts.

We recognise that our analysis is restricted to children who remained resident in the same NHS Board area for the period of study, i.e. up to 59 months of age for the old child health programme cohort and up to18 months for the new cohort. A previous unpublished analysis conducted by ISD found that the coverage of child health reviews experienced by children who remain in the same NHS Board area throughout childhood is marginally, but not significantly, higher that that experienced by children who move between Board areas. Coverage of child health reviews for children who emigrate out of Scotland altogether is unknown but emigration is commoner among least deprived groups. Our results are therefore likely to provide a reasonable estimate of the child health review coverage in the whole Scottish population.

The audit of CHSP-PS data provides valuable information on the reliability of the findings. The audit shows that the reliance on transfer of paper forms before data entry does result in some data loss. The actual level of review coverage is therefore likely to be somewhat higher than the results suggest. For example, the overall percentage of children missing their 6-8 week review is likely to be closer to 2.5% than 5%. The general patterns observed are very likely to be real however. Indeed, the audit findings emphasise the association between missing child health reviews and greater vulnerability: the level of inequality in review coverage may therefore actually be wider than that presented.

For children born after the implementation of the revised child health programme, it has obviously only been possible to examine the coverage of the two remaining reviews, both of which are offered in early infancy. Implementation of the revised review schedule aimed to strengthen the programme's ability to consistently reach children in need of support, provide effective early intervention, and thus reduce inequalities in children's outcomes.[8] One would therefore have hoped and expected to see reduced inequality in coverage for the remaining reviews. The finding that there has been no change is disappointing.

It appears that a minority of families (with relatively high needs) continue to miss out on their child health reviews. This analysis cannot fully explain why children miss their reviews but the audit results suggest that unavailability (e.g. child in hospital) or parental disengagement (e.g. failure to respond to multiple invitations) are the most common underlying reasons. The audit results provide reassurance that almost all children who genuinely missed their 6-8 week review had some kind of contact with

their HV however, indicating that few if any children are completely unknown to services. Further qualitative work with HVs and parents will be required to more fully understand why some families do not participate in child health reviews and to develop innovative services that meet their needs. There has been a significant reduction in inequalities in breastfeeding rates in Scotland over recent years (driven mainly by increasing rates in more deprived groups)[24], giving cause for optimism that child health promotion activities can effectively engage deprived groups and reduce inequalities. Work looking at facilitation of, and barriers to, engagement of families in other child wellbeing services such as Sure Start may also hold valuable lessons for the child health programme.[25-27] There is evidence that the distribution of HV resources are not always adequate for, or aligned with, population needs. Achieving equitable coverage of child health reviews will therefore also require careful consideration of the HV resources available in different areas.[28-30]

There has been debate in Scotland recently as to whether the core programme of universal child health reviews has been reduced too far. HVs have expressed unease at the lack of a 'safety net' opportunity for reassessment of children's needs after early infancy. The Scottish Government therefore issued guidance in early 2011 recommending a further review at 24-30 months of age[31] although this is yet to be fully implemented. It will be particularly important to strive for equitable coverage of this new review in light of the historical results presented here that show marked inequalities in uptake of reviews in this age group.

In England, despite an established policy to review all children at 24-30 months, there are still only 60% of Primary Care Trusts commissioning this.[32] A robust universal service is essential on which to base targeted professional input but this is not being uniformly achieved. It is clear that children who do not attend their child health reviews are likely to have relatively high needs and robust efforts should be made to assess their needs and engage them and their families with appropriate and sensitive services. It will remain important to monitor the coverage of universal child health reviews as an indicator of the performance of the child health programme and its likely impact on inequalities in children's outcomes.

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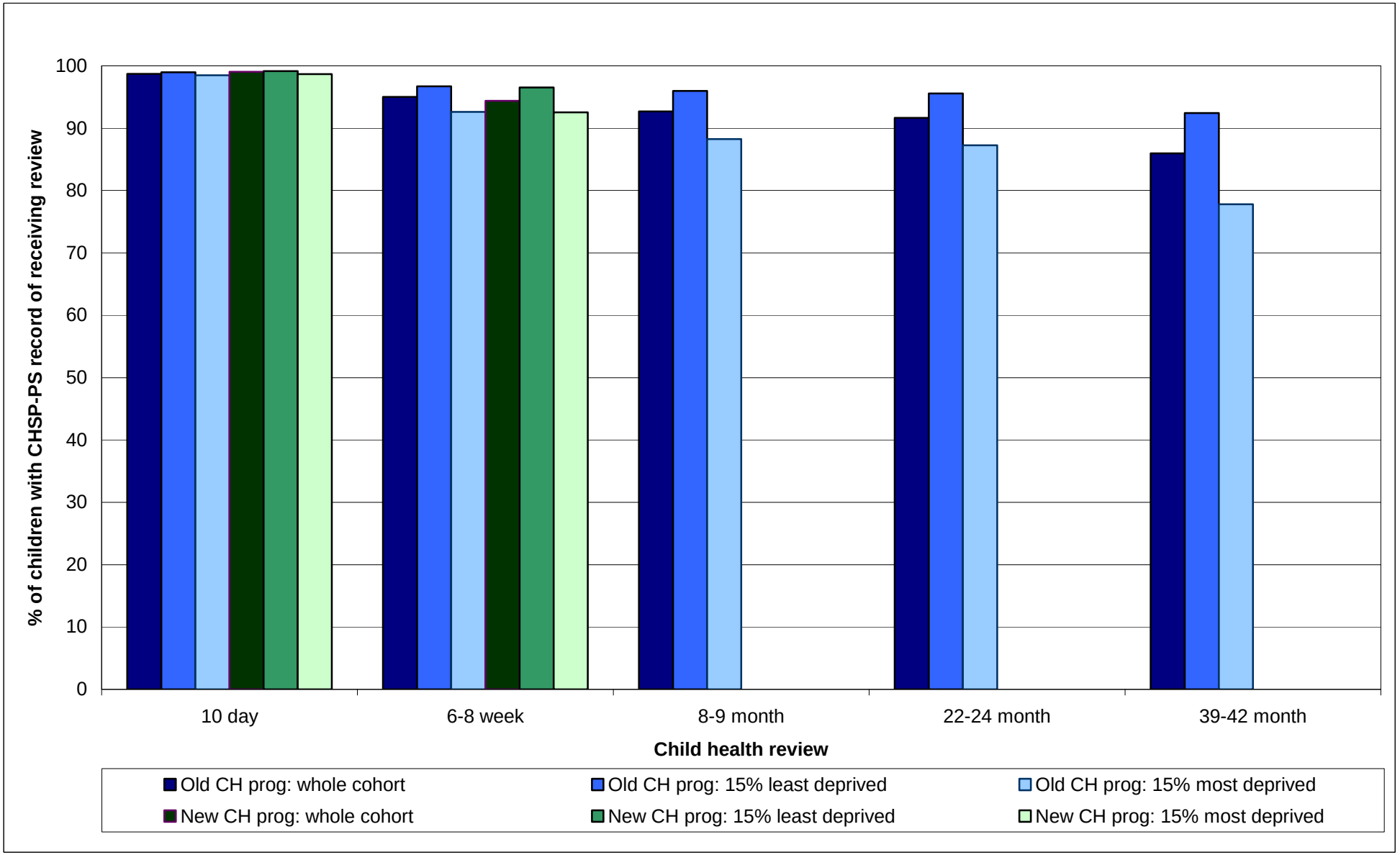
Figure 1: Coverage of universally offered child health reviews
Data for Figure 1

	Total number of children	Received 10 day review		Received 6-8 week review		Received 8-9 month review		Received 22-24 month review		Received 39-42 month review	
		N	%	N	%	N	%	N	%	N	%
Old child health programme whole cohort	37,668	37,185	98.7	35,795	95.0	34,913	92.7	34,520	91.6	32,382	86.0
Old child health programme least deprived	5,587	5,530	99.0	5,403	96.7	5,363	96.0	5,339	95.6	5,163	92.4
Old child health programme most deprived	7,322	7,210	98.5	6,781	92.6	6,462	88.3	6,390	87.3	5,697	77.8
Difference in coverage (least-most deprived) % (95% CI)		0.5% (0.1-0.9%) p=0.015		4.1% (3.3-4.9%) p<0.0001		7.7% (6.8-8.7%) p<0.0001		8.3% (7.3-9.2%) p<0.0001		14.6% (13.4-15.8%) p<0.0001	
New child health programme whole cohort	45,777	45,334	99.0	43,199	94.4						
New child health programme least deprived	5,726	5,678	99.2	5,528	96.5						
New child health programme most deprived	9,932	9,801	98.7	9,190	92.5						
Difference in coverage (least-most deprived) % (95% CI)		0.5% (0.1-0.8%) p=0.008		4.0% (3.3-4.7%) p<0.0001							

Figure 2: Coverage of universally offered child health reviews by deprivation quintile (old child health programme cohort for illustration)
Data for Figure 2

Old child health programe cohort	Total number of children	Received 10 day review		Received 6-8 week review		Received 8-9 month review		Received 22-24 month review		Received 39-42 month review	
		N	%	N	%	N	%	N	%	N	%
Quintile 1 (least deprived)	7,333	7,257	99.0	7,076	96.5	7,018	95.7	6,988	95.3	6,760	92.2
Quintile 2	6,552	6,476	98.8	6,331	96.6	6,217	94.9	6,144	93.8	5,886	89.8
Quintile 3	6,111	6,027	98.6	5,818	95.2	5,732	93.8	5,651	92.5	5,317	87.0
Quintile 4	7,763	7,657	98.6	7,372	95.0	7,141	92.0	7,055	90.9	6,631	85.4
Quintile 5 (most deprived)	9,566	9,429	98.6	8,874	92.8	8,495	88.8	8,373	87.5	7,496	78.4

Figure 1: Coverage of universally offered child health reviews



Least and most deprived groups are children living in the 15% least and most deprived areas of Scotland respectively

Figure 2: Coverage of universally offered child health reviews by deprivation quintile (old child health programme cohort for illustration)

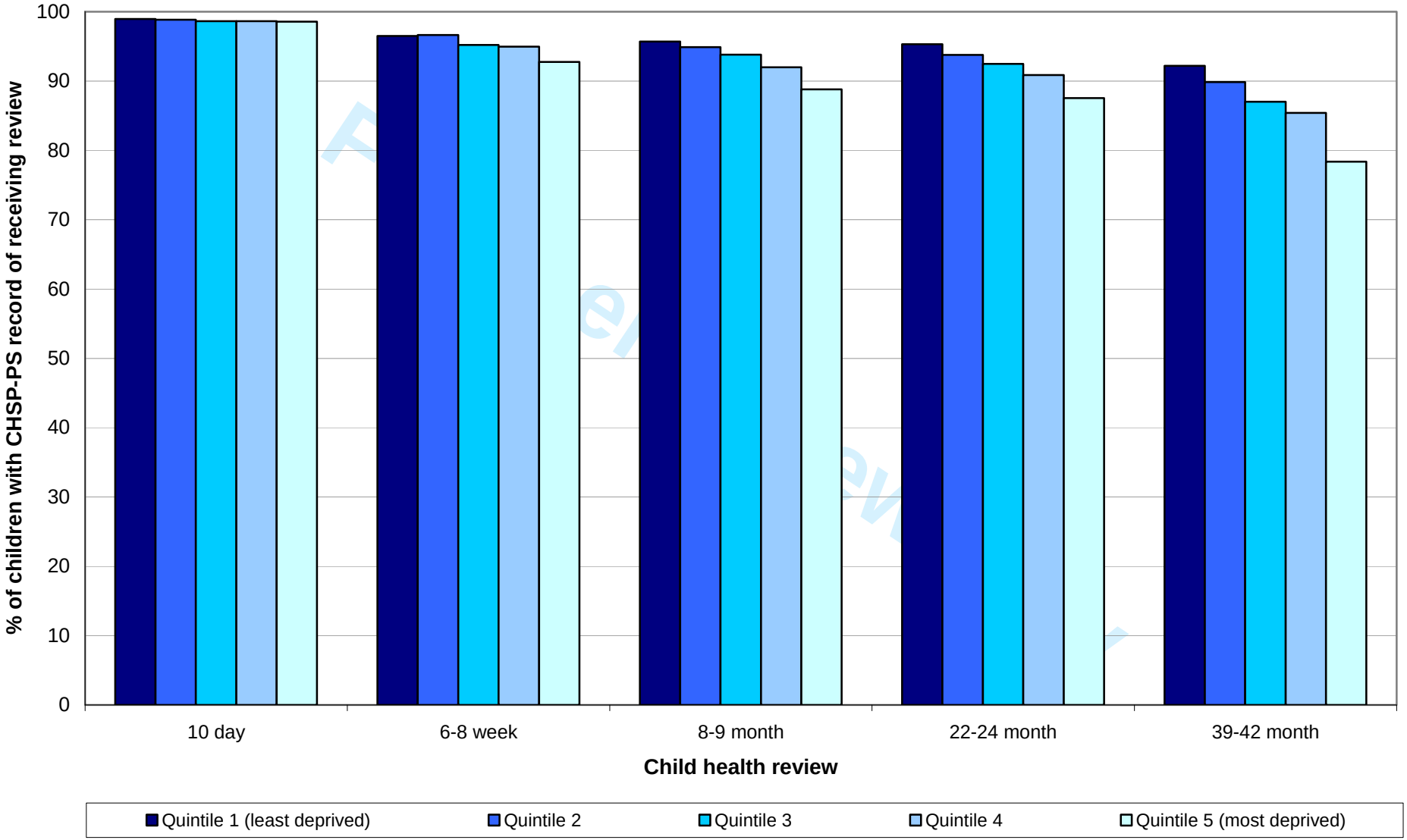
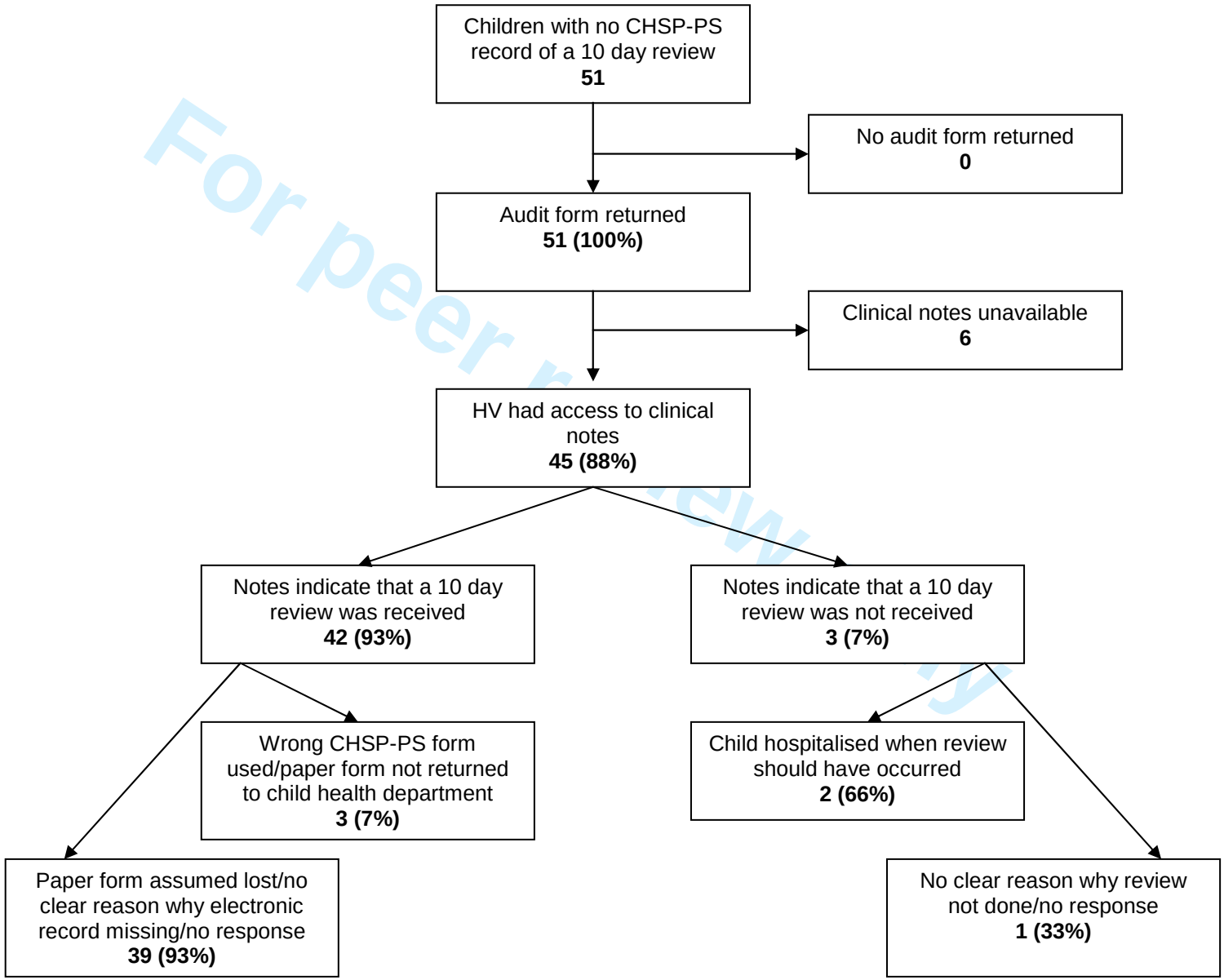
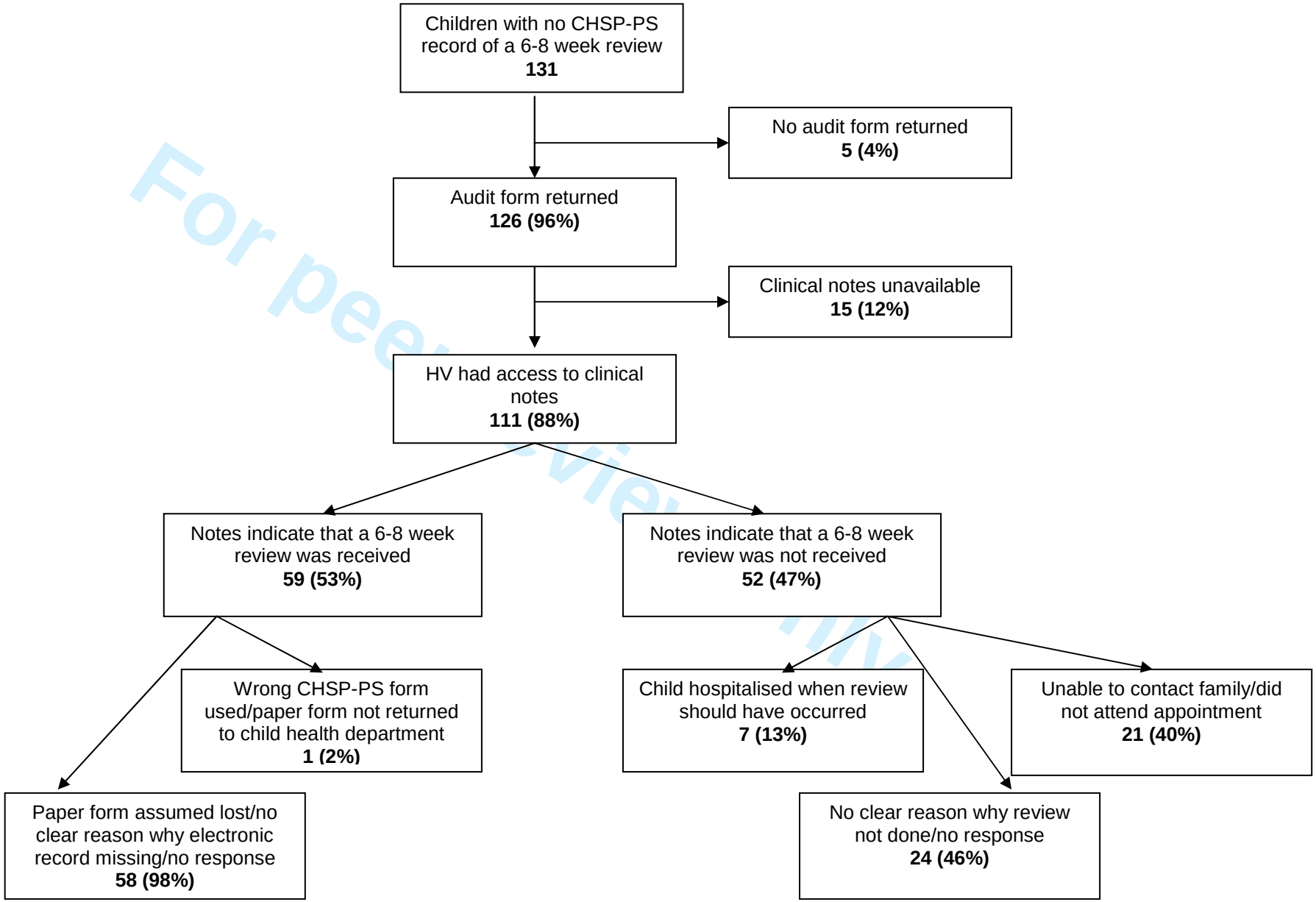


Figure 3: Results of audit of CHSP-PS data

3a: Children with no CHSP-PS record of a 10 day review



3b: Children with no CHSP-PS record of a 6-8 week review



759STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	4
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	4, 6-7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4, 6-7 (Table 1)
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	6-7
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6-7*
Bias	9	Describe any efforts to address potential sources of bias	7 (audit of data quality)
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		(*c*) Explain how missing data were addressed	8 (Table 2)
		(*d*) If applicable, explain how loss to follow-up was addressed	NA
		(*e*) Describe any sensitivity analyses	7 (audit of data

			quality)
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8 (Table 2)
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Not really relevant as study based on whole population birth cohort and analysis of routine data – cohorts fully described in methods as noted above
		(b) Indicate number of participants with missing data for each variable of interest	8 (Table 2)
		(c) Summarise follow-up time (eg, average and total amount)	6 (Table 1)
Outcome data	15*	Report numbers of outcome events or summary measures over time	8 and Figure 1 and 2
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8 and Figure 1 and 2
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7 and Figure 3 audit of data quality
Discussion			
Key results	18	Summarise key results with reference to study objectives	10
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10-11
Generalisability	21	Discuss the generalisability (external validity) of the study results	10

Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	2

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.