



National Audit Office

Caring for Vulnerable Babies: The reorganisation of neonatal services in England

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Caring for Vulnerable Babies: The reorganisation of neonatal services in England

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KEY FACTS

Demand for neonatal care is increasing

- In 2006, 635,748 babies were born in England, a 3.7 per cent increase since 2005 and the fifth increase since 2001.
- In 2006-07, 62,471 babies, or roughly one in ten of all births, were admitted to neonatal units. This was up from 59,711 in 2005-06.¹
- Babies need neonatal care because they are premature, have a low birth weight or suffer from an illness or condition, such as a heart defect. The trend in low birth weight babies is increasing in the UK and other developed countries.²
- The risk factors associated with prematurity or low birth weight are high or low maternal age, obesity, smoking, ethnic origin, deprivation and assisted conception such as IVF.
- The number of women giving birth at 40 years of age or more has more than doubled since 1986. The proportion of births to non-UK born mothers has increased from 12.8 per cent in 1996 to 21.9 per cent in 2006. The number of women receiving assisted conception has more than trebled since 1991.³

Key facts continued

- Survival rates for premature or low birth weight babies have improved dramatically. In 1975 half of babies born prematurely with birth weight 1500g or less died and many others were stillborn. By 1985 a quarter died and by 1995 it was a sixth. Many babies who previously would have been stillborn are now born alive. As a result there is an increased expectation that very small babies will survive.
- Infant mortality as a whole has fallen from 7.3 deaths per 1,000 live births in 1991 to 5 deaths in 2005 and is heavily affected by deaths in the neonatal period. Some 70 per cent of infant mortality occurs in the first 28 days of life. Although prematurity and low birth weight are most closely associated with infant mortality, other factors, such as congenital anomalies, also have a significant impact.
- Neonatal mortality rates have fallen from 4.2 deaths per 1,000 live births in 1995 to 3.5 deaths in 2005.⁴ There is evidence showing that neonatal mortality increases with higher levels of deprivation.⁵
- Premature birth can have long-term health impacts such as learning difficulties and cerebral palsy, but accurate data on trends over time is sparse and its full effects may not be identified for several years. Long-term studies of premature children, such as the EPICure study, suggest that prematurity can have a wide range of physical and cognitive effects.⁶

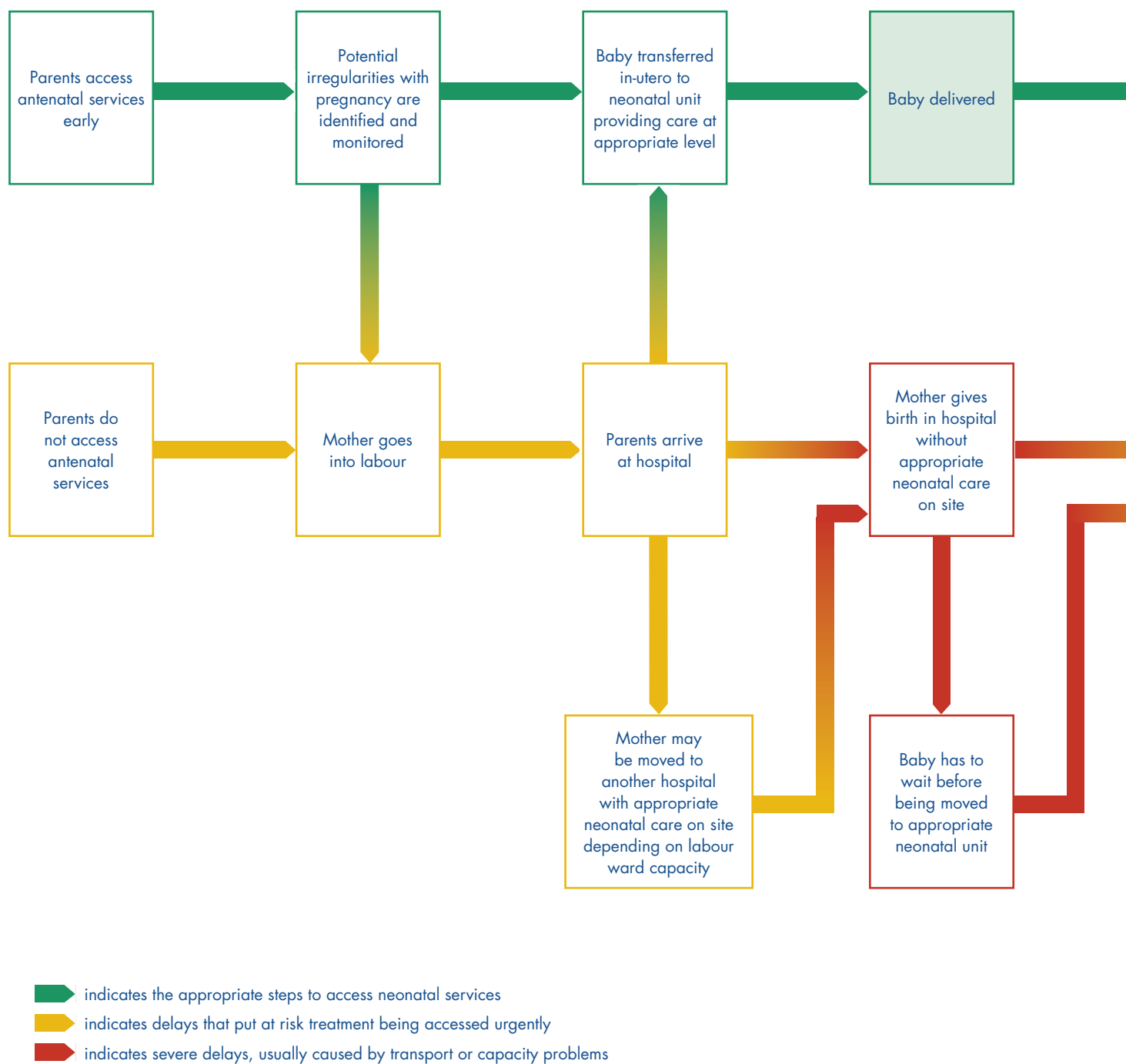
How neonatal services have responded

- Advances in technology and health care expertise have led to increasing survival rates of very premature babies over the last 20 years.⁷ Medical advances such as antenatal steroids and surfactant (which helps babies' lungs to function more effectively), improvements in nutrition, evolution of neonatology as a paediatric sub-specialty and the development of nursing expertise mean the service continues to be an innovative and cutting edge area of medicine.
- In England there are 180 neonatal units based in NHS and Foundation Trusts currently structured into 23 regional networks.⁸ Each unit has a designation of either level 1, 2 or 3 which indicates the type and intensity of the care it provides. See Figures 4 and 5 for further details.
- Babies are cared for in incubators, also described as cots, at three levels of care. The total number of cots has increased from 3,243 in 2004-05 to 3,521 in 2006-07.⁹
- These units are staffed by paediatric and neonatal doctors and neonatal nurses, some of whom have specialist training.

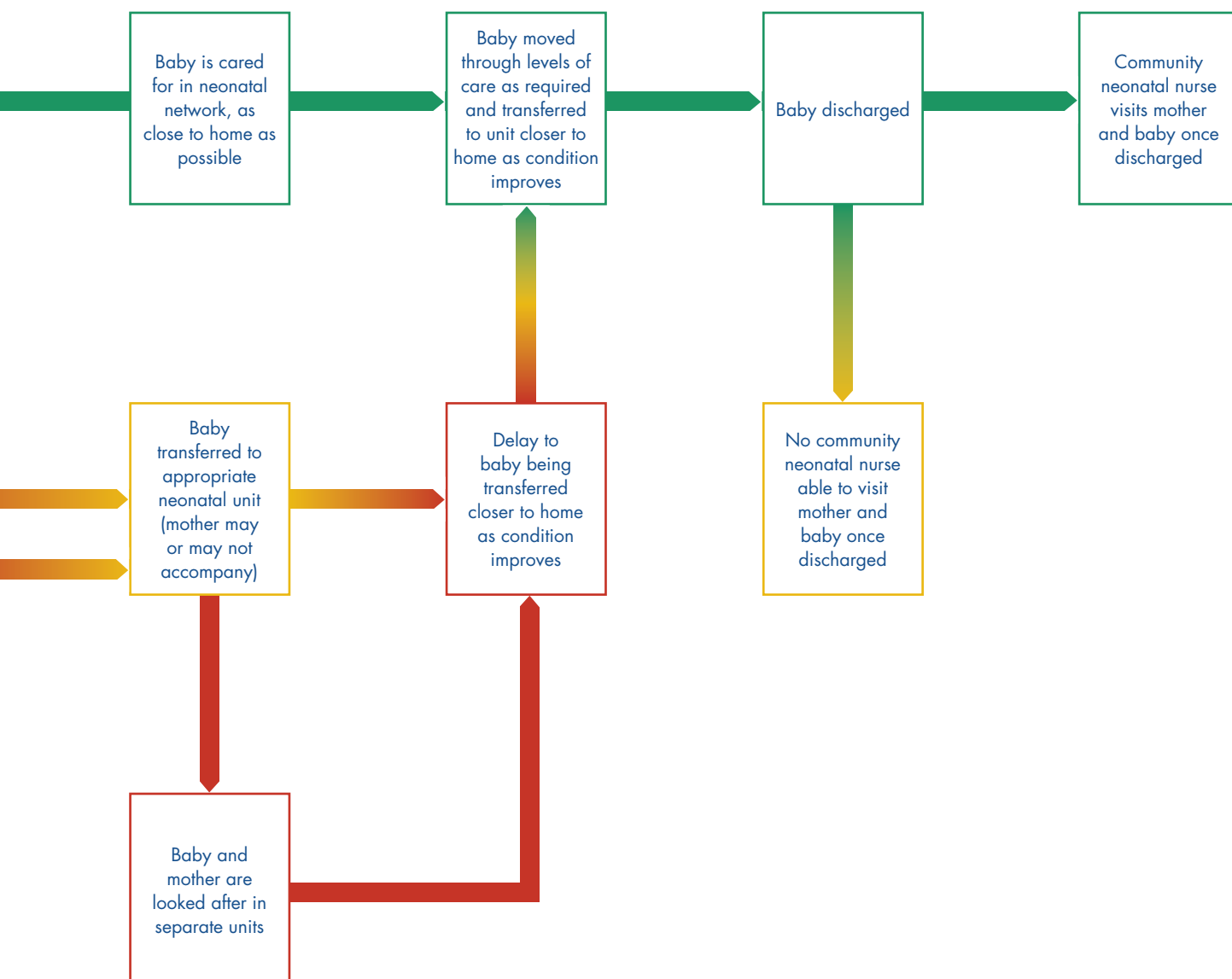
Figure 1 overleaf shows the ideal patient pathway and shows the points at which the pathway can be undermined.

1

The ideal neonatal pathway can be interrupted by delays at different decision points



Source: National Audit Office analysis





1 Most babies are born healthy requiring little or no medical intervention. Every year, however, around ten per cent of babies are born prematurely or suffer from an illness or condition which requires care ranging in complexity, from a local special care baby unit to a highly specialised neonatal intensive care department (Figure 1). Prematurity and illness in newborn babies are associated with a complex range of factors, including social deprivation, ethnicity and maternal age, assisted conception and lifestyle factors. Babies can also require care arising from complications of pregnancy and delivery, from medical disorders such as infection or metabolic disorders or when surgical or other treatment is required for congenital anomalies.

2 Over the last 20 years, neonatal services have undergone substantial organisational and technological changes whilst remaining a challenging and necessarily innovative area of medicine. Specialised training of doctors and nurses underpinned by technological advances has led to greater numbers of very small babies being born alive and surviving. Year on year increases in birth rates and improvements in survival rates have placed increasing pressure on the capacity of neonatal services and led to some instances of babies being transferred long distances to receive definitive care.

3 In 2001 the Department of Health (the Department) commissioned an expert working group to review neonatal intensive care services. The resulting report, published as a consultation document in April 2003, proposed the reorganisation of neonatal care into managed clinical networks so that units in each network would provide virtually all the care required by mothers and babies without the need for long-distance transfers. This followed evidence from other countries that networked models of intensive neonatal care produced the best outcomes for babies.¹⁰

4 The Department endorsed the report's recommendations and at the same time announced an additional £72 million between 2003-04 and 2005-06 to help implement the recommendations. The distribution of these additional funds was weighted by incidence of low birth weight. In 2006-07 some £420 million was spent on running neonatal units.^a

5 There are important ethical issues surrounding neonatal care, such as the gestational age at which it is appropriate to treat extremely premature babies and the long term impacts of disability. These issues were addressed in the Nuffield Council on Bioethics 2006 report.¹¹ Our report does not comment on these decisions nor does it examine issues aimed at reducing the risks of premature and low birth weight babies, for which there are a number of NHS and cross-Government initiatives. Rather, our focus is on how well the introduction of networks has helped the service respond to the increasing demand for neonatal care. Full details of our methodology are at Appendix 1.

Findings

6 **There is widespread support for neonatal services to be delivered through managed clinical networks, but these networks have evolved at different rates.**

Most neonatal units in England organised themselves into formal networks linked by supervisory management structures, although there has recently been some shifting of network boundaries, including one merger (Appendix 2). As specific arrangements are determined locally, variations exist in network budgets, stakeholder representation and the roles networks have assumed. All networks have developed their own neonatal care pathways, guidelines and clinical audit programmes. However, there has been less progress in influencing

^a This covers the costs of special, high dependency and intensive medical care provided in neonatal units plus surgery where it is provided on the same site, but excludes costs of babies treated in other specialist surgical units.

commissioners and Trusts to re-designate units according to the care they are able to provide, which was one of the key recommendations of the 2003 Review.

7 Most networks have made progress in reducing long-distance transfers, but only half provide specialist transport services 24 hours a day, seven days a week.

Neonatal transport is an essential element of networked neonatal care including transfers to, between and back from units. Networks generally deploy some form of specialist transport service during day time working hours, with half providing a 24-hour, seven day-a-week transport service. Seventeen out of 23 networks are now meeting the target of treating 95 per cent of babies within the network. However, few transport services have separate staffing arrangements from the clinical inpatient service. As a result, staff often have to leave their unit to accompany a baby on a transfer, putting pressure on remaining staff.

8 Evidence of outcomes, other than the traditional indicator of mortality rates, is sparse and these rates show unexplained variations.

Whilst management information is improving, it is not yet strong enough to provide evidence of improvements in quality of care. The neonatal mortality rate for England was 3.7 (deaths per 1,000 live births) in 2003, 3.4 in 2004 and 3.5 in 2005, which is within a similar range of other comparable countries. This national figure however masks wide variation at the network level. We focussed on neonatal mortality rates at network level in recognition that at unit level a complex combination of factors can affect the mortality rate; and that we would expect some variations to be smoothed out at the network level. In 2005 Midlands South (South West Midlands) had the highest rate (4.8 per 1,000) and Surrey and Sussex the lowest rate (1.8 per 1,000). Whilst this may be due to the demographics of the population covered by the network, differences in service provision may also be a factor.

9 Networks have improved communication and coordination between units and now have better, more consistent information on performance.

All networks have agreed their own protocols, standards and pathways of care. The Healthcare Commission, supported by the Department has funded a Neonatal Audit Programme minimum dataset. Seventy per cent of units (n=153) now use a neonatal.net electronic patient record, making information easier to record and creating opportunities to evaluate. Networks have also supported the development

of regional data sets, enabling analysis and benchmarking of data. However, there is a high level of duplication of data collection and a need for consolidation and harmonisation.

10 Constraints in relation to capacity continue to undermine the effectiveness and efficiency of neonatal care. One of the key indicators of the capacity of a unit is the frequency with which it has to close to new admissions (each unit had closed to new admissions an average of 52 times during 2006-07 due mainly to either lack of cots or shortages of nursing staff (n=122)). Fifty-eight units (33 per cent) operated above the British Association of Perinatal Medicine (BAPM)^b guideline of 70 per cent cot occupancy and three units above 100 per cent.^c Although there has been an increase in the numbers of intensive and high dependency cots, most special care units had to care for babies needing these higher levels of care.

11 A key reason for problems with capacity is nursing shortages. Most units had an adequate level of medical staffing and were in line with the BAPM 2001 medical staffing guidelines. The situation with nursing is much more critical with significant shortages of trained nurses across the country and wide regional variations in vacancies (Appendix 3). Only the guideline for special care, one nurse to four babies, is being met. Half of all units met the standard for high dependency care but only 24 per cent did so for intensive care (n=151).^d

12 Parents are mostly very happy with the specialist care and expertise their babies receive, but they also have needs which are currently not always met.

Parents' views of the service are important given that babies cannot speak for themselves and the former are extremely appreciative of the care their babies receive. However, their needs are often overlooked. Parents have consistently suggested a need for improvements in support for breastfeeding, information about their babies' care, communication with medical staff, car parking and accommodation to enable them to stay with their babies.

13 The separation of commissioning for different levels of care causes difficulties in planning services.

Special care is commissioned by Primary Care Trusts (PCTs) and high dependency and intensive care are commissioned by the ten Specialised Commissioning Groups, despite the tendency of babies to move rapidly between these levels of care. In addition, there is no

^b The British Association of Perinatal Medicine is a professional organisation, which aims to improve the standard of perinatal care in the British Isles. BAPM's Standards for Hospitals Providing Neonatal Intensive and High Dependency Care (Second Edition) was published in December 2001. They are professional guidelines, endorsed by the Council of the Royal College of Paediatrics and Child Health and the Trustees of BLISS (the national charity of the newborn) and are not mandatory standards.

^c See paragraph 3.4 for more details on how occupancy rates were calculated.

^d Unit staffing can vary from shift to shift. Vacancy levels are against establishment.

formal link between the commissioning of maternity and neonatal services, despite the fact that the former is a key driver of demand for the latter.

14 The costs of the service are not fully understood and there is a mismatch between costs and charges.

Data provided by units suggest wide variations within and between the different types of unit, from one unit with an operating deficit of £2.6 million to one with an operating surplus of £4.9 million. Charges for neonatal care do not necessarily reflect costs and financial management at the unit level needs to be improved. The future introduction of Payment by Results could bring positive benefits for neonatal services, although there are concerns about the practicalities of its introduction.

Overall conclusion

15 The reorganisation of care into neonatal networks has improved the coordination and consistency of services, pointing to increased effectiveness. There are however still serious capacity and staffing problems and a lack of clear data on outcomes. In addition, the variable state of financial management makes it difficult to judge the economy and efficiency of the service. We are therefore unable to say whether or not networks have improved the overall value for money of the service. Nonetheless the majority of parents are grateful for the care their babies receive. Given the rising demand for the service and the constraints within the system, parents' views are an important indicator of achievement, but the lack of robust evidence on outcomes makes it difficult to reach an objective view of the quality of the service.

Recommendations

16 Reducing disparities in mortality rates cannot be addressed through improved neonatal services alone. Reducing the prevalence of premature and low birth weight babies requires a range of coordinated NHS, public health and cross government initiatives. Many of these, such as programmes to reduce teenage pregnancies and smoking, are already in train. Once a baby is born, however, neonatal services should provide high quality, safe care in an appropriate setting, keeping transfers of the baby to a minimum. The following recommendations are focused to that end.

- a** *Issue: The 2003 Review did not specify how the performance of networks in meeting the needs and outcomes of neonates should be managed. It also occurred prior to the recent reconfiguration of Strategic Health Authorities and Primary Care Trusts.*

Strategic Health Authorities and commissioners should define the performance management arrangements which will monitor the outcomes of the networks drawing on our evaluations of the current situation as illustrated in Appendices 2 and 3.

- b** *Issue: Neonatal services are part of a continuum of care which starts with maternity services but they are at present commissioned and planned separately rather than as part of a whole systems approach. There is a need for:*

- Targeted research, whether commissioned by the Department or by other appropriate funders such as the relevant professional bodies. This needs to be aimed at reducing the demand for neonatal care through improved understanding and prevention of the trigger factors which are associated with preterm birth, low birth weight and sickness in newborns.

- **Commissioners and networks to** coordinate the commissioning of neonatal and maternity services. This should include undertaking strategic needs assessments of the local population, taking standards set by professional bodies into account and addressing the blockages in networks which prevent efficient in-utero transfers.

- c** *Issue: At the moment special care is commissioned separately from high dependency and intensive care. There is consensus that they should be commissioned together and in some networks commissioners have moved to this arrangement. **Networks, commissioners and Strategic Health Authorities should** work together to commission care pathways across all three levels of care including transport to enable capacity to be planned and managed effectively. Lessons from Kent and Medway and other networks already implementing this approach should be evaluated by the national group of specialist commissioners and neonatal network managers and adopted or adapted as necessary.*

- d** *Issue: Although three quarters of networks have reviewed the designation^e of all or most of their units, re-designation has not been implemented in full for a variety of reasons. Without meaningful re-designation processes, networks may find it difficult to ensure they have appropriate capacity to meet demand safely. Using evidence from professional bodies, **commissioners should** drive re-designation to enable capacity to match the needs of their population and that babies are being cared for in*

^e This refers to the type and intensity of care a unit can provide and is outlined further in paragraphs 1.14-1.16 and in figures 4 and 5.

settings with appropriate staffing levels and skills. In doing this, they will need the support of Strategic Health Authorities and full cooperation of NHS and Foundation Trusts in each network.

- e *Issue: Progress in improving the quality of management information at unit, network and national levels is slow. The availability of this information is vital for establishing the efficiency and effectiveness of the service, particularly in calculating the long-term impacts of different types of care. All neonatal units should, as a priority, contribute fully to the Neonatal Audit Programme minimum dataset, regardless of which system they use to gather data. The neonatal network managers group should work with units and the Department to reduce duplication of data collection.*
- f *Issue. Transport arrangements are still not optimised in terms of responsiveness or cost-effectiveness and have developed in a piecemeal fashion. As a result, delays are still occurring and unit staff are being diverted to accompany transfers. Networks and Strategic Health Authorities should examine the relative cost-effectiveness of the different transport arrangements currently in place and look to join up either with neighbouring networks or with paediatric intensive care transport services if necessary to achieve the optimum geographic coverage.*
- g *Issue: On average each neonatal unit in England is currently carrying three whole-time equivalent nurse vacancies and the proportion of vacancies increases as the intensity of care provided increases. Very few units are meeting the recommended nurse staffing guidelines. NHS and Foundation Trusts should develop a targeted action plan to address neonatal nurse staffing shortages. In addition to addressing staffing levels as part of the commissioning process, solutions may be found by working with NHS Employers to address recruitment or retention issues and with Strategic Health Authorities to commission more neonatal nurse training courses.*
- h *Issue: There are variations in the way Trusts calculate costs and charges for neonatal care, making it difficult for commissioners to allocate resources effectively. NHS and Foundation Trusts should improve the completeness and accuracy of financial management data on neonatal activity, by using developments such as patient-level costing and service-line reporting, and ensure that overheads are apportioned in a consistent manner.*
- i *Issue: The implementation of Payment by Results (PbR) for neonatal services is due to be considered by the PbR Children's Services Clinical Working Group alongside the new neonatal dataset. There are widespread concerns that not enough work has yet been done to create a set of tariffs which capture the full costs of neonatal care. We have also identified considerable variation in the costs and charges as they are currently understood by Trusts. In determining a future tariff or tariffs for neonatal services, the Department of Health advised by the Payment by Results Working Group needs to take into account the findings of this report, in particular our findings on the wide range of Trusts' costs and charges, and ensure that transport costs are included.*



Neonatal services have been reorganised into networks

1.1 Neonatal care is needed for babies born prematurely and for babies who are either ill or have congenital disorders. In 2003 the Department of Health published the results of a Review by an expert working group on Neonatal Intensive Care Services which proposed the reorganisation of neonatal care into managed clinical networks.¹²

The 2003 Review made the case for the reorganisation of neonatal services

1.2 The Review's key reason for proposing a reorganisation was that some mothers and babies were travelling long distances for their care, often not in a planned way or to their nearest hospital, against a backdrop of rising demand. It found that neonatal intensive care was provided in a widely dispersed manner across district general hospitals and there was a need for agreed national standards of care. There was also limited capacity in the larger units which provided care for the most ill babies, lack of national data on outcomes and major challenges in nursing recruitment.

1.3 The Review considered two options: major centralisation of neonatal intensive care and moves to provide care within managed clinical networks. Major centralisation was rejected because neonatal intensive care is often needed for some weeks which would impose considerable travel and other burdens on families. The Review therefore recommended the reorganisation of neonatal care into managed clinical networks so that units in each network would provide virtually all the care required by mothers and babies without the need for long-distance transfers. This followed evidence from other countries that networked models of intensive neonatal care produced the best outcomes for babies.

1.4 The review was issued as a consultation document the outcome of which was never published and the report's recommendations, although not mandated, remain the Department's key communication on how it expects neonatal services to be provided. This part of the report examines the rationale behind the review and the progress networks have made in reorganising neonatal care. It also compares each network's mortality rates and England's neonatal mortality rates with the rest of the UK and internationally.

The reorganisation of services into managed clinical networks has largely been achieved

1.5 The report from the 'Neonatal Intensive Care Services Review Group' recommended that the numbers of hospitals in each network would be for local decision, but must reflect local need and geography, and that extra cots should be established across England to meet the increased demand. It suggested that re-structuring neonatal services into managed clinical networks and implementing the other report recommendations might save 200 to 300 lives every year and thus impact on the Department's Public Service Agreement target of reducing the inequality gap in infant mortality rates by at least 10 per cent by 2010.¹³ The Review's recommendations and performance against them are summarised in **Figure 2**.

1.6 In publishing the report on the 2003 Review, the then Minister of State for Health, Jacqui Smith MP, announced that additional resources would be provided to help implement the recommendations of the Review, comprising £20 million for capital expenditure and additional running costs of £52 million over three years.^f

^f Further details are given in Part 4.

2 Summary of the 2003 Reviews' recommendations and performance against them

Recommendation	Performance
Neonatal services should be structured around geographical networks comprising hospitals with differing types of neonatal units working together. The purpose of the network being to ensure that mothers and babies receive the care within it or, very occasionally, in an adjacent network (95 per cent of mothers and babies should receive their care within their local network).	<i>Largely achieved. Paragraphs 1.8 to 1.13.</i>
Within the networks there should be agreed identification of the needs of individual babies (categories of care) and agreed designation of the types of units providing for their care (types of neonatal unit).	<i>Partly achieved. Paragraphs 1.14 to 1.16.</i>
Networks should have agreed protocols, standards and pathways of care and a joined-up approach to clinical governance, including clinical audit, incident reporting and clinical training. Networks should also be aligned with obstetric and maternity services.	<i>Partly achieved. Paragraphs 2.3 to 2.7.</i>
Transport systems should be put in place to move critically ill babies and also for babies being taken back to a unit near their homes. Staffing arrangements for neonatal transport should be separate from inpatient services to avoid compromising care.	<i>Partly achieved. Paragraphs 2.12 to 2.23.</i>
Networks should enable the concentration of skills and expertise required for care of babies needing longer and more complex care, thereby maximising the overall capacity of the system with skills, expertise and paediatric training in intensive care maintained in all neonatal units. In this way networks would offer families the greatest opportunity for local birth and minimise transfers for intensive care to those that are necessary, returning babies to a local hospital as soon as possible.	<i>Partly achieved. Paragraphs 3.2 to 3.9.</i>
Networks should adopt the BAPM categories of care and staffing levels ¹ . The designation of each unit in a network should drive the activity that they are resourced for and the capacity they develop.	<i>Partly achieved. Paragraphs 3.10 to 3.25.</i>

Source: National Audit Office

NOTE

1 *Standards for Hospitals providing Neonatal Intensive and High Dependency Care*, 2nd Edition, British Association of Perinatal Medicine, December 2001. These are widely accepted as the pre-eminent standards for delivery of care in neonatal units.

1.7 The concept of networking neonatal services has near universal support and there is broad agreement that a regionalised networked system of care improves outcomes for neonates. International research highlights the benefits of a regional system of care, although the evolution of such systems is related to the extent to which neonatal intensive care is already centralised.¹⁴

Since 2003 neonatal networks have developed in different ways

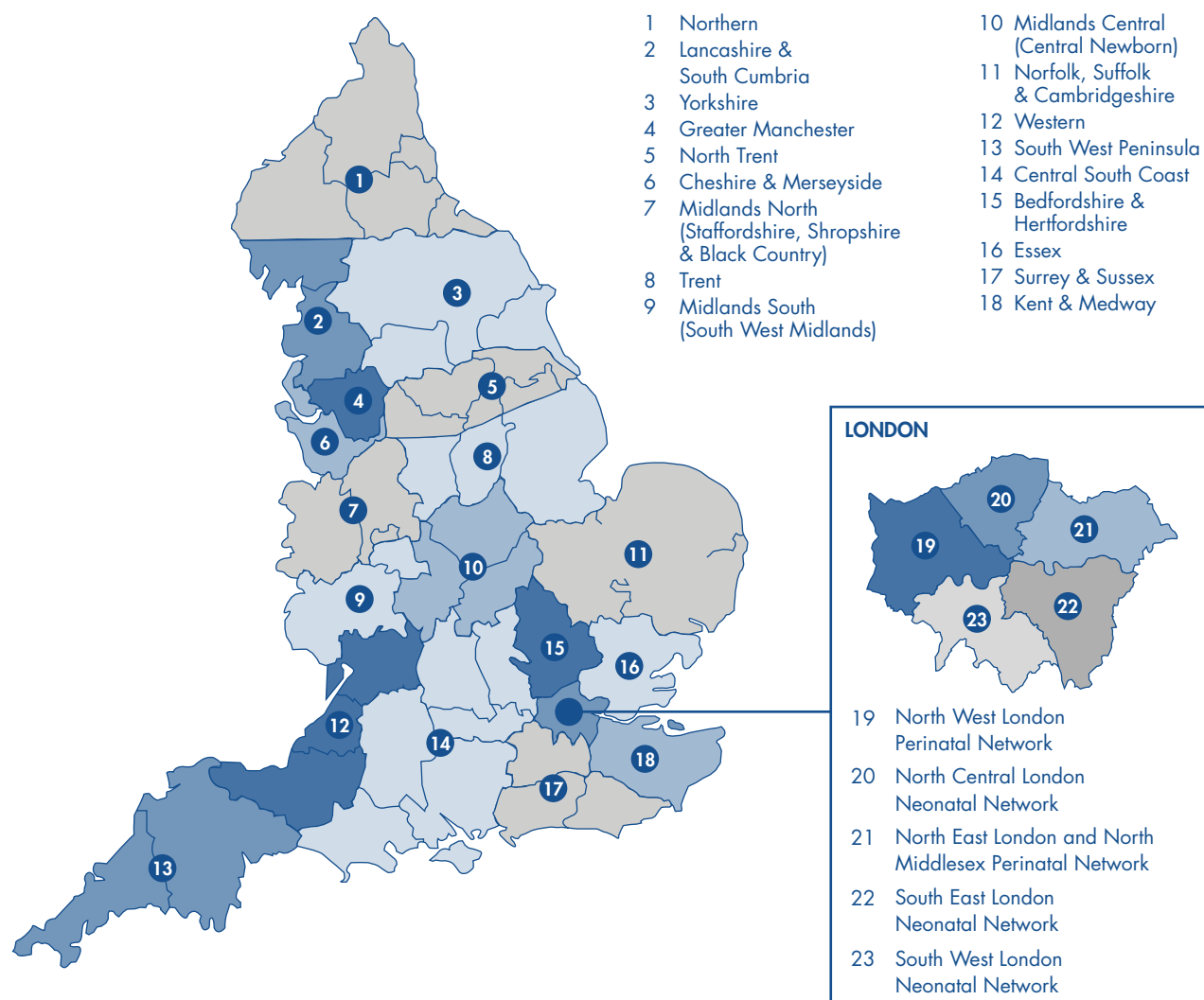
1.8 In response to the 2003 Review, neonatal care in England was organised into 24 networks but this has now reduced to 23 with the recent merger of the former Central South and Thames Valley networks. **Figure 3 overleaf** shows the geographical distribution of the networks. The Department recognised that the implementation of the Review's recommendations would need to be staged because there was insufficient capacity and skills in all types of units to make immediate progress. Its view was that changes in provision should be decided on

and implemented locally, following local reviews. As a result, the pace of implementation has varied widely across England.

1.9 The concept of a network is a fluid one, with varying degrees of budgetary control, authority, stakeholder representation and scope. The NHS has used the idea of networks in a range of different services in recent years at regional and national levels, including establishing cancer and emergency care networks.⁸ The 2003 Review did not set out the accountabilities and performance management arrangements for neonatal networks, nor did it give networks formal powers to effect change. Instead networks operate through communication and consensus-building amongst provider Trusts and commissioning PCTs. A typical neonatal network comprises a group of neonatal units in a particular region linked by a supervisory management structure. There is usually one unit capable of providing the whole range of neonatal care, including intensive care; the remainder provide special and high dependency care.

g Previous work by the National Audit Office and other commentators have shown that both the make-up and scale of implementation of the network concept has varied and that they have not always achieved what was intended.

3 Location of networks in England



Source: British Association of Perinatal Medicine/National Audit Office

NOTE

Networks are linked groups of health professionals and organisations from primary, secondary and tertiary care working together in a coordinated manner across organisational boundaries to ensure equitable provision of high quality clinically effective services. The map shows the geographic location of each network. For the composition of networks, please see Appendix 2.

1.10 The funding for neonatal networks has been used for a range of activities including network manager posts, transport services and education initiatives. They have evolved since 2003 with some shifting of geographical boundaries and mergers. There is a strong expectation that others will merge in the future, particularly in London and in those areas where revised SHA boundaries no longer conform to network boundaries. At the time of our survey 21 out of 23 networks had a manager in post, either full or part-time. All networks had a lead clinician and 12 had a lead nurse. Six networks had a transport manager, three were covered by the East of England Acute Neonatal Transport Service and seven by the Greater London Neonatal Transfer Service, see Appendix 2.

1.11 Networks currently undertake a range of different roles including:

- improving clinical governance by developing guidelines and clinical audit programmes (17 out of 23 networks);
- providing education and training, particularly for neonatal nurses (16 out of 23 networks);
- improving standards by developing care pathways and benchmarking (16 out of 23 networks);
- advising commissioners on setting standards, monitoring outcomes and agreeing investment projects (15 out of 23 networks); and
- co-ordinating the provision of services, so that the network as a whole can safely and effectively meet the needs of its population (21 out of 23 networks).

1.12 Two networks have yet to establish formal structures, with differing results. Neonatal care in the Northern network has been delivered in a co-ordinated fashion

since 1983 and it is undertaking many of the functions of a network as envisioned by the Department without a dedicated staff or board. Using as a proxy the measure of how many babies were transferred out of the network to receive care in 2006-07, the Northern region performed well with less than one per cent being transferred out (Appendix 3). The Essex network on the other hand has no manager and is not functioning as a network due to a lack of agreement as to which unit should provide intensive care and take the lead role in the network. It is also not yet meeting the target of treating 95 per cent of babies who need specialist care in the network as six per cent of babies had to be transferred out in 2006-07 (Appendix 3).

1.13 Our census of all neonatal units in England showed that 70 per cent of units (n=150) thought that their networks were the right size and configuration, with broad support amongst units for networking neonatal services despite some local difficulties in re-designating units. Units did however express various concerns about lack of capacity, rising birth rates, the knock-on effects of the re-configuration of maternity services in some areas, the lack of surgical provision in some networks and major concerns about the status of the Essex network.

There has been some re-designation of units but this remains an ongoing process

1.14 Constituent units within each network are characterised in terms of the level of care they provide. **Figure 4** sets out the characteristics of the three levels of care for newborns and infants, as advised by the BAPM. Each network should have one or more level 3 units (one of which is a lead centre) and also a number of level 2 and level 1 units (Appendix 2). **Figure 5 overleaf** shows the total units at each designation and total cots.

4 BAPM Categories of Neonatal Care

Categories of neonatal care

Special care

For babies requiring continuous monitoring of respiration or heart rate; for babies receiving added oxygen, being tube fed, receiving phototherapy or recovering from more specialist care.

The recommended nurse-to-baby ratio is 1:4.

High dependency care

For babies receiving nasal continuous positive airway pressure (CPAP) but not fulfilling any of the categories for intensive care; any baby below 1,000 gms who does not fulfil any of the categories for intensive care; babies receiving parental nutrition, with apnoea requiring stimulation.

The recommended nurse-to-baby ratio is 1:2.

Intensive care

For babies needing respiratory support (ventilation); for babies weighing less than 1,000g and/or born at less than 28 weeks' gestation and receiving nasal continuous positive airway pressure (CPAP); for babies with severe respiratory disease or who require major surgery.

The recommended nurse-to-baby ratio is 1:1.

Source: British Association of Perinatal Medicine

5 Unit designations and numbers

Unit Designation	Units ¹	Cots
Level 1		
Units provide Special Care but do not aim to provide any continuing High Dependency or Intensive Care	38	2,014
Level 2		
Units provide High Dependency Care and some short term Intensive Care as agreed within the network	89	608
Level 3		
Units provide the whole range of medical neonatal care but not necessarily all specialist services such as neonatal surgery	51	750
Total	178	3,521²

Source: British Association of Perinatal Medicine/National Audit Office Census

NOTES

1 The units at each designation are based on the units' responses to our census in spring 2007, please see also paragraph 1.14 and Appendix 2.

2 Total cots include 149 additional cots which are un-designated. Babies can move very quickly between the three levels of care and will often stay in the same cot while the level of nursing and medical care increases or decreases as appropriate. Level 3 cots will predominantly be found in Level 3 units, Level 2 cots will predominantly be found in Level 2 and 3 units, whilst Level 1 cots will be found in all units. The numbers of cots are based on the responses from 175 out of 178 units.

1.15 A key role envisaged for networks was that they would lead work to categorise and, if necessary, re-designate all units in their region to establish a service with safe levels of capacity. Networks cannot enforce re-designation; only Trusts can make the decision to change their services. However, with support from commissioners, networks should be able to present evidence based on capacity planning and the implementation of standards which supports the need for change. By June 2007 18 networks had undergone or were undergoing a re-designation process. Vigorous local debates over which units should take which roles have meant that networks are at different stages of the re-designation process. Some units have changed their designation but this has not been carried through to the movement of staff. **Case Example 1** illustrates how one network achieved an effective re-designation process.

CASE EXAMPLE 1

A key achievement of the Peninsula network has been the implementation of a re-designation process of its units. Crucial to the acceptance of this process was the establishment of a fully funded transport service, which would allow the network to manage the efficient transfer of mothers and babies to the nearest appropriate unit. The establishment of the transport service gave neonatal units confidence that a networked system could function effectively, despite the long distances between units in Devon and Cornwall.

After a process of consultation, Derriford Hospital in Plymouth was chosen as the lead tertiary care (level 3) centre and the other two major units in the region, Truro and Exeter, were confirmed as level 2 centres. Each unit in the network has agreed transfer guidelines based on gestational age. If units find themselves looking after babies who breach those guidelines, they liaise with the lead centre to determine where those babies should be cared for. In addition, the entire network subscribes to the Vermont-Oxford benchmarking scheme, allowing for comparisons between units and performance management of the network as a whole. The view of the network staff is that the success of the re-designation process has led to a considerable improvement in the quality of care.

1.16 The designation of units is an ongoing process, with 12 units across nine networks describing their designation as '2 plus', meaning they are officially designated level 2 but often provide intensive care (level 3). Most cited network guidelines allowing intensive care at certain levels of gestation. In addition, two level 1 units across two networks described the care they provide as '1 plus'. In most cases the decision to operate across two levels of designation appears to be a pragmatic way to maintain skills and capacity across networks. Whilst there is a risk that units may provide care that they are not staffed or equipped to provide, we found no evidence that this was happening.

The objective of reducing mortality rates continues to be a challenge

1.17 The Department's Public Service Agreement target for infant mortality states: 'Starting with children under one year, by 2010 to reduce by at least 10 per cent the gap in mortality between the routine and manual group and the population as a whole.'¹⁵ The Department considered that implementing the recommendations of the 2003 Review might have an impact on the infant mortality gap through the reduction of deaths due to immaturity-related conditions. The Department's 2007 review of the target showed that, although rates in the routine and manual group were improving, the gap between the routine and manual group and the population as a whole had widened to 18 per cent in 2004-05 from the target baseline in

1997-99 of 13 per cent, a reduction from 19 per cent in 2002-04.¹⁶ The Department is planning to publish an implementation plan to address the infant mortality review's recommendations shortly, but the target to narrow the gap by 10 per cent by 2010 remains challenging.

1.18 The neonatal period has one of the highest mortality rates of any period of life. Out of all babies that die before their first birthday, two thirds die because they are premature. There is also a correlation between high neonatal death rates and lower socio-economic groups. Improvements in neonatal mortality rates could therefore assist the Department in meeting its PSA target. We compared England's neonatal mortality rates with rates in other countries and at network level in recognition that at unit level a complex combination of factors affects the mortality rate, requiring sophisticated risk adjustments to enable meaningful comparisons to be made.^h In addition units are part of a continuum of care which begins with maternity services, obstetrics and fetal medicine and continues with ongoing community and paediatric care. Babies can also be treated in more than one unit.

Mortality data for networks shows some unexplained variations and some deteriorating trends over time

1.19 Neonatal units routinely submit various different types of mortality data to the Confidential Enquiry into Maternal and Child Health (CEMACH). CEMACH provided us with network data on stillbirth, perinatal mortality and neonatal mortality rates for 2003, 2004 and 2005.ⁱ Overall, the neonatal mortality rate in England went from 3.7 (deaths per 1,000 live births) in 2003, to 3.4 in 2004, and to 3.5 in 2005. There was variation within these figures by network, as **Figure 6 overleaf** shows. Midlands South (South West Midlands) had the highest rate of any network, reaching 4.8 deaths per 1,000 live births in 2005 and Surrey and Sussex and Essex the lowest rate at 1.8.^j

1.20 Figure 6 shows that nine networks had mortality rates which were significantly lower than the network average and eight networks had mortality rates which were significantly higher than the network average.¹⁷ Data from the Index of Multiple Deprivation shows that localities in the far north, far west and clustered around Birmingham and London suffer from the highest levels

of deprivation.¹⁸ Whilst these roughly correspond with the networks that have higher than average mortality rates, more detailed work is required to determine the contribution which different socio-economic, ethnic, demographic, cultural and service factors are making to variations in mortality.

1.21 Comparing the English average of 3.4 for 2004 (the last year that comparative data is available) to the rest of the UK, England's mortality rate is below that of Northern Ireland but above Scotland and Wales. Our international comparison shows that England's neonatal mortality rate is below the USA and Canada but above Australia and Sweden. When the incidence of low birth weight births are taken into account, England performs well internationally as it has the second highest incidence after the USA but the third highest neonatal mortality rate. When compared to Scotland however England performs less well, as Scotland has a higher rate of low birth weight but a lower neonatal mortality rate. Full details can be found in the accompanying report by RAND.¹⁹

Other NHS bodies hold data which could help networks evaluate quality of outcomes

1.22 The National Patient Safety Agency's (NPSA) National Reporting and Learning System holds reports on patient safety incidents from all NHS trusts. From 1 April 2006 to 31 March 2007, there were 13,320 patient safety incidents reported to the NPSA relating to neonatal services. Whilst almost 90 per cent of these incidents were recorded as 'no harm' or 'low harm' incidents, the most frequently reported serious incidents were those involving medication errors. The NPSA recently undertook an analysis of a sample of 200 incidents from neonatal services which showed that, in addition to medication errors, key problems included a failure to monitor, staff shortages and extravasations.^k The NPSA has since begun a multi-agency work programme to develop and implement a neonatal safety 'package' with the Royal College of Paediatrics and Child Health and others such as the Royal College of Nursing, Neonatal Nurses Association, BAPM and BLISS (the premature baby charity). This is a two year programme which will focus on newborn infection, medication and neonatal transport.

^h The Trent Regional Survey has been collecting data for 15 years and has produced risk-adjusted mortality data. For further details see paragraph 2.11.

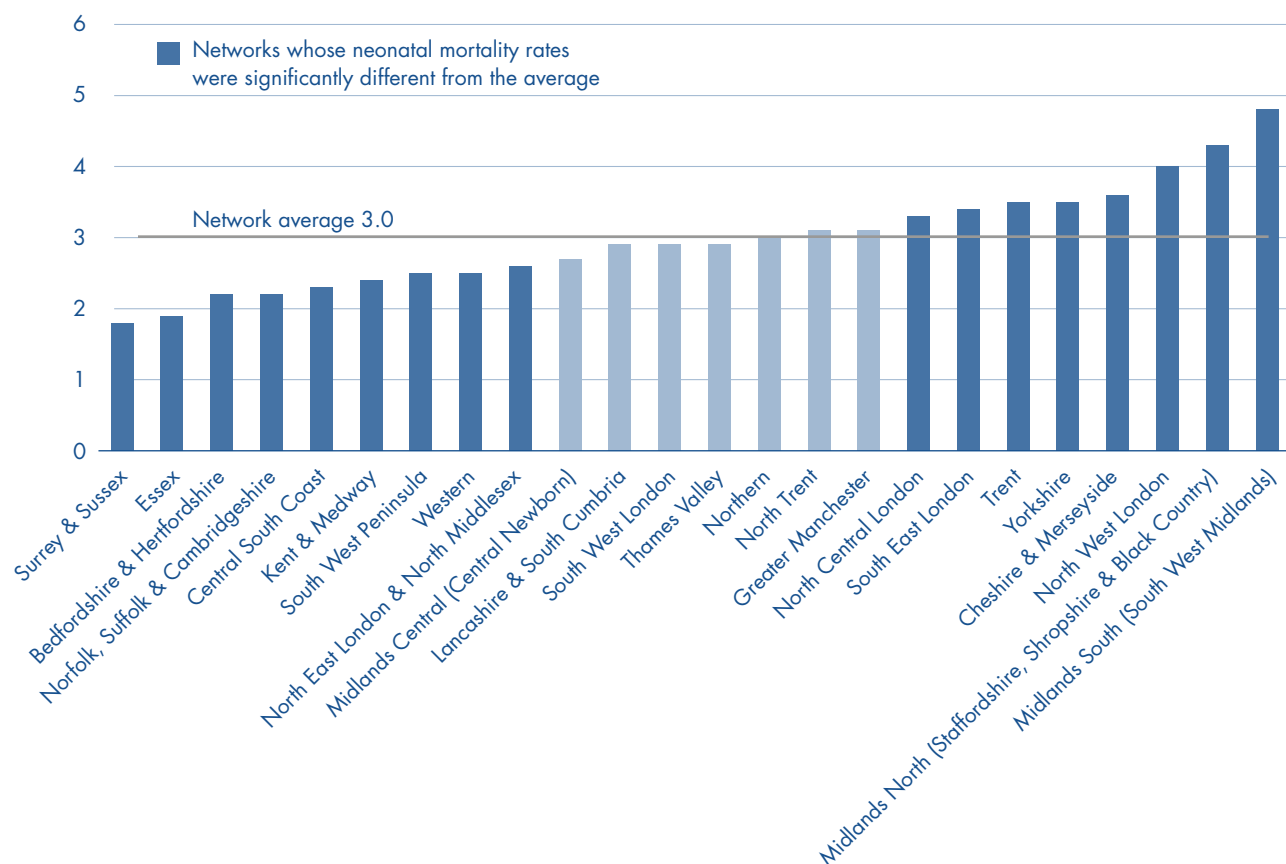
ⁱ For this analysis adjusted data was used, including only those deaths of babies born at 22 or more weeks' gestation, in order to remove the potential for distortion where there are high numbers of pre-viable gestation births. There were some caveats with these data – 6 of the 187 units were not included in the 2005 analysis as denominators were not available. Mortality rates are based on deliveries occurring in major provider units (but do not include smaller birthing units, unless co-located) within the neonatal network.

^j Based on adjusted data, including only babies born at 22 or more weeks' gestation. The network average shown in figure 6 is therefore not the same as the England neonatal mortality rate which includes all neonatal deaths. Office of National Statistics, Series DH3 no. 38 Mortality Statistics, Childhood, Infant and Perinatal 2005 also gives neonatal mortality data by Government Office Regions which are similar in size to but do not map across to neonatal networks.

^k Extravasation, or infiltration, occurs when fluids or medications penetrate into the tissues surrounding an intravenous site following damage to the vessel endothelium.

6 Network neonatal mortality rates (for babies born at 22 or more weeks' gestation), 2005

Neonatal death rates for babies born at 22 or more weeks' gestation per 1,000 live births, 2005, by network



Source: Confidential Enquiry into Maternal and Child Health

NOTE

The figure illustrates what is happening at a network level and it is the first time that individual networks' mortality rates have been presented in a public document. CEMACH is planning to undertake more sophisticated analysis of the 2006 data and their findings will be published in early 2008.

1.23 The Medicines and Healthcare Products Regulation Agency receives reports on medication errors. A review of these reports shows that they received four reports linked to neonatal care in 2006. Whilst their data cannot be used as a reliable indicator of the frequency of suspected adverse drug reactions due to a general level of under-reporting, these can alert the NHS to important concerns.

1.24 The NHS Litigation Authority is also a valuable source of information on incidents that resulted in a claim. Their database shows more than 180 claims logged with a location code of 'Neonatal Intensive Care Unit' since 1995.¹ Of these, almost half (85) are now closed with no damages being awarded, 20 per cent (40) have closed with total payments of approximately £5.5 million and almost a third (50) are still open. Currently, unlike its work on maternity services, the Litigation Authority does not carry out any specific risk assessment of neonatal units.

1.25 Similarly, to date, there has not been any formal review or inspection of neonatal units by the Healthcare Commission. However they have commissioned a National Neonatal Audit Programme from the Royal College of Paediatric and Child Health which is expected to report in early 2008 (paragraph 2.11 refers). Except for some reviews undertaken by regional associations such as the Thames Regional Perinatal Group and independent surveys by the National Perinatal Epidemiology Unit (NPEU), commissioned by BLISS, there are no other national inspections or audits of neonatal services.

1.26 Our report, therefore, is the first independent assessment of progress in improving neonatal services since the establishment of networks. The rest of the report covers the following areas:

- Part 2: Progress made by networks in relation to the 2003 recommendations;
- Part 3: What more needs to be done to address capacity and staffing issues; and
- Part 4: Financial management and funding and how commissioning can use these levers to further improve services.

¹ The database was designed primarily as a claims management tool rather than for risk management or research purposes, it therefore cannot be guaranteed to be 100 per cent consistent or that all the incidents giving rise to these claims did in fact occur within the neonatal intensive care unit or that all such incidents have been included in the data. In addition, before April 2002 Trusts were responsible for the management and cost of claims below their Clinical Negligence Scheme for Trusts excess. Although some of these claims were notified to the NHSLA for recording purposes, information on these claims is not included in these figures.



Networks have made progress in improving consistency, communication and coordination of neonatal services

2.1 The 2003 Review suggested a more structured, collaborative approach to caring for newborn babies. It recommended that networks should have agreed protocols, standards and pathways of care as part of a joined up approach to clinical governance. A key priority was that families should be engaged in and involved with the care provided. Furthermore, it recommended that neonatal networks should develop IT infrastructures and datasets to support the audit of activity and outcomes.

2.2 Central to the recommendations was the need for specialist transport services for the movement of critically ill babies and also for babies being taken back to a unit near their homes. Furthermore, the Review also recommended that staffing arrangements for these transport systems should be separate from inpatient services to avoid compromising care. This part of the report evaluates the progress that has been made in implementing these recommendations.

Networks have made progress in agreeing protocols and standards to improve consistency of services

2.3 One success achieved by many networks is the widespread implementation of network-wide protocols. These protocols represent agreement, usually between clinicians, that they will undertake an operational or clinical activity in a common way across the network. Many networks have protocols setting out the kind of case mix a named unit is able to undertake. These are usually based on gestational age and capacity and are becoming a strong element of clinical governance within the networks, since they set a standard for determining which babies will be treated where.

2.4 More sophisticated protocols have also been introduced in some networks, under which all consultants agree to use the same kinds of treatments for specific conditions or follow common policies for planning in-utero transfers. A good example of how network protocols can influence behaviour for the benefit of babies comes from the Midlands South (South West Midlands) network. All obstetricians in this network have signed up to pre-term labour guidelines which set out how premature babies' care will be managed in the first hour of life. The use of protocols means that care is delivered more consistently on the basis of evidence and good practice and that parents are reassured to see the same things happening to their baby upon transfer to another unit.

2.5 Another way that networks have helped to influence and improve clinical practice is by organising clinical audits and benchmarking exercises. The vast majority of units surveyed, 94 per cent (n=152), participated in network benchmarking exercises to compare clinical practices and all ten SHAs undertook audits.

2.6 Virtually all networks have established a series of medical working groups to discuss particular aspects of their service. These groups discuss a wide range of subjects including education and training, transport, nursing, parental involvement and incidents. They also enable best practice to be disseminated, protocols to be formulated and relationships to be formed between staff from different units, thereby leading to stronger clinical governance and more collegiate behaviour.

2.7 Networks are also beginning to develop a distinct training and education role. Ten out of 23 networks cited training as being part of the main operational role of the network and half of the ten SHAs mentioned this as an activity undertaken by their networks. In addition, the Royal College of Nursing highlighted the employment of practice/clinical educators by networks and units as good practice. These educators have proved to be successful in addressing the initial training needs of new and newly-qualified staff, as well as the maintenance of skills of existing staff.

Engaging and involving families is improving

2.8 Neonatal units have made strides in considering the needs of parents and involving them in their babies' care. Encouraged by BLISS, 83 per cent of units (n=153) actively sought feedback from parents regarding the quality of care they and their babies received. For example, Addenbrookes Hospital Trust hold 'parents evenings' once a month and alternating between morning and evening. These are designed to derive important parental feedback on good and poor elements of neonatal services. Feedback to date has often highlighted the high quality of clinical care, but has also revealed the importance of sensitive, timely and thorough communication with parents.

2.9 Thirteen networks have started to include parents in a formal 'user involvement' programme in order to gain their feedback to inform the re-design of services.²⁰ For example, since 2006 the Trent network has formally included parents in its governance structure. Each unit in the network puts forward parent representatives to participate in the network-wide Patient Advisory Group (PAG), which in turn reports to the network board. Network staff told us that the PAG has suggested a series of ideas whose implementation has improved services at minimal cost.

Networks are helping to improve management information and data on performance

2.10 There has been progress in improving management information at unit, network and national levels. This information is vital for establishing the efficiency and effectiveness of the service, particularly in calculating the long-term impacts of different types of care. To assist this process, the Healthcare Commission began to fund a Neonatal Audit Programme minimum dataset in 2006. An increasing number of units – now seventy per cent (n=153) – stated that they now used a neonatal.net electronic patient record, making information recording easier. At the moment these neonatal.net systems are seen as an interim solution until the Electronic Patient Record is rolled out nationally. Until then these systems are not automatically integrated with Trust systems and staff may therefore have to enter data more than once, with the scope for errors and inefficiencies that this brings.

There are good regional databases but also some duplication with national data collection

2.11 Various regionally based data sets have evolved, such as the Standardised Electronic Neonatal Database (SEND), Maternal and Neonatal Electronic Recording System (MANNERS) and The Neonatal Survey.²¹ Some of these have been in existence for many years and thus can provide useful historical trend data. SEND, which has been rolled out across 19 networks, is providing an increasingly standardised dataset (**Case Example 2**). However there are also central data collection exercises being undertaken by Neonatal Data Analysis Unit and the Healthcare Commission via the National Neonatal Audit Programme. While these data collection exercises are expected to produce useful analysis, many of our interviewees told us that neonatal services as a whole would benefit further if they were consolidated.

There are signs of improvement in the transfer of babies but problems remain

2.12 A key recommendation of the 2003 Review was to put effective, specialist transport services in place and that the staffing arrangements for these transport services should be separate from the clinical inpatient service in each network so that care of babies should not be compromised by lack of staff availability. This is not the case everywhere, although transport arrangements are working well in a number of places (see Appendix 2 and 3). Funding arrangements for transport vary, with some transport services funded out of existing PCT allocations and others receiving money allocated to networks. Most transport services are affiliated with a level 3 unit but they do not always have a dedicated transfer team or specific funding.

CASE EXAMPLE 2

The North West London Perinatal Network implemented SEND in October 2005. All seven units in the network are entering daily data into the system. This allows for transfer of records and ensures continuous and seamless care when a baby is transferred between units. Transfer of babies between units during their initial neonatal course is common – one of the greatest advantages of SEND is the transfer of the data record, not just basic demographic information. SEND enables the network to be responsive to each baby's individual needs. In addition, the system is used for benchmarking, monitoring performance and to undertake audits to inform best practice. It also accurately monitors premature infants and their outcomes.

2.13 Half of the networks provided specialist neonatal transport 24 hours a day, seven days a week, whilst the remainder had access only during working hours (see Appendix 3). At unit level, 60 per cent of units had access to specialist neonatal transport 24 hours a day, seven days a week, and the remainder during normal working hours or with some evening or late night cover (n=142). Nine units did not, mainly because one network had not established a specialist service at the time of our census. Those without access to specialist transport usually used the regular ambulance service but compatibility of transport incubators with front line ambulances can be an issue in these arrangements. Private contractors are also used in some cases and one unit stated that they dialled 999 for an emergency transfer. In all these cases, staff from the units had to accompany the transfers.

2.14 Three network teams noted that transport was a large constraint to providing the right levels of specialised care. Back transfers – returning a baby back to its local unit after a stay in a level 2 or 3 unit – were also noted as being problematic in places. Just under three quarters of units (n=151) which had access to a specialist transport team could use them to transfer babies back, although 28 units across 13 networks could not. Those units mainly relied on the regular ambulance service available to the Trust or private contractors to bring babies back. Developing transport services was often cited by network staff as a positive outcome from the 2003 Review but many agreed that there was still much to do in order to implement a high-quality transport service.

Two thirds of networks are meeting the target of treating 95 per cent of their babies within the network

2.15 One of the key drivers behind the Department's 2003 Review was the problem of mothers and babies travelling long distances to find empty beds and cots. The Review therefore stated that networks should aim to treat 95 per cent of their babies within the network. Seventeen of the 23 networks met the target but six had to transfer more than five per cent of their admitted babies out of the network (Appendix 3).^m These transfers were often appropriate because specialised surgical services, which are not provided in every network, were required. But they were also due to limited capacity in parts of networks. Overall, however, out of the total number of babies admitted across England in 2006-07, only 3.4 per cent (n=159) was admitted to a unit outside its network.ⁿ

^m Central South and Thames Valley are counted as a single network here.
ⁿ See Appendix 3 for full details of how this was calculated.

2.16 There is scope to improve services and save money by changing services to keep babies inside each network, as **Case Example 3** shows.

The National Cot Locator is not widely used and network-level information about cot availability takes precedence

2.17 In November 2006 the Department launched the National Cot Locator to aid the process of locating available intensive care cots around the country. The Cot Locator is run by two providers, First Response Agency and Emergency Bed Service based in Birmingham and London respectively. Development of the Cot Locator cost around £40,000 and running costs are met from the two providers' budgets.

2.18 The Department's business case for the Cot Locator contained no formal projections of activity levels and support for the Cot Locator was low across units and networks. Sixty-six per cent of units (n=152) and 20 out of 23 network interviewees stated they did not use it. Forty-one of the 51 units that do use the Cot Locator consult with the network first. Several network managers pointed out that it does not have real-time cot availability which deters some units from using it. Without this kind of real-time information, it is unlikely that the Cot Locator will deliver the full intended benefits.

CASE EXAMPLE 3

In the Bedfordshire and Hertfordshire Perinatal Network over 600 unplanned care days were provided by hospitals outside the network in 2003-04. This resulted in some babies being transferred long distances, creating inconvenient arrangements for families and with the potential risk that the babies might suffer adverse effects.

In order to mitigate this problem, the network examined cot capacity across its own neonatal units and, in 2004-05, opened three additional intensive care cots. This action significantly reduced the need for long-distance transfers and cut the cost of using hospitals outside the network by approximately £550,000. Similar amounts have been saved every year since because the numbers of transfers has been kept to a minimum.

Staff accompanying babies and transfer delays meant units consider care was compromised for a small number of babies

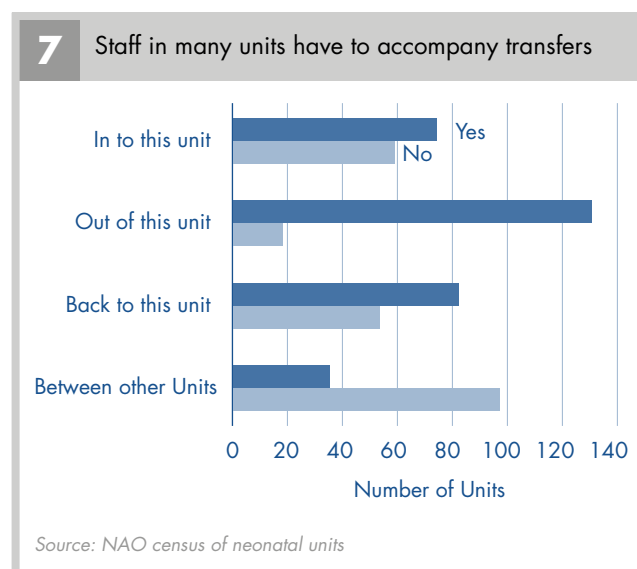
2.19 Current transport arrangements place a significant burden on units as not all specialist transport services have dedicated staff. This means that staff, often a doctor and a nurse, must leave the unit to accompany the baby being transferred. This removal of staff from units that are already short-staffed places a burden on those remaining to care for the babies. **Figure 7** shows that in 2006-07 a large number of units had to provide staff to accompany babies into, out of and back to their units.

2.20 On average the units providing staff to accompany these transfers were carrying between three and five vacancies, mainly of nurses, and many units had to accompany transfers on multiple occasions.²² The workload was particularly heavy for level 3 units as the majority of them had to accompany transfers.²³ Just over ten per cent of units (n=135) reported that in their view care of babies remaining on the unit was compromised as a result of staff being diverted away to accompany these transfers. Illustrative examples of the types of problems that arose were supplied to us, but only three units provided the actual numbers of babies affected (a total of eight babies). The survey did not collect information on the outcome for any of the babies.^o The problem of under-staffing is looked at in more detail in Part 3.

2.21 Twenty per cent of units (n=151) across 12 networks did not have the equipment and appropriately trained staff to do an emergency transfer (of a baby needing ventilation for example), if the specialist transport team was unavailable. The majority of these were level 1 and level 2 units and nine of them did not have 24 hours a day, 7 days a week specialist transport cover. Our analysis shows that in 2006-07 two of these units experienced delays in transport which in turn compromised the care of five babies.

2.22 Three quarters of units (n=152) across all networks experienced delays moving babies as a result of lack of transport and 44 per cent of units (n=116) stated that care had been compromised through such delays. Twenty-five units from 16 networks told us that in their view care for a total of 94 babies was compromised as a result of delays in transport in 2006-07. Again, illustrative examples of the types of problems that arose were supplied but the survey did not collect information on the eventual outcome for the babies affected.

2.23 In some networks, in order to avoid the need for transfers, clinicians from different units manage the care of babies together and conduct joint ward rounds. These more flexible approaches to working practices can help overcome temporary capacity problems and reduce transfers (see **Case Example 4**).



CASE EXAMPLE 4

At Homerton Foundation Trust Hospital consultants have been experimenting with different ways of treating babies without actually moving them. There are occasions when a baby in the North East London and North Middlesex Perinatal network requires a higher level of care than the original unit can provide but there are no cots available at Homerton. In these circumstances, and depending on the condition of the individual baby, a consultant at Homerton can manage the baby's care over the phone, or by visiting the unit, or by a combination of both. This kind of practice can also reduce pressure on transport services.

^o In our census we asked units to state whether care was compromised in relation to unit staff accompanying transfers, delays in transport and managing the care of a baby needing to be transferred to receive a higher level of care, and to provide the numbers affected and examples. See paragraphs 2.20, 2.22 and 3.8. We did not ask what the long term effects were for the babies concerned nor did we define 'compromised'. Our census questionnaire is available from www.nao.org.uk.



Capacity and staffing problems at unit level continue to constrain the service

3.1 A key objective of the 2003 Review was to improve the capacity within each network, in terms of providing extra cots where required in the right places, underpinned by a recommendation that units should adopt the BAPM 2001 categories of care and staffing standards. This can only be achieved through direct actions by the units and Trusts who are responsible for determining capacity and staffing levels and, as such, are areas in which networks can only effect change through influence. This part of the report examines actions taken to address capacity and staffing problems in units and the impact on service delivery.

There are shortfalls in capacity

3.2 Units are attempting to respond to the rising demand for neonatal care outlined in Key Facts. Forty-one per cent of units (n=153) regularly carry out demographic trend analysis, although their ability to respond to increases in birth rate or immigration depends upon commissioners understanding and responding to the patterns of demand within their regions. We found limited strategic planning for changes in demand for neonatal services happening at a network level and little sense that this is routinely being undertaken by commissioners in PCTs or SHAs. In relation to demand, we found that there were increases in cot days for all three types of care between 2005-06 and 2006-07, with the largest percentage increase in the demand for intensive care cots (**Figure 8**).

8 The number of cot days provided by units has increased

Type of cot day	Cot days provided in 2005-06	Cot days provided in 2006-07	Change between 2005-06 and 2006-07
Special care	550,111 (n=156)	573,946 (n=157)	+23,835 (+4%)
High dependency	111,411 (n=153)	116,571 (n=154)	+5,160 (+5%)
Intensive care	141,024 (n=155)	155,976 (n=156)	+14,952 (+11%)
Total	802,546	846,493	+43,947 (+5%)

Source: National Audit Office census of neonatal units

NOTES

- 1 The largest percentage increase in cot days is for intensive care cots.
- 2 Data were drawn from unit-level and Trust-level sources, 'n' therefore include units and Trusts. See Appendix 1 for further details.

Units often closed to new admissions due to shortfalls in capacity and nurse staffing

3.3 Each unit had to close to new admissions 52 times on average during 2006-07 (n=122), although there was variation.²⁴ We did not collect data on how long units were closed for. The main reasons for closure were a lack of cots (20 instances on average (n=122)) and shortages of nurses (11 instances on average (n=118)). Other reasons included cots being held for local mothers due to deliver prematurely and cots being occupied by babies ready to be moved to a lower level of care but could not as a suitable receiving cot was not available. These are similar to findings from the NPEU 2006 survey, which found that units were closed for 24 days on average over

six months.²⁵ Whilst we recognise that on occasions closure may be clinically appropriate, for example due to infection control, our census did not identify that infection outbreak was a prevalent reason for closure (the majority of units, 70 (n=100), ranked infection as the fifth or sixth most prevalent reason). One of the purposes of networks is to enable units to work together to ensure that babies receive care at an appropriate level within the network and assist each other at times of greatest demand. However, these findings show that networks have not yet achieved this aim.

3.4 During 2006-07, 58 units operated above the BAPM 2001 guideline occupancy rate of 70 per cent and three units operated at above 100 per cent.^p We found that the higher the level of unit, the more likely it was to have operated at above 70 per cent capacity. Occupancy rates ranged from 25 to 111 per cent, with an average overall of 74 per cent.²⁶ Units that were part of Foundation Trusts were slightly less likely than NHS Trusts to have operated above 70 per cent capacity in 2006-07. The average occupancy rate for Foundation Trusts was 70 per cent, compared to 76 per cent for NHS Trusts. These high occupancy rates could have consequences for patient safety, for example due to the increased risk of infection or inadequate levels of care.^q High rates prevent networks from functioning effectively as they reduce the ability of units to take babies in on transfer.

3.5 The majority of networks believed that staffing was the largest constraint to meeting demand. Four out of 23 networks believed that physical space and cot capacity were large constraints. Several interviewees believed that proper engagement with obstetrics and labour ward capacity were also key constraints in meeting demand. The neonatal unit and the labour ward are closely linked and both need to have spare beds in order to accept in-utero transfers.^r A small number of units pointed out that lack of space on the labour ward to accommodate an in-utero transfer were also reasons for the unit having to close.

Half of units had to manage the care of babies needing a lower level of care

3.6 In 2006-07, just over half of units (n=151) across all networks had to manage the care of an improving baby who was ready to be transferred but could not be because an appropriate receiving cot was not available. This was

a particular problem for level 3 units. This happened 26 times on average for each unit in 2006-07 (n=48). As a result 53 units were unable to admit a baby into a high dependency or intensive care cot because it was occupied by a baby who only required special care. In addition, 45 had to close to new admissions. Several units noted that this resulted in them going over 100 per cent cot occupancy without an increase in staff. Other implications were delays to planned deliveries to high risk mothers and disruption of the usual flow of local babies to the unit. Networks are the mechanism for organising care at different levels but these findings show that all networks still have a problem in this area.

3.7 The Royal College of Nursing noted that some units were offering an increasing amount of community nursing support and care packages to accelerate discharges and free up cots and resources. Half of the units (n=149) had community neonatal nurses attached to them. The number of Whole Time Equivalents (WTEs) ranged from less than one WTE (33 units) to 14 WTEs (one unit) with the majority of having two WTEs or less (n=69). They provided care for between two weeks (4 units) and 104 weeks (one unit) with the majority for eight weeks or less (n=60).

Thirty-two per cent of units had to manage babies requiring a higher level of care than they should

3.8 In 2006-07 about a third of units (n=152) across 20 networks had to care for a baby who should have been transferred to a higher level of care. This was a particular problem for level 1 and 2 units. This happened 4 times on average for each unit in 2006-07 (n=36). As a result 32 units had to divert nurses from looking after other babies on the unit and 22 units had to divert medical staff from fixed duties leading to a reduction of appropriate medical input for other babies on the unit. In addition, 19 units had to close to new admissions and 16 units told us that, in their view, the care of the baby was compromised. Illustrative examples of the types of problems that arose were supplied but the survey did not collect information on the eventual outcome for the babies affected. Several units also noted that such circumstances resulted in extra staff being brought in and staff having to be on call.

^p Occupancy rates were calculated by dividing the sum of the cot days provided by the sum of funded cots x 365. N=97. A unit can operate above 100 per cent cot occupancy when there are more babies in cots than they are staffed to care for.

^q Work by the UK Neonatal Staffing Study found that there was an association between increasing maximum occupancy at time of admission and increasing risk adjusted mortality. See Tucker, Parry, McCabe, Nicolson and Tarnow-Mordi on behalf of the UK Neonatal Staffing Study. *Lancet* 2002; 359: 99-107.

^r An in-utero transfer occurs before a baby is delivered and happens when a mother with a high risk pregnancy is transferred to a hospital which has a level 2 or 3 unit to ensure the baby is in the right place to receive care when it is born. Transferring a baby in-utero is preferable to transfer after birth. Research in the Trent region – *Impact of service changes on neonatal transfer patterns over 10 years*. Cusak, Field & Manktelow (2006), *Archive of diseases in childhood: fetal & neonatal edition* 2007, vol. 92, pp. F181-F184 – shows that in-utero transfers have declined over the last ten years.

3.9 The 2003 Review provided additional funding from the Department which was invested in intensive or high dependency cots (at least 29 extra cots).²⁷ Nevertheless we found that problems remain in getting intensive care capacity right, exacerbated by being unable to move babies out of intensive care to lower dependency care cots. Attention needs to be paid to special care capacity and in particular whether there is capacity in the right places to relieve bottlenecks in level 2 and 3 units. Seventeen out of 23 networks believed that babies are now usually treated in the right place from a clinical perspective.

Medical staffing ratios are generally being met

3.10 According to our census, units had an adequate supply of medical staff. On average, units had less than one Whole Time Equivalent (WTE) vacancy for any type of doctor, with a total of 38 WTE doctors' vacancies across the networks. Of these fifteen vacancies were in level 2 units and were for consultants with shared responsibility for the unit.²⁸

3.11 The medical staffing ratios specified in the BAPM 2001 guidelines were generally being met with the majority of units meeting the guidelines for having a dedicated SHO/ANNP rota (n=152), designated consultant (n=151) and 24-hour consultant cover (n=150). However the guidelines for 24-hour middle grade cover with exclusive neonatal duties (n=152) and specialist neonatal consultant with principal duties to the unit (n=150) was not always met. For example, 14 level 3 units did not have 24-hour middle grade cover and seven did not have a specialist neonatal consultant with principal duties to the unit.

3.12 As a result of the implementation of the European Working Time Directive (EWTD), there is currently an interim 56-hour maximum working week and August 2009 is the deadline for implementation of the 48-hour working week.²⁹ Two networks volunteered that they had concerns about the potential impact of the EWTD in the context of existing staff shortages and the difficulties faced by some level 2 units in ensuring appropriate medical cover.

Shortages in the numbers of neonatal nurses are a key concern

3.13 We found that the nursing staffing ratios specified in the BAPM 2001 guidelines were not being met; only the standard for special care – one nurse to four babies – was met by the majority of units (n=152). Half of units met the standard for high dependency care (n=151) and 24 per cent met the standard for intensive care (n=151). Crucially, the vast majority of level 3 units (40 out of 44) did not meet the standard for intensive care.

3.14 On average each unit had nearly three WTE vacancies for nurses qualified in neonatal care (n=116) against their existing establishment. **Figure 9** gives the average vacancies per level of unit with level 3 units that provide surgery having the most acute shortfall of qualified nurses with an average of nearly nine vacancies per unit. In total there were 459 WTE vacancies for neonatal nurse practitioners, qualified and other nurses.⁵ The number of vacancies on average by network is given in Appendix 3.

3.15 None of the UK nations meets the BAPM guidelines for intensive care nursing staff. England, Scotland, Northern Ireland and Wales all have nursing shortages. BAPM standards are recommended by the Department³⁰ rather than mandatory standards as decisions regarding safe nursing ratios are a matter for local networks and units. The extent to which the neonatal nursing workforce is understaffed against the BAPM guidelines has been reported on in detail by the NPEU.³¹ Their 2006 survey of units across the UK found that the shortfall between actual and recommended nursing establishments had diminished somewhat between those units which had answered their survey in 2005. However the shortfall still stood at 2,285 WTEs across the UK.

9

The number of vacancies, on average, increases as the intensity of care provided by the units increases

Level of unit	Average qualified nurse vacancies (WTE)
1 (n=22)	1.3
2 (n=59)	1.8
3 (n=23)	4.7
3 plus surgery (n=12)	8.3
Average across total (n=116)	2.9

Source: National Audit Office census of neonatal units

⁵ This is the total for the three nurse types specified in our census. Figure 9 shows the averages for one type of nurse, qualified neonatal nurses, only. Vacancies for: neonatal nurse practitioners n=98; nurses (post-registration qualified in neonatal care) n=116; other nurses n=102.

3.16 Units also employed a total of 382 nursing assistants (an average of 3 per unit (n=123)). Unit managers were positive about the role these assistants can play, particularly in communicating and spending time with parents, assisting with breastfeeding and helping to prepare babies and parents for discharge. Whilst these staff can have a valuable role the Royal College of Nursing noted that it is important that they only perform roles for which they are trained and with appropriate supervision.

Problems in training, recruitment and retention are exacerbating nursing staff shortages

3.17 Twenty out of 23 networks noted that there was a large shortfall of trained staff in their areas, either against the BAPM 2001 standards or against their funded posts. In this context, several networks also noted the difficulties in getting access to Allied Health Professionals such as dietitians and physiotherapists³² and others made reference to the difficulties in releasing staff for additional training.

3.18 Deficiencies in the provision of specialist training, particularly for nurses, are compounding the overall problem of understaffing. The Royal College of Nursing expressed concern over the perceived effect of NHS deficits on the commissioning of specialist post-registration training programmes. Units also struggle to release people for training due to budget constraints. BLISS provided three study days in 2006. Over half of the 502 delegates paid the course fees themselves and many had to take annual leave to attend.³³ Alongside this, the Neonatal Nurses Association told us that demand for neonatal nurse training may decline as traditional routes into neonatal nursing as a career choice become increasingly limited. The two main routes into neonatal nursing as a career choice are through midwifery or children's nursing training. The NPEU found that the proportion of nursing staff that were qualified in speciality declined from 64 per cent to 61 per cent between 2005 and 2006.³⁴

3.19 The Royal College of Midwives noted the importance of links between maternity and neonatal services and that maternity and neonatal staff now hold more joint meetings and training courses. One example of this is the provision of courses such as the examination of the newborn and the Newborn Life Support (NLS) programme, which are facilitating better and closer working relations between midwives, neonatal nurses and neonatologists.

3.20 The Neonatal Nurses Association (NNA) noted that units have problems retaining staff as well as recruiting and training them. Neonatal nursing is emotionally demanding due to the life and death issues encountered every day and the additional support required by parents. Several networks noted that the problem in retaining neonatal nurses is likely to worsen due to the ageing of the neonatal nurse workforce. However, resolution of these issues is made more problematic by a lack of administrative data. For example, no body or organisation holds data on how many neonatal nurses are currently practising.

Re-designation poses de-skilling challenges but also opportunities

3.21 The re-designation process underway in most networks can create challenges in the maintenance of skills for staff in units moved to a lower designation. It can also increase the training requirements and stress levels in units moved to a higher designation or admitting babies with more intensive care requirements. To help solve these problems, the Royal College of Midwives recommended the rotating of staff between units with different levels of designation within their network, supported by an appropriate continuing education and development programme. We found little evidence that rotation was already being implemented by networks, although this may be because it is difficult to do without funding the backfilling of posts.

3.22 Another way of tackling these challenges is by experimenting with skill-mix. A small number of level 1 and level 2 units are led by Advanced Neonatal Nurse Practitioners (ANNPs), funded from the additional £72 million allocated by the Department of Health in 2003.³⁵ Advanced practice roles have been developed in other areas of paediatrics but their numbers are low and, whilst there is a need for profession-wide clarification of the roles, training and competences, neonatal units are making good use of ANNPs supported by their networks.

There is ongoing debate about the applicability of BAPM nursing staffing standards

3.23 The BAPM 2001 standards set out in detail the nursing staff numbers recommended to provide each level of care (Figure 4) and that they should be regarded as minimum standards. However, there is ongoing debate about the guidelines, particularly for intensive care nursing, and a debate about whether this level of staffing can ever be achieved. Several networks expressed confusion over the Department's position regarding these standards and did not know whether or not they were expected to meet them. The Department recommended the BAPM standards in the 2003 Review, but did not mandate them believing that decisions regarding safe nursing ratios are a matter for local networks and units.

3.24 There was clear support for the BAPM standards from BLISS and the Royal College of Nursing. BLISS believes that newborns are entitled to the same one-to-one ratio of nurses to patients as in paediatric and adult intensive care. A study of 54 UK neonatal intensive care units found that survival for very low birth weight or preterm infants was related to the proportion of nurses with neonatal qualifications per shift.³⁶ This and other research is creating an evidence base which supports an increased ratio of trained staff to babies.

3.25 Some clinicians and network managers, however, suggested the need for a more flexible interpretation of the BAPM guidelines. Whilst they recognised the desirability of having more staff, they believed that units could never attain full compliance because of the costs. They noted that the three levels of care were broad categories with some babies within a category needing much higher levels of nursing than others and suggested more pragmatism might be needed. There was widespread agreement that the Department had a role to play in consulting on this issue. International comparisons show that in the regions of California and Victoria there are more nuanced categories of care.

Parents are mostly content with the expert care provided to their babies

3.26 Since babies cannot speak for themselves, parents' views are the best measure of evaluating the service from the patient's perspective. There is a consistent view from the available evidence that parents are extremely grateful for the care their babies receive. In addition there was a

consensus among mothers who participated in our focus groups that the medical care that they and their babies received was generally good.

3.27 BLISS told us that the vast majority of parents were very appreciative of the care that their babies received. However, they felt that parents needed to be more readily recognised as key care partners and that their needs and views should be taken into account in developing services. They noted that parents often feel they cannot engage with health professionals, as they feel as if they are in the way of what can be very complex treatment.

3.28 In a survey conducted by BLISS in 2007, two thirds of parents said that their baby's problems were discussed with them always and just under a third said they were discussed sometimes. Similar figures of 61 per cent and 32 per cent of parents said that equipment and procedures were always or sometimes explained to them.^t Whilst these indicate high satisfaction, they are also areas of concern, as the most common comments parents made to BLISS concerned poor communication between hospital staff and parents. This includes parents who felt that medical information about their baby's treatment had not been explained to them adequately; that they were not given much notice or a sufficient explanation as to why their baby needed to be transferred; and parents who need support once their baby has come home. In areas where people may not have English as a first language, the communication problems are often exacerbated. A BLISS survey in 2005 found that 20 per cent of units across the country did not have access to an interpreting service.³⁷

Parents have specific recommendations for improvements

3.29 BLISS, parents' focus groups and the Royal College of Nursing (RCN) highlighted consistency in suggestions from parents for improvements, including support for breast-feeding, information, communication with medical staff, car parking and accommodation. BLISS noted poor coordination between maternity and neonatal services was a key concern, since parents of premature babies are often unprepared, practically and emotionally, for their child's admittance to neonatal care. BLISS also noted the 2003 Review recommendation to provide more support and facilities for parents but that the provision of basic facilities where families can have some privacy was extremely variable. On average, there were three rooms (n=141) on each unit solely for the use of parents.

^t 360 parents responded to the survey.



PART FOUR

There has been additional funding for services but financial management and commissioning need to improve

4.1 This part describes the arrangements for funding neonatal services, how the service is commissioned, how units manage their costs and charges and how the Department might use Payment by Results to improve commissioning and management of neonatal care.

The Department has allocated additional resources to neonatal services although its visibility of the costs of the service is somewhat limited

4.2 According to the Department's Programme Budgeting figures for neonatal conditions, £802 million was spent in 2006-07.^u This is much larger than the total costs of running neonatal units generated from our census which were £422 million for 2006-07 (n=161).^v This difference could be due to the fact that the Department's Programme Budgeting figure for neonatal conditions includes a wide range of categories of care required for conditions such as feeding problems and dehydration, which babies may need regardless of whether they are admitted to the neonatal unit. Programme Budgeting is still evolving and the Department recognises that some categories may not yet be at the right size. Also the costings from the census have not been subject to audit and therefore some of the variations in both the unit and total costs may be due to the different interpretation of the guidance by individual organisations.

In 2003 the Department allocated an additional £72 million to support the establishment of networks over three years

4.3 Alongside the 2003 Review, the Department released an extra £72 million over three years to aid the establishment of networks.^w The distribution of these

additional funds was weighted by incidence of low birth weight. This funding was given to Strategic Health Authorities and Primary Care Trusts although the money was not ring-fenced. However, the Department wrote to Finance Directors specifying how the money should be spent when allocating the money. The £72 million was split between £20 million for capital expenditure and £12 million for revenue costs in 2003-04, and £20 million for revenue costs in both 2004-05 and 2005-06. From 2005-06, £20 million is the total amount being added for neonatal networks to PCTs' general allocations subject to an annual uplift. All ten SHAs told us that their predecessor SHAs received additional funding due to the 2003 Review.

4.4 Using data from networks and units, we established that around £47 million reached neonatal services between 2003-04 and 2005-06. Networks were allocated £23 million, although only half could provide supporting data.³⁸ Units estimated that they had received £24 million, although less than two thirds who said they had received funding from the additional £72 million provided details.³⁹ This suggests a shortfall of approximately £25 million. In the absence of data from every NHS unit, it is not possible to conclude how much of the money reached the intended services. Network managers explained that SHAs and PCTs sometimes diverted the funds towards other priorities or brokered elements between years because the extra funding was not ring-fenced. The Department expects PCTs to determine locally, in conjunction with the direction and priorities agreed with the SHAs, how allocations are invested.

4.5 The funds that did reach the service were spent on both network-wide services such as transport teams and on specific unit needs. The money was used to fund training, buy equipment such as cots and transport incubators, refurbish units and to fund extra staff and educator posts.⁴⁰

^u NHS organisations record what they are spending their allocations on according to the Programme Budgeting system. See glossary for further details.

^v The £422 million covers what units/Trusts consider to be the costs of special, high dependency and intensive medical care provided in neonatal units plus surgery where it is provided on the same site, but excludes costs of babies treated in other specialist surgical units. Data were drawn from unit-level and Trust-level sources, 'n' therefore include units and Trusts. See Appendix 1 for further details.

^w This comprised £20 million capital funding distributed to Strategic Health Authorities (SHAs) and £52 million revenue funding to Primary Care Trusts (PCTs) on the basis of the rate of low birth weight within their localities.

4.6 In 2007-08 networks were, on average allocated £679,000, with a minimum of £60,000 and a maximum of £1.3 million (Appendix 2). One of the reasons for the range is that some of the networks interpreted differently what was meant by 'allocation for network-wide activities' with some including funding for transport services in their data to us (see notes section of Appendix 2). However, given this is what each network believes they received, it clearly affects what each one can achieve. Networks usually have a manager, lead clinician and lead nurse on a full or part-time basis and for most, their allocation is spent on building the capacity of the units or on transport. Half of networks agreed that they have sufficient staff in place to manage their network, although many pointed to other improvements that they could undertake with additional resources.

Financial management at the unit level needs to be improved

4.7 In our census of units we asked how much the unit actually cost to run in the last two financial years. The results suggest that the true cost of running the service were not understood by many units, although the diversity of methods of classifying and allocating costs within trusts was apparent during our census. For example the average estimated cost across all units was £2.2 million in 2005-06 (n=135) and £2.3 million on average in 2006-07 (n=133). However, where the average cost per cot is calculated, this shows wide variations between the maximum and the minimum for each level of care (**Figure 10**).

4.8 We asked trusts to provide an estimate of the cost for a defined set of components to determine a standard analysis of the running costs of each unit. We found that this produced a higher cost estimate (£2.7 million (n=141) and £2.5 million (n=141) for each year respectively). All estimates included nursing salaries (n=135) and equipment consumables (n=133) but pharmaceuticals were only included in three quarters of cases (n=133).

4.9 Medical salaries (n=136) and community neonatal nurses (n=119) were excluded in half of cases. Diagnostics (n=115), breast milk bank (n=109), facilities overheads (n=124), transport (n=118), surgery (n=118), equipment leasing costs (n=109) and equipment that accompany babies home (n=108) were excluded from the majority of stated operating costs. This may be due to the accounting systems in individual Trusts and it may be appropriate for doctors with responsibilities to other services to be apportioned elsewhere. However, these accounting systems did not fully reflect the true costs of providing the neonatal service. This highlights the challenges faced in calculating charges for commissioners and in developing future tariffs.

Charges for neonatal care do not necessarily reflect costs

4.10 There is large variation in unit charges for cot days between similar types of unit. For example, daily charges for special care ranged from £126 to £1,421 (**Figure 11**). The majority of neonatal units set daily charges for the different types of cot days they provided to cover the care of out of area babies, which are not covered out of local population commissioning arrangements. They also set charges as a basis for cost and volume contracts between commissioners and Acute Trusts. Our census also showed that units providing intensive care were less likely to cover their costs than units only providing special care.

10 The average cost of running a cot increases as the level of unit increases, showing that intensity of care is a large determinant of cost¹

Designation of unit	Average cost per cot 2006-07	
	Minimum	Maximum
Level 1 (n = 24)	£43,672	£205,740
Level 2 (n = 61)	£46,310	£180,718
Level 3 (n = 29)	£61,218	£246,339
Level 3 plus surgery (n = 12)	£96,583	£256,248

Source: National Audit Office census of neonatal units

NOTE

¹ The average cost per cot was calculated by dividing total costs by the number of staffed cots. This is used to provide a normalised indicator of cost, although this will remove the differences in the costs of running different types of cots. There was variation, including a level one unit whose average cost per cot was higher than the highest average cost per cot from level 2 units. The 'n' figures do not match the total numbers of units at each designation in Figure 5 as not all units provided the data presented in this Figure.

11 The charges for cot days in 2006-07 varied across all types of care

	Special care cot day (n=109)	High dependency care cot day (n=95)	Intensive care cot day (n=95)
Minimum	£126	£165	£173
Maximum	£1,421	£1,680	£2,384
Median	£406	£635	£945
Range	£1,295	£1,515	£2,211
Average	£426	£714	£976

Source: National Audit Office census of neonatal units

4.11 There was no consensus on the basis on which these charges were formulated. Between 41 and 47 per cent of units stated that charges for all three levels of care were based on historic charges adjusted for inflation.⁴¹ A third of units stated that charges for special care were based on costs (n=151) and Trust overheads (n=153). Just over a quarter stated that charges for high dependency and intensive care were based on costs and Trust overheads.⁴² When asked whether the charges covered the unit's costs in 2006-07, 48 per cent answered yes, 33 per cent answered no and 19 per cent did not know (n=122).

4.12 Forty-seven units, just under a third, were part of Foundation Trusts. Half were level 2 units and a third were level 3 and surgical units. Very few were level 1. These units were slightly more likely than NHS Trusts to report that their charges covered costs although, on average, their charges were significantly lower, as shown in **Figure 12**. They were also less likely to report that they did not know whether their charges covered costs.

Trust income exceeds expenditure by half a million pounds on average but this may not all filter back to the neonatal unit

4.13 The income Trusts receive to provide neonatal care exceeds the costs of running the units by £559,000 on average (n=134). The difference ranged from costs exceeding income by £2.6 million to income exceeding costs by £4.9 million. Thirty-five units' costs were greater than income and 99 were less. Those units that were part of Foundation Trusts were less likely to have costs greater than income.

4.14 Despite income exceeding costs in some units, there is some evidence that not all of it is allocated to the unit. Staff at one unit told us that they did not automatically receive all the money their unit earned from commissioners and had to negotiate with Trust finance staff to determine what proportion of that money should be returned to their budget.

4.15 The charitable sector provides an additional funding stream for neonatal services. Besides the established national charities such as BLISS and SANDS, many units have dedicated local groups who support their work through fund-raising activities and donations. Units received average contributions from these charities of £25,208 in 2005-2006 (n=126) and £26,831 in 2006-07 (n=127). Charitable donations have also paid for new equipment in units. Our census showed that in total charities provided a quarter of the total investment in new incubators, ventilators and blood gas analysers, or £2.2 million, and Trusts provided three quarters or £6.9 million.⁴³ The majority of this new equipment was bought in the last five years.

Commissioning practices vary but should be more joined up

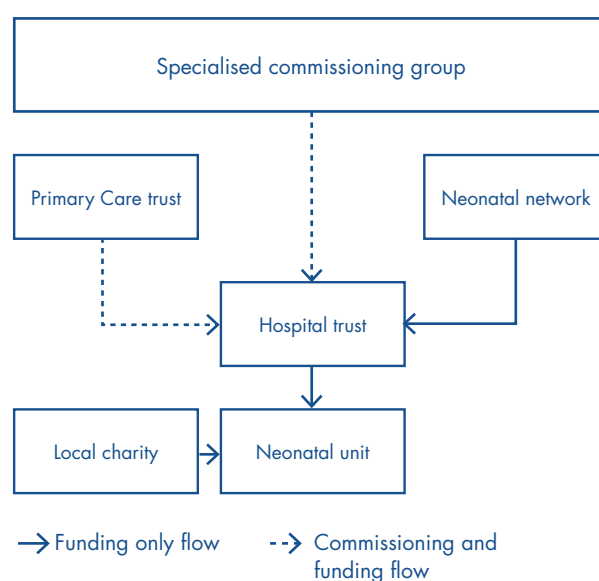
4.16 Primary Care Trusts (PCTs) are responsible for securing health services for their local areas.⁴⁴ This includes the commissioning of special care. However, due to the relatively small number of babies requiring neonatal intensive and high dependency care^x, collaborative arrangements called Specialised Commissioning Groups (aligned with the ten Strategic Health Authorities) commission and procure these on behalf of their constituent PCTs. In addition, there is no formal link between commissioning maternity and neonatal services, yet the services are linked given that demand for maternity services is the driver of demand for neonatal services. **Figure 13** shows the commissioning and funding arrangements for neonatal services in a typical region.

12 Foundation Trusts' average charges were significantly lower than those of NHS Trusts

Type of care	Foundation Trusts	NHS Trusts
Special Care	£402 (n=41)	£440 (n=68)
High Dependency Care	£650 (n=34)	£725 (n=63)
Intensive Care	£907 (n=34)	£1,014 (n=61)

Source: National Audit Office census of neonatal units

13 Commissioning arrangements and funding flows for neonatal services in a typical English region



Source: National Audit Office

x The national definition set of 35 specialist services is currently being reviewed.

4.17 In one region, Kent and Medway, all three types of neonatal care are commissioned together (**Case Example 5**). The London networks are considering taking this approach from 2008-09. Several SHAs commented on the difficulties of commissioning the levels of care separately and how networks played an important role in bringing them together. The reason is that the capacity of each network to enable babies to receive care in the right setting is as dependent upon the availability of special care cots as on intensive care cots because a baby's care pathway cuts across both. From a clinical perspective, the distinction between the three types of care can become blurred as a baby's condition can improve or deteriorate in a very short space of time whilst in the same cot.

4.18 In practice, commissioning and funding arrangements vary considerably in terms of the types of contractual arrangements being used and which types of care they cover. One SHA pointed out that not all PCTs are using cost and volume contracts based on local tariffs yet. In many cases a unit will receive its income via a combination of a block contract with the PCT for providing special care and on a per case basis with the Specialised Commissioning Group for providing high dependency and intensive care. Our view is that this kind of commissioning leads to a lack of clarity about what resources are available.

Implemented carefully, Payment by Results could bring real benefits

4.19 Payment by Results (PbR) is the payment system which now governs over a third of PCT funding allocations and nearly two thirds of acute hospital income. Critical care services, including neonatal care, are not yet part of PbR. They are being implemented at a slower pace due to the inherent difficulties of developing a robust tariff for more complex services. The implementation of PbR in neonatal care will be considered by the PbR Children's Services Clinical Working Group and awaiting approval of new datasets.

CASE EXAMPLE 5

The Kent and Medway neonatal network falls within the South East Coast SHA and covers three PCTs. The originator of their commissioning model was the contract with the East Kent Hospitals Acute Trust, which operates intensive care and special care on different sites. Commissioners realised that having separate contracts for intensive and special care would not reflect the totality of what the Trust was providing and would not take account of the intrinsic relationship between these activities. This analysis applied equally at a network level as total capacity needed to be understood in order for babies to be moved back closer to home as they recovered and for commissioners to have visibility of the total experience of the service for patients.

The South East Coast Specialised Commissioning Group has taken the lead role for commissioning neonatal services across the Kent and Medway network and works closely with the lead commissioners in each of the PCTs in the network and the network manager. From April 2007, each Trust within the Kent and Medway network has had a single, separate contract in which all three levels of care are identified. The key benefits of this approach are a better understanding of the service as a whole and the relationships between different elements, the journey for patients and issues for units. This approach also safeguards against Trusts playing commissioners off against each other, enables robust capacity planning and facilitates a better service with commissioning aligned to the care pathway.

4.20 Neonatal unit and network staff had concerns about the practicalities of implementing PbR and a degree of uncertainty about how it is being taken forwards. There was scepticism about whether a national tariff for neonatal care can be achieved for 2009-10. The Carter Review of Specialist Commissioning in May 2006 recommended that alternatives to the basic 'episode x tariff price' approach should be developed to cover services where patient activity and throughput is not the main determinant of cost.⁴⁵ During the course of our fieldwork we identified general confusion about how this is being done for neonatal care, whether the neonatal HRGs will include all three levels of care and which standards will apply. The Department's recent consultation paper on the future of PbR noted that there is an issue as to whether the proposed approach to adult services should be applied to paediatric and neonatal patients.⁴⁶

4.21 In developing a neonatal tariff it will be important to recognise transport costs, since the transfer of a sick baby involves significant staff and consumable costs. In addition, there are other support costs such as physiotherapy and dietetics, and community-based support which will need to be considered when developing a national tariff.

Payment by Results could deliver positive benefits for neonatal networks, but there are challenges to be managed

4.22 The Department made clear in its consultation paper that any new funding models must strengthen, not weaken, the progress that has been made in organising services on a network basis. The Department believes that networked services could be undermined if critical care remains outside the scope of PbR, with some elements of a care pathway covered by the tariff and others not.

4.23 Networks, units and commissioners agreed with PbR in principle and the benefits it offers in terms of consistency in prices and standards of care, and rewarding efficiency and encouraging innovation. They believed that an appropriate tariff would serve to reinforce networked services by ironing out price variance, give an opportunity for units to find the right activity level and enable commissioners to audit against specified minimum standards of care. However, the BAPM and several networks were concerned that PbR could destabilise neonatal services and therefore undermine networks. The disparities in current occupancy rates and charges for cot days could mean that the tariff results in a net gain for those units with high occupancy rates and a loss for units with low occupancy rates or charges higher than the tariff. PbR may therefore incentivise units to undertake more activity than they should or may result in unit closures if activity levels are too low to break even.

4.24 Using the costs, charges and cot capacity data from our census of units, we calculated that under current funding arrangements 26 units (27 per cent of those who supplied adequate data) would have to operate at above 70 per cent capacity in order to cover their costs. Nine units (9 per cent) would have to operate at above 100 per cent capacity.⁴⁷ This shows the importance of developing a tariff that not only fully reflects the costs of providing neonatal care, but also does not incentivise units to undertake unsafe levels of activity. Using current charges, a unit would generate £13,566 in charge income for 14 intensive care days, which was the average number in the East Midlands and Yorkshire in 2006.⁴⁸ This gives an indication of the size of the tariff if an episode rather than a per diem-based approach is taken.

APPENDIX ONE

Methodology

1 We designed this study to examine how well the introduction of networks has helped neonatal services to respond to the increasing demand for neonatal care. This is the first time that data have been gathered for the purposes of assessing the effectiveness of the model for organising neonatal care and, as a result, we were not able to assess the value for money achieved by networks in comparison to the previous situation.

Census of all NHS Neonatal Units

2 We carried out a census of all 178 hospital neonatal units in England for cost and activity data to enable us to analyse how the units are performing. The total number of units has since increased to 180. We achieved a 99 per cent response rate and the breakdown of responses is given in **Figure 14**. Our questionnaire is available from the website.

3 Most of the data were supplied to us on a unit-level basis; however some were supplied on a Trust-level basis. In those cases where a Trust had more than one unit and aggregate data was given, we had to exclude these from the analysis. This affected 11 Trust returns (nine NHS Trusts and two Foundation Trusts) or 22 individual units and is summarised in **Figure 15**.

4 Data from 153 units (86 per cent of the census population) were taken forward for analysis. We analysed the data using SPSS (version 13). Most of the analysis in the report is based on 153 units although where it was appropriate to do so we combined unit- and Trust-level data to generate totals. The combined unit and Trust population was 164.

5 In addition we prepared individual unit feedback reports to all Trusts, copied to relevant network management teams, to benchmark their performance and highlight areas for improvement.

Interviews with all Neonatal Networks in England

6 In order to produce a picture of the state of development of the 23 neonatal networks in England, we conducted semi-structured interviews with the management teams of each network. We conducted these interviews in order to ascertain their views as well as factual information on the impact of the networks in relation to working cultures, innovation and patient care, along with funding, demand assumptions and future directions for the networks.

14 Census population and responses

	Census	Responses ¹
Foundation Trusts	46	45 (98%)
NHS Trusts	103	102 (99%)
Total Trusts	149	147 (99%)
Total Units	178	175 (98%)

Source: National Audit Office

NOTE

¹ Differences in percentages are due to rounding

15 Population for analysis

	Census	Analysis
Level 1 units	38	30 (79%)
Level 2 units	89	79 (89%)
Level 3 units	34	31 (91%)
Level 3 plus surgery	17	13 (77%)
Total	178	153 ¹ (86%)

Source: National Audit Office

NOTE

¹ Across 136 Trusts (43 Foundation Trusts, 93 NHS Trusts)

Telephone Interviews with all Strategic Health Authorities

7 We conducted a census of all ten Strategic Health Authorities by telephone interview in order to assess how they understand their role in relation to neonatal services with reference to their current position and how they believe that role will change with the future development of the service.

International Comparison

8 We commissioned RAND Europe to undertake a comprehensive literature review to enable us to compare the neonatal services in England with those in other parts of the United Kingdom and abroad, with particular reference to the Australia, Canada, Sweden and United States of America. Their report is available on our website.

Key Stakeholders

9 We interviewed and consulted with a range of key stakeholders:

- Department of Health
- Healthcare Commission
- Confidential Enquiry into Maternal and Child Health
- British Association of Perinatal Medicine
- Royal College of Obstetrics and Gynaecology
- Royal College of Paediatrics and Child Health
- Royal College of Midwives
- Royal College of Nursing
- Neonatal Nurses Association
- National Perinatal Epidemiology Unit
- BLISS

Focus Groups

10 Three focus groups were run in partnership with Pilgrim Projects in order to obtain independent third-party views from a wider range of mothers' experiences of neonatal care, including those in 'harder-to-reach' socio-economic groups, who for example do not speak English, so as to achieve a rounded picture of neonatal services. Pilgrim Projects recorded some of these stories as illustrative examples only on to a DVD which is available as a supplement to this report or via our website.

APPENDIX TWO

Profile of neonatal networks

	Network	Estimated total births 2006	Total units	Level 1 units ³	Level 2 units ³	Level 3 units ³	Level 3 units (plus surgery) ⁴	2007-08 Revenue allocation for network-wide activities
1	Bedfordshire & Hertfordshire	19,000	5	2	2	1	0	£662,748
2	Central South Coast	27,000	9	0	7	1	1	£844,000
	(Former Thames Valley network) ¹	28,000	7	1	5	0	1	£869,000
3	Cheshire & Merseyside	28,000	8	0	6	2	0	£919,000
4	Essex	19,000	5	1	4	0	0	£553,000
5	Greater Manchester	36,000	12	2	5	4	1	£1,296,000
6	Kent & Medway	20,000	6	3	1	2	0	£649,000
7	Lancashire & South Cumbria	17,000	6	1	3	2	0	£617,000
8	Midlands Central (Central Newborn)	30,500	8	4	2	1	1	£172,762
9	Midlands North (Staffordshire, Shropshire & Black Country)	24,500	6	1	3	2	0	£255,000
10	Midlands South (South West Midlands)	34,000	8	3	3	2	0	£139,000
11	Norfolk, Suffolk & Cambridgeshire	27,000	8	0	6	0	2	£783,000

Network manager (Whole Time Equivalent)	Lead clinician	Lead nurse	Transport manager	Notes
0.33	✓		See notes	Bedfordshire & Hertfordshire, Essex and the Norfolk, Suffolk & Cambridge networks are due to share a single East of England Neonatal Director. Transport services in the East of England are pooled and managed by the Acute Neonatal Transport Service. The team will also have a Data Manager, Lead Nurse and Coordinator and clinical lead sessions of 0.6 WTE.
1	✓	✓		Lead nurse is part time.
0	✓	✓		Lead nurse is part time.
1	✓	✓	✓	Interim transport service in operation. Development required to offer full 24 hour cover. Revenue funding figure includes transport.
0.33	✓		See notes	The needs of Essex are under review by the East of England Specialised Commissioning Group and will go out to public consultation in January 2008 once the formal review is completed. Also see Bedfordshire & Hertfordshire Notes.
1	✓		✓	
0.4	✓		See notes	Network manager shared with Surrey & Sussex. Transport services in the greater London area are pooled and managed by the Neonatal Transfer Service. Revenue funding figure includes transport.
1	✓	✓		Revenue funding figure includes transport.
1	✓	✓		Revenue allocation figure for infrastructure only. An additional £901,606 recurrent funding invested directly into services for Network-wide activities, including transport.
1	✓	✓	See notes	Network manager is also Lead Nurse. Transport services are shared with with South West Midlands Newborn Network and led by a Neonatal Nurse Consultant. Revenue funding figure excludes transport.
1	✓	✓	See notes	Network manager is also Lead Nurse. Transport services are shared with with Staffordshire, Shropshire & Black Country Newborn Network and led by a Neonatal Nurse Consultant. Revenue funding figure excludes transport.
0.33	✓		See notes	See Bedfordshire & Hertfordshire Notes.

Profile continued overleaf

Network	Estimated total births 2006	Total units	Level 1 units ³	Level 2 units ³	Level 3 units ³	Level 3 units (plus surgery) ⁴	2007-08 Revenue allocation for network-wide activities
12 Northern	32,700	14	5	5	3	1	N/A
13 North Central London	17,000	5	2	2	1	0	£712,375
14 North East London & North Middlesex ²	26,700	7	1	4	1	1	£1,198,861
15 North Trent	30,000	9	1	6	1	1	£458,650
16 North West London	30,000	7	2	1	2	2	£633,825
17 South East London	24,000	6	1	3	0	2	£546,000
18 South West London	19,000	4	0	3	0	1	£632,000
19 South West Peninsula	12,000	5	2	2	1	0	£850,000
20 Surrey & Sussex	28,500	9	6	1	1	1	£853,000
21 Trent	21,500	6	1	2	2	1	£850,000
22 Western	30,500	8	2	4	1	1	£60,000
23 Yorkshire	43,000	12	2	6	2	2	£1,068,000
Total	624,900	180	43	86	32	19	£15,622,221

Source: National Audit Office

NOTES

175 units responded to our census. The table reflects the profile of the networks at the time of publication.

1 The administration of the Central South and Thames Valley networks has merged, although separate clinical networks continue to operate.

2 One unit in this network has since merged with another unit.

3 For an explanation of unit designations, please see Figure 5 in the main report.

4 Level 3 units plus surgery refers to those units that are co-located with a surgical provision. In some networks surgery is provided at a different location to the lead level 3 unit.

Network manager (Whole Time Equivalent)	Lead clinician	Lead nurse	Transport manager	Notes
N/A	N/A	N/A	See notes	Transport services are provided by the Newcastle upon Tyne Hospitals NHS Trust and South Tees Hospitals NHS Trust staffed from establishment plus four neonatal paramedic practitioners.
0.2	✓	✓	See notes	The five London networks now share a single London Perinatal Director. Transport services in the greater London area are pooled and managed by the Neonatal Transfer Service.
0.2	✓	✓	✓	See North Central London Notes.
0.3	✓	✓	✓	Revenue funding figure includes transport (£276,000). Three level 2 units are classed as 'level 2.5' and are able to undertake intensive care on any gestational age but not all modalities of care.
0.2	✓		See notes	See North Central London Notes.
0.2	✓		See notes	See North Central London Notes.
0.2	✓		See notes	See North Central London Notes.
0.5	✓		✓	Western and Peninsula networks share a Whole Time Equivalent Manager. Revenue funding figure represents the total investment for 2007-08, not the total neonatal service budget. Includes elements of the transport service.
0.6	✓		See notes	Network manager shared with Kent & Medway. Transport services in the greater London area are pooled and managed by the Neonatal Transfer Service. Revenue funding figure includes transport.
0.5	✓	✓	See notes	Whole Time Equivalent manager post shared and funded with Trent Paediatric Critical Care Network. The Network strategy is to amalgamate the two level 3 units in Nottingham to a single site provision. The operational aspects of this are the responsibility of Nottingham University Hospitals Trust which also manages the transport service. Revenue funding figure includes transport (£396,000).
0.5	✓			Western and Peninsula networks share a Whole Time Equivalent Manager. Additional
1	✓	✓		£961,000 invested directly into services to support the network. Revenue funding figure excludes transport, however a proposal for investment into transport infrastructure and service is currently under discussion.
12.8	23	12	5	Network manager/lead nurse – this is a joint post which is currently vacant. It is the intention to recruit to this post. Revenue funding figure includes transport (£531,000 – Leeds Teaching Hospitals Trust).

APPENDIX THREE

Summary of key service indicators, grouped by network

Network	The network has re-designated ¹	Availability of specialist transport	2005 neonatal mortality rate ²	Surgery available in the network	Percentage of babies transferred out of the network ³	Average number of nurse vacancies ⁴
Bedfordshire & Hertfordshire	Yes	Working hours ⁵	2.2	No	Above target 5.9 per cent (n=4)	3.7 (n=2)
Central South Coast	Yes	Working hours	2.3	Yes	On target 1.8 per cent (n=9)	2.0 (n=8)
Thames Valley		Working hours	2.9	Yes	On target 3.4 per cent (n=5)	2.3 (n=2)
Cheshire & Merseyside	Yes, partially implemented	Working hours	3.6	Yes	On target 0.7 per cent (n=7)	1.7 (n=6)
Essex	No	Working hours	1.9	No	Above target 6.2 per cent (n=5)	1.3 (n=4)
Greater Manchester	Yes, but not yet implemented	24-7	3.1	Yes	On target 2.1 per cent (n=11)	1.4 (n=7)
Kent & Medway	No	Working hours	2.4	No	Above target 6.2 per cent (n=5)	3.1 (n=4)
Lancashire & South Cumbria	Yes, but not yet implemented	24-7	2.9	No	Above target 6.4 per cent (n=6)	2.9 (n=4)
Midlands Central (Central Newborn)	Yes, partially implemented	Working hours	2.7	Yes	On target 2.0 per cent (n=7)	2.1 (n=5)
Midlands North (Staffordshire, Shropshire & Black Country)	Yes, but not yet implemented	24-7	4.3	No	Above target 9.3 per cent (n=6)	2.8 (n=3)
Midlands South (South West Midlands)	Yes	24-7	4.8	Yes	On target 2.7 per cent (n=8)	4.8 (n=2)
Norfolk, Suffolk & Cambridgeshire	Yes, partially implemented	Working hours	2.2	Yes	On target 2.9 per cent (n=8)	1.7 (n=8)
Northern	No, informal network	24-7	3.0	Yes	On target 0.3 per cent (n=12)	1.6 (n=8)
North Central London	Yes	24-7	3.3	Yes	On target 2.5 per cent (n=4)	6.4 (n=3)
North East London & North Middlesex	Yes	24-7	2.6	Yes	On target 4.6 per cent (n=6)	7.6 (n=5)
North Trent	Yes, partially implemented	Working hours ⁶	3.1	Yes	On target 2.1 per cent (n=7)	0.3 (n=6)
North West London	No	24-7	4.0	Yes	On target 2.8 per cent (n=5)	8.4 (n=5)

Network	The network has re-designated ¹	Availability of specialist transport	2005 neonatal mortality rate ²	Surgery available in the network	Percentage of babies transferred out of the network ³	Average number of nurse vacancies ⁴
South East London	Yes	24-7	3.4	Yes	On target 2.2 per cent (n=6)	11.2 (n=5)
South West London	N/A	24-7	2.9	Yes	On target 3.7 per cent (n=4)	2.6 (n=4)
South West Peninsula	Yes	24-7 ⁷	2.5	No	Above target 5.4 per cent (n=8)	1.7 (n=8)
Surrey & Sussex	Yes	Working hours	1.8	Yes	On target 4.2 per cent (n=7)	2.3 (n=5)
Trent	Yes	24-7	3.5	Yes	On target 3.4 per cent (n=5)	0.3 (n=5)
Western	Yes	No specialist transport	2.5	Yes	On target 3.5 per cent (n=5)	1.8 (n=2)
Yorkshire	Yes, partially implemented	24-7 ⁸	3.5	Yes	On target 1.9 per cent (n=9)	2.1 (n=5)

Source: National Audit Office

NOTES

1 As of spring 2007. Source: survey of network staff/representatives.

2 The average network neonatal mortality rate (for babies born at 22 or more weeks' gestation) is 3.0 deaths per 1,000 live births. The crude neonatal mortality rate (for all deaths in the first month of life) for England as a whole is 3.5 deaths per 1,000 live births. Sources: data from the Confidential Enquiry into Maternal and Child Health/ONS.

3 The target is 5 per cent. The data covers transfers of all babies, but not in-utero transfers which occur prior to birth. This therefore includes both appropriate transfers for surgery or for specialist children's services such as cardiology, which may not be provided in the network, and inappropriate transfers due to lack of capacity within the network. The percentage for each network was calculated by dividing the total babies admitted to units in the network by the total babies transferred out of the network. This method of calculation is sensitive to the number of admissions. The network percentages ranged from 0.7 per cent to 9.3 per cent with a network average of 3.7 per cent and an English average of 3.4 per cent (n=159, data were drawn from unit-level and Trust-level sources, 'n' therefore includes units and Trusts. See Appendix 1 for details). Source: census of units Spring 2007.

4 Source: census of units Spring 2007. Vacancies of nurses post-reg qualified in neonatal care (n=116). The English average was 2.9 (rounded) WTE vacancies. Total vacancies (against funded establishment not against BAPM standard) were 339 (rounded).

5 8am–8pm.

6 Non Acute Transfer: 9am–5pm, Mon to Fri. Acute Transfers: 8am–10pm, 7 days a week.

7 Funded for but not fully implemented.

8 Into two level 3 units only.

GLOSSARY

Acute Trust	A NHS Trust which provides secondary or hospital-based health care services. An acute trust can cover one or more hospitals.
Advanced Neonatal Nurse Practitioner	Were first introduced in the early 1990s and are nurses who have extensive neonatal nursing experience and who have successfully completed a neonatal degree programme which provides scientific and medical underpinning required to practice effectively at this level. They carry out all procedures that a junior medical member of staff would do; and are responsible for most of the day time resuscitation on the delivery suite. They diagnose, draw up treatment plans and order medications from a strictly protocolised unit formulary.
Commissioning	Commissioning involves the strategic planning, funding, monitoring and quality assurance of services provided by hospitals and other health bodies.
European Working Time Directive	The European Working Time Directive (EWTD) is a directive from the Council of Europe to protect the health and safety of workers in the European Union. It lays down minimum requirements in relation to working hours, rest periods, annual leave and arrangements for night workers. The Directive was enacted into UK law as the Working Time Regulations with effect from October 1998 but the Government negotiated an extension of up to twelve years to prepare for full implementation for doctors in training. Currently, there is a 56-hour week in place due to reduce to 48-hours in 2008.
Foundation Trust	A new type of NHS Trust that has greater management and financial freedoms than other NHS Trusts to retain surpluses and invest in delivery of new services.
High Dependency Care	For babies receiving nasal continuous positive airway pressure (CPAP) but not fulfilling any of the categories for intensive care; any baby below 1,000 gms who does not fulfil any of the categories for intensive care; babies receiving parental nutrition, with apnoea requiring stimulation.
Infant Mortality	Death occurring within one year of birth, excluding stillbirths.
Intensive Care	For babies needing respiratory support (ventilation); for babies weighing less than 1,000g and/or born at less than 28 weeks' gestation and receiving nasal continuous positive airway pressure (CPAP); for babies with severe respiratory disease or who require major surgery.
Neonatal Mortality	Death occurring between birth and 28 days of life, excluding stillbirths.

Neonatal Unit	A unit within a Foundation or NHS Trust whose role is to provide specialist care at varying levels for premature or ill babies.
Patient-level costing	See <i>Service-Line Reporting</i> .
Payment by Results	The aim of Payment by Results (PbR) is to link income to work actually performed and by so doing reward efficiency and encourage innovation. It is based on a prospective payment system where the price for a given unit of activity is set in advance, and income is based on multiplying the relevant price by the amount of activity actually delivered. The key components of PbR are the Healthcare Resource Group (HRG) and the tariff or price. The HRG is based on an 'episode' of care which is a defined package of treatments, alongside a typical hospital stay, for a particular condition.
Perinatal Mortality	Death occurring between birth and seven days of life, excluding stillbirths.
Primary Care Trust	Since April 2002 Primary Care Trusts (PCTs) have been responsible for securing health services for their local populations.
Programme Budgeting	Programme budgeting is a retrospective analysis of NHS spend across 23 categories based on major disease types, to show where the money has gone and to provide information to prompt analysis of future spend decisions. It is still being developed by the Department. The accuracy of the data will take time to improve as uncertainties, such as how health professionals apportion their time between categories, need to be reduced. However, programme budgeting has the potential to be a powerful information tool, allowing NHS organisations to benchmark their expenditure against each other to identify opportunities for more effective service delivery.
Service-line reporting	Service-line reporting (SLR) provides trusts with profitability information by individual service lines. Service lines are typically specialties (e.g. orthopaedics, cardiology) and are characterised by distinct patient groups, distinct products/services/procedures, designated staff and clearly identified profit or loss responsibilities. SLR facilitates the management of a trust as a portfolio of autonomous and accountable business units. Where possible, SLR transfers key decision-making rights to the clinicians and managers working in each service line. SLR is underpinned by patient-level costing data, which is a bottom-up patient-focused approach to gathering the costs of providing a particular service.
Special Care	For babies requiring continuous monitoring of respiration or heart rate; for babies receiving added oxygen, being tube fed, receiving phototherapy or recovering from more specialist care.
Strategic Health Authority	The ten Strategic Health Authorities are local headquarters of the NHS. They performance manage Acute Trusts and Primary Care Trusts.
Vermont Oxford Benchmarking Group	The Vermont Oxford Network is a non-profit voluntary collaboration of health care professionals dedicated to improving the quality and safety of medical care for newborn infants and their families.

ENDNOTES

- 1 National Audit Office Census of Neonatal Units, spring 2007, data from 175 out of 178 units.
- 2 The Provision of Neonatal Services. Data for International Comparisons. RAND Europe commissioned by the National Audit Office, 2007.
- 3 Office of National Statistics. Human Fertilisation and Embryology Authority.
- 4 Neonatal mortality covers deaths in the period from birth to 28 days. Infant mortality covers deaths in the period from birth to one year (this usually excludes stillbirths). Office of National Statistics.
- 5 Confidential Enquiry into Maternal and Child Health, Perinatal Mortality 2005, April 2007. Health Statistics Quarterly 24, Inequalities in infant mortality: trends by social class, registration status, mother's age and birth weight, England and Wales, 1976-2000, Office for National Statistics, Winter 2004.
- 6 EPICure was established in 1995 to determine the changes of survival and later health status by following up children who were born in the United Kingdom and Ireland at less than 26 weeks gestational age during a 10 month period in that year. A second study, EPICure 2, was established in 2006 and will show how survival and morbidity has changed in the past ten years.
- 7 Health Statistics Quarterly 35, Introducing new data on gestation-specific infant mortality among babies born in 2005 in England and Wales, Office for National Statistics, Autumn 2007.
- 8 See Appendix 2. There were 178 neonatal units at the time of our census in spring 2007.
- 9 National Audit Office Census, National Perinatal Epidemiology Unit.
- 10 Neonatal Intensive Care Review: Strategy for Improvement, Department of Health, 2003.
- 11 *Critical Care Decisions in Fetal and Neonatal Medicine: Ethical Issues*, Nuffield Council on Bioethics, 2006.
- 12 *Neonatal Intensive Care Review: Strategy for Improvement*, Department of Health, 2003.
- 13 The baseline is 1997-1999. *Review of the Health Inequalities Infant Mortality PSA Target*, Department of Health
- 14 *The Provision of Neonatal Services. Data for International Comparisons*. RAND Europe commissioned by the National Audit Office, 2007. Available via www.nao.org.uk or www.rand.org/europe. See Appendix 1 for more details of this and other methodologies.
- 15 The routine and manual group includes those in lower supervisory and technical, semi-routine and routine occupations. *Review of the Health Inequalities Infant Mortality PSA Target*, Department of Health, 2007.
- 16 2003-05 data update for the National 2010 PSA Target can be found via http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH_063689
- 17 We calculated the significance levels using a t-test.
- 18 The Indices of Deprivation 2004 were produced by the Social Disadvantage Research Centre (SDRC) at the University of Oxford. Further details can be found via www.neighbourhood.gov.uk.

- 19 The study we commissioned from RAND Europe accompanies this report and is available via www.nao.org.uk or www.rand.org/randeurope. The mortality statistics are crude and are not adjusted for risk factors. An example of risk-adjusted analysis can be found in *Risk adjusted and population based studies of the outcome for high risk infants in Scotland and Australia*. Tarnow-Mordi et al: International Neonatal Network, Scottish Neonatal Consultants, Nurses Collaborative Study Group: Arch Dis Child Fetal Neonatal Ed 2000.
- 20 Information supplied by BLISS
- 21 More detail about SEND can be found at: <http://www.neonatal.org.uk/Healthcare+Professionals/SEND/>. MANNERS is a data set established by the Perinatal Institute. More detail can be found at: http://www.pi.nhs.uk/manners/index_manners.htm. More details about The Neonatal Survey can be found at <http://www2.le.ac.uk/departments/health-sciences/extranet/ECC/timms/project-webpages/the-neonatal-survey>.
- 22 Staff vacancies/transfers into the unit: n=46. Staff vacancies/ transfers out of the unit: n=52. Staff vacancies/transfers back to the unit: n=46. Staff vacancies/transfers between other units: n=46.
- 23 Staff accompany transfers into the unit = 35/41 level 3 units; out of the unit = 43/44 level 3 units; back to the unit = 34/41 level 3 units; between other units = 17/41 level 3 units.
- 24 Total closures ranged from 0-312 in 2006-07, with a median of 21. Lack of cots as a reason for closure ranged from 0-209 instances, with a median of 1. Nursing shortages as a reason for closure ranged from 0-120 instances, with a median of 2.
- 25 *Networks, admissions and transfers: the perspectives of networks, neonatal units and parents*. Maggie Redshaw, Karen Hamilton; National Perinatal Epidemiology Unit, December 2006. *A Survey of Current Neonatal Unit Organisation and Policy*, Maggie Redshaw, Karen Hamilton; National Perinatal Epidemiology Unit, July 2005.
- 26 See also *Too Little, Too Late*, BLISS, 2007
- 27 BLISS *Neonatal Services... are they improving?* May 2005.
- 28 Vacancies for: consultants with sole responsibility for the unit n=81; consultants with shared responsibility for the unit n=95; junior doctors n=94; other grades n=78.
- 29 See Glossary, European Working Time Directive.
- 30 Neonatal Intensive Care Review: Strategy for Improvement, Department of Health, 2003.
- 31 The recommended nursing establishment (WTE) formula can be found in *Networks, admissions and transfers: the perspectives of networks, neonatal units and parents*, NPEU, *ibid*.
- 32 See staffing standards contained within *Allied Health Professionals and Healthcare Scientists Critical Care Staffing Guidance*, July 2003.
- 33 BLISS submission to National Audit Office, June 2007.
- 34 In matched units. NPEU, *ibid*
- 35 See Glossary, Advanced Neonatal Nurse Practitioners.
- 36 Increasing the ratio of nurses with neonatal qualifications to intensive care and high dependency infants to 1:1 was associated with a decrease in risk-adjusted mortality of 48 per cent. *Nurse staffing in relation to risk-adjusted mortality in neonatal care*. Hamilton, Redshaw, Tarno-Mordi; Arch. Dis. Child Fetal Neonatal Ed, 6 Nov 2006.
- 37 BLISS report *Special care for sick babies... choice or change?*, 2005.
- 38 Revenue allocations: n=6 (2003-04), n=9 (2004-05), n=13 (2005-06). Capital allocations: n=6 (2003-04), n=4 (2004-05), n=4 (2005-06).
- 39 N=23 (2003-04), n=57 (2004-05) n=71 (2005-06). Total stating they had received funding = 114. Data were drawn from unit-level and Trust-level sources, 'n' therefore include units and Trusts. See Appendix 1 for further details
- 40 BLISS reported that 46 extra cots were funded in its May 2005 report *Neonatal Services: are they improving?*
- 41 Special care n=149. High dependency care n=148. Intensive care n=148.
- 42 High dependency care: unit costs n=148. High dependency care: Trust overheads n=150. Intensive care: unit costs n=148. Intensive care: Trust overheads n=150.
- 43 Incubator costs borne by Trusts n=74, by Charities n= 58. Ventilator costs borne by Trusts n=66, by Charities n=33. Blood Gas Analyser costs borne by Trusts n=52, by Charities n=13.

44 See Glossary, Primary Care Trust.

45 Review of Commissioning Arrangements for Specialised Services. May 2006. An independent review requested by the Department of Health chaired by Sir David Carter.

46 *Options for the Future of Payment by Results: 2008/09 to 2010/11*, Department of Health, March 2007.

47 The level of activity required to cover costs was calculated by dividing the cost per day to operate the unit (annual cost/365) by the maximum daily income (sum of number of funded cots x daily charge).

48 For all infants who received some intensive care (defined as ventilation, continuous positive airway pressure or total perenteral nutrition). Data prepared by The Neonatal Survey based on all births in the East Midlands and Yorkshire 2006.