

A systematic review of presumed consent systems for deceased organ donation

A Rithalia, C McDaid, S Suekarran,
G Norman, L Myers and A Sowden



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Abstract

A systematic review of presumed consent systems for deceased organ donation

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Objectives: To examine the impact of presumed consent legislation on organ donation and to review data on attitudes to presumed consent among the public, professionals and any other stakeholders.

Data sources: Eight electronic databases (MEDLINE, MEDLINE In-Process, EMBASE, CINAHL, PsycINFO, HMIC, PAIS International and OpenSIGLE) were searched from inception to January 2008. Supplementary internet searches were also performed.

Review methods: A systematic review of studies comparing donation rates in a single country before and after the introduction of a presumed consent law or in countries with and without presumed consent systems. The methodological quality of these studies was assessed and a narrative synthesis of results undertaken. Surveys of attitudes towards presumed consent legislation were also included.

Results: Over 2000 potentially relevant citations were identified, of which 13 studies met the inclusion criteria for the primary objective and 13 for the secondary objective. For the primary objective, eight studies were between-country comparisons and five were before-and-after studies. Four of the between-country comparisons were of sufficient methodological quality to provide reliable results. In all four studies presumed consent law or practice was associated with increased rates of organ donation, ranging from an increase of 2.7 donors per million population (pmp) in one study to 6.14 donors per million in another, and an increase of between 20% and 30% in two other studies. Factors other than presumed consent that had an impact on organ donation rates were mortality from road traffic accidents and cerebrovascular accident, the transplant capacity of a country, gross domestic product per capita and health expenditure per capita, religion, education, public access to information and a common

law legal system. The five before-and-after studies represented three countries, all of which reported an increase in donation rates following the introduction of a presumed consent system (Austria, from 4.6 to 27.2 donors pmp over a 5-year period; Belgium, increase in kidney donation from 10.9 to 41.3 pmp during a 3-year period; Singapore, increase in kidney procurement from 4.7 to 31.3 per year in the 3 years after the change in legislation). There was very limited investigation of any other changes taking place concurrently with the changes in legislation across this set of studies. Of the 13 studies addressing the secondary objective, eight were surveys of the UK public, four were from other countries and one was an international survey of health professionals. There was variation among the UK surveys in the level of support for presumed consent, with surveys conducted before 2000 reporting the lowest levels of support (28–57%). The most recent survey by YouGov in 2007 reported that 64% of respondents supported a change to presumed consent.

Conclusions: Presumed consent alone is unlikely to explain the variation in organ donation rates between different countries. A combination of legislation, availability of donors, transplantation system organisation and infrastructure, wealth and investment in health care, as well as underlying public attitudes to and awareness of organ donation and transplantation, may all play a role, although the relative importance of each is not clear. Further reviews could investigate the factors likely to modify donor rates, such as procedures for family involvement. The way in which families of any potential donor are approached is likely to be an important factor and a review of qualitative research examining the experience of relatives in this context would be useful.



Contents

Glossary and list of abbreviations	vii	5 Conclusions	39
Executive summary	ix	Implications for policy	39
1 Introduction	1	Implications for research	39
Organ donation	1	Acknowledgements	41
Systems of consent	2	References	43
Consent law in the UK	3	Appendix 1 Organ donation legislation by country	47
Objectives of the review	3	Appendix 2 Search strategy	55
2 Methods	5	Appendix 3 Excluded studies	63
Review methods	5	Appendix 4 Data extraction tables	65
Search strategy	5	Appendix 5 Quality assessment of surveys	87
Inclusion criteria	5	Appendix 6 Protocol	93
Data extraction	6	Health Technology Assessment reports published to date	97
Quality assessment	6	Health Technology Assessment programme	115
Analysis and synthesis	6		
3 Results	9		
Study selection	9		
Overview of the evidence	9		
Between-country comparisons	9		
Before-and-after studies	20		
Surveys of attitudes to presumed consent	24		
4 Discussion	35		
The evidence base	35		
Strengths and weaknesses of the review	37		





Glossary and list of abbreviations

Glossary

Comparative studies Studies that compared donation rates in countries with and without presumed consent systems.

Eurotransplant The Eurotransplant International Foundation (Eurotransplant) is responsible for the mediation and allocation of organ donation procedures in several European countries, currently Austria, Belgium, Croatia, Germany, Luxemburg, the Netherlands and Slovenia.

Informed or explicit consent system The individual authorises the removal of his or her organs after death, for example by carrying a donor card.

Human Tissue Act 2004 An Act to make provision with respect to activities involving human tissue; about the transfer of human remains from certain museum collections; and for connected purposes.

Heartbeating donors Patients with catastrophic brain injury who have been ventilated in the period leading up to their death. Death is diagnosed by brainstem criteria.

Non-heartbeating donors Individuals who have suffered catastrophic, irreversible neurological damage but who do not meet the criteria for death based on brainstem testing. Death is diagnosed by cardiac criteria.

Opt-in system An informed or explicit consent system.

Opt-out system A presumed consent system.

UK Organ Donation Taskforce The UK-wide Organ Donation Taskforce was established in 2006 to identify barriers to organ donation and recommend actions needed to increase organ donation and procurement within the current legal framework.

Presumed consent Legislation that allows the organs to be used for transplantation after death if there is the opportunity to do so, unless the individual has objected during his or her life.

Strong/hard organ donation law The views of the deceased's relatives are not actively sought and organ recovery takes place unless it is known that the deceased objected to organ removal prior to death.

Weak/soft organ donation law The views of the deceased's relatives are taken into consideration regardless of whether or not it is known that the deceased objected to organ removal prior to death.

List of abbreviations

CRD	Centre for Reviews and Dissemination	NHBD	non-heartbeating donors
CVA	cerebrovascular accident	NHSBT	National Health Service Blood and Transplant
GDP	gross domestic product	OECD	Organization for Economic Cooperation and Development
GLS	generalised least squares	OLS	ordinary least squares
HBD	heartbeating donors	pmp	per million population
HOTA	Human Organ Transplant Act	RTA	road traffic accident
ISHLT	International Society for Heart and Lung Transplantation	SD	standard deviation
LCGT	Leuven Collaborative Group for Transplantation	STC	shock trauma centre

All abbreviations that have been used in this report are listed here unless the abbreviation is well known (e.g. NHS), or it has been used only once, or it is a non-standard abbreviation used only in figures/tables/appendices, in which case the abbreviation is defined in the figure legend or in the notes at the end of the table.



Executive summary

Introduction

In the UK there is currently an insufficient supply of donor organs to meet the demand for organ transplantations. At present the UK has an informed consent legislative system in which individuals opt in if they are willing for their organs to be used after death. The process involves carrying a signed donor card, joining the NHS organ donor register or filling in the relevant sections of a passport or driving licence. However, only approximately 25% of the UK population are on the NHS register. The number of organ donors in the UK in 2007/8 was 13.4 per million population (pmp). It has been proposed that a change in legislation to that of presumed consent, in which everyone is considered a donor unless they have explicitly opted out, would increase donor rates.

Objectives

The primary objective of the review was to examine the impact of presumed consent legislation on organ donation rates by identifying, appraising and synthesising empirical studies that have examined the impact of having a presumed consent or opt-out system. The secondary objective was to identify, appraise and synthesise data on attitudes of the public, professionals and any other stakeholders to presumed consent.

Methods

A systematic review was conducted. Eight electronic databases (MEDLINE, MEDLINE In-Process, EMBASE, CINAHL, PsycINFO, HMIC, PAIS International and OpenSIGLE) were searched from inception to January 2008 to locate published and unpublished studies on organ donation and presumed consent. Supplementary internet searches were also performed.

To be included studies had to compare donation rates in a single country before and after the introduction of a presumed consent law (before-and-after studies) or compare donation rates in

countries with and without presumed consent systems (between-country comparisons). The methodological quality of these studies was assessed and a narrative synthesis of results was undertaken. In addition, surveys of attitudes towards presumed consent legislation were included. The methodological quality of the surveys was assessed and considered within a summary of the results of the surveys.

Results

Over 2000 potentially relevant citations were identified, of which 68 were retrieved as full papers (44 for the primary objective and 24 for the secondary objective). After screening, a total of 13 studies (reported in 15 publications) met the inclusion criteria for the primary objective and 13 studies met the inclusion criteria for the secondary objective.

Of the 13 studies addressing the primary objective, eight were between-country comparisons and five were before-and-after studies. Four of the eight between-country comparisons were of sufficient methodological quality to provide reliable results. These studies all used regression models to compare data from different countries. In all four studies presumed consent law or practice was associated with increased rates of organ donation, ranging from an increase of 2.7 donors pmp in one study to 6.14 donors pmp in another. In the third study there was an increase in the rate of organ donation of between 25% and 30% in presumed consent countries and in the fourth study the increase was between 21% and 26%. The studies all assessed the impact of factors other than presumed consent on organ donation rates. Factors found to be important in at least one study were mortality from road traffic accidents and cerebrovascular accident, the transplant capacity of a country, gross domestic product (GDP) per capita and health expenditure per capita, religion (Catholicism), education, public access to information and a common law legal system.

The five before-and-after studies represented three countries, all of which reported an increase

in donation rates following the introduction of a presumed consent system. For example, in Austria the donation rates rose from 4.6 donors pmp to 27.2 pmp over a 5-year period; in Belgium kidney donation rose from 10.9 pmp to 41.3 pmp during a 3-year period; and in Singapore kidney procurement rose from an average of 4.7 per year to 31.3 per year in the 3 years after the change in legislation. Importantly, however, there was very limited investigation of any other changes taking place concurrently with the changes in legislation across this set of studies.

Of the 13 studies addressing the secondary objective, eight were surveys of the UK public and four were from other countries, along with one international survey of health professionals. There was variation among the UK surveys in the level of support for presumed consent, with surveys conducted before 2000 reporting the lowest levels of support (28–57%). The most recent survey by YouGov in 2007 reported that 64% of respondents supported a change to presumed consent. Among the surveys from other countries, only in Belgium, a presumed consent country, was there overall approval of presumed consent.

Conclusions

1. Presumed consent alone is unlikely to explain the variation in organ donation rates between different countries. A combination of legislation, availability of donors, transplantation system organisation and infrastructure, wealth and investment in health care, as well as underlying public attitudes to and awareness of organ donation and transplantation, may all play a role, although the relative importance of each is unclear. The between-country comparison studies overall point to presumed consent law being associated with increased organ donation rates (even when other factors are accounted for) although it cannot be inferred from this that the introduction of presumed consent legislation per se leads to an increase in donation rates. The before-and-after studies suggest an increase in donation rates following the introduction of presumed consent legislation; however, it is not possible to rule out the influence of other factors on donation rates.
2. It is important to note that the survey evidence is incomplete and the variation in attitudes between surveys may reflect differences in methods and the phrasing of questions. Some

surveys suggest a lack of public support for presumed consent, both in the UK and in other countries; however, more recent UK surveys provide evidence of support for presumed consent.

Implications for policy

The evidence identified and included in this review relates only to the specific questions posed. It does not address all of the issues relevant to the work of the UK Organ Donation Taskforce and, therefore, cannot be fully informative with respect to policy. In addition, it is important to be aware of the methodological limitations of the evidence that we have identified and appraised. The available evidence suggests that presumed consent legislation is associated with an increase in organ donation rates, although the size of the association varied between studies. Other factors also appear to be associated with organ donation rates, such as transplant capacity and GDP and health expenditure per capita. It is therefore important to consider such factors when attempting to predict the impact of changing to a presumed consent system. It is also important to take into account the likely public response to presumed consent should legislation be changed. The limited and incomplete evidence available from surveys suggests variable levels of support. In addition, consideration needs to be given to potential variation in attitudes between different sociodemographic subgroups.

Implications for research

When a change in legislation occurs it is important to evaluate and monitor the impact on donor rates and other factors, such as registration to opt out. Further reviews could investigate the factors likely to modify donor rates, such as procedures for family involvement. The way in which families of any potential donor are approached is likely to be an important factor and a review of qualitative research examining the experience of relatives in this context would be useful. The information obtained could be used to determine a priori the factors to be investigated in any evaluation of a change in legislation. At the same time contextual information should be gathered such as transplant capacity and any concurrently running media campaigns.

As public views about presumed consent are crucial, any future surveys should carefully consider the

framing of questions and be designed to minimise the strong possibility of providing what is viewed as a socially acceptable answer. To identify groups with whom it would be particularly important to engage

with about presumed consent, any future surveys need to be large enough to investigate variations in attitudes across different sociodemographic groups.

Chapter I

Introduction

Organ donation

Human organ transplantation has been developing and increasing in effectiveness since just after the Second World War. Improved surgical techniques, better immunosuppressive drugs and growing expertise mean that an organ transplant can dramatically improve the quality of, or even save, a patient's life.^{1,2} Additionally, having an organ transplant can be more cost-effective than replacement therapies, in particular dialysis for end-stage renal failure. It is estimated that in the UK each annual cohort of renal patients that have received a kidney transplant will give rise to cost savings of £100 million over a 30-year period.³ Demand for organ transplantation is growing worldwide, but the supply of organs is not keeping pace with demand. The UK active transplant waiting list is increasing by approximately 8% each year and it is anticipated that the ageing population and the increasing incidence of type 2 diabetes will exacerbate this shortage of available organs.^{4,5} The need for organs varies between population subgroups in the UK, which can contribute to health inequalities in these communities. For instance, although the majority of donors are white (96.0% in 2007/8),⁶ individuals of Asian and Afro-Caribbean descent are three to four times more likely to require a kidney transplant because of end-stage renal failure. The biological differences between ethnic communities (e.g. frequency of blood groups and combinations of human leukocyte antigen) and low donation rates result in difficulties finding suitable donors for such patients.⁴

Organs can be procured from living or deceased donors. The procurement of organs from living donors in the UK is not as substantial in volume as that from deceased donors (there were 702 living donor compared with 2385 deceased donor transplants in the year up to the end of March 2007).⁶ Although the number of living donors is rising steadily and consistently, it is almost exclusively restricted to the procurement of kidneys.^{5,6} Donation from deceased individuals is only possible in very particular circumstances, therefore only a small proportion of all potential donors are able to donate. The suitability of the

donor is dependent on the nature of the critical injury, and the illness trajectory subsequent to it. In the UK, deceased donation is primarily by patients with catastrophic brain injury who have been ventilated in the period leading up to their death. These are termed heartbeating donors (HBD).^{4,7} In these circumstances the diagnosis of death must be confirmed by brainstem testing as circulation and breathing are maintained artificially (usually the cessation of these indicate death).⁵ In the UK the number of suitable donors has decreased as a result of the overall fall in deaths due to head injuries caused by road traffic accidents combined with improvements in paramedical care, neurosurgical practice and preventative medicine.⁷ It is also possible to remove organs from non-heartbeating donors (NHBD), individuals who have suffered catastrophic, irreversible neurological damage but who do not meet the criteria for death based on brainstem testing. Death is therefore determined by loss of cardiopulmonary function.⁸ Although overall donor numbers have shown little change in recent years the number of NHBDs increased from 159 in 2006/7 to 200 in 2007/8.⁶ In 2007 the rate of deceased organ donors per million population (pmp) in the UK was 13.2⁶ (*Table 1*). This was similar to rates in Denmark and Croatia but substantially lower than that in Spain, which had the highest rate at 34.3 pmp.⁹

Currently the UK active transplant list stands at 7235;⁴ however, this is unlikely to reflect the true extent of need as some clinicians are unwilling to list more patients than may have a realistic chance of receiving organs. In 2006/7, over 3000 patients received a transplant, but 1000 patients died while waiting on the transplant list or after being removed from the list as they had become too ill to undergo transplantation.⁴ Issues such as inadequate staffing and delays in transplanting organs have been cited as some of the factors limiting organ transplantation. Also, a lack of 'transplant culture' is linked to a lack of donated organs.⁷ A number of recommendations have recently been made by the UK Organ Donation Taskforce to increase donation rates and to facilitate the use of all available organs.⁴ It was recommended that a UK-wide Organ Donation Organisation should be established to provide a

TABLE 1 European donation rates 2007⁹⁻¹¹

Country	Deceased organ donors (annual rate pmp)	Country	Deceased organ donors (annual rate pmp)
Iceland	0	Hungary	15.0
Bulgaria	1.3	Germany	15.95
Romania	1.7	Netherlands	16.9
Luxembourg	2.1	Finland	17.2
Turkey	3.0	Latvia	18.7
Cyprus	^a 5.7 ^{10,11}	Estonia	19.2
Greece	5.8	Norway	19.9
Israel	8.5	Slovakia	20.1
Poland	9.2	Italy	20.5
Switzerland	10.7	Republic of Ireland	21.0
Slovenia	11.4	Czech Republic	21.1
Croatia	13.1	Austria	22.3
Denmark	13.2	Portugal	23.9
UK	13.2	France	25.3
Lithuania	14.1	Belgium	28.15
Sweden	14.5	Spain	34.3

pmp, per million population.
a 2006 data (2007 figures not available).

UK-wide integrated service and that this should be the responsibility of the NHS Blood and Transplant (NHSBT). An unambiguous framework of good practice should also be established to resolve legal, ethical and professional issues in this area. Steps should be taken to establish organ donation as a usual event, such as each Trust having a clinical organ donation champion. A number of organisational issues should also be addressed: criteria to identify potential donors and notify the organ donation organisation should be introduced, donation activity should be monitored in all Trusts, brainstem testing should be carried out in all patients in whom death based on these criteria is the likely diagnosis, and financial disincentives to Trusts facilitating organ donation should be removed. Recommendations were also made regarding workforce planning and training, and ways of publicly acknowledging and promoting organ donation.⁴ It has been suggested that the high donation rate seen in Spain is the result of organisational changes within a supportive legislative framework.¹² Since the implementation of the 'Spanish model' in Latin American countries, such as Uruguay and Argentina, an increase in donation rates has also been observed.^{4,13}

Systems of consent

The issue of organ donation is complex and multifactorial, involving ethical, legal, medical, organisational and societal factors. Simplistically, the dilemma lies in concurrently respecting the rights of the potential donor and obtaining organs in an efficient manner.¹ There are a number of systems in use by different countries to try to maximise organ procurement (Appendix 1), with varying levels of success.

The general consensus worldwide is that organs may be retrieved postmortem if there is valid consent.¹⁴ There are several existing legislative approaches. For our purposes the legal frameworks of interest are presumed consent and informed (also known as explicit) consent. Presumed consent systems allow the organs to be used for transplantation after death if there is the opportunity to do so unless the individual has objected during his or her life (an opt-out system).¹⁵ Conversely, informed consent systems require that the individual authorise organ removal after death, for example by carrying a donor card or joining a national registry (an opt-in system).¹⁶

The UK, North America, Australasia and most of Asia (excluding Singapore) have an informed consent system, whereas a number of countries in continental Europe have presumed consent systems in place.¹⁷

In practice, the ways in which these laws function differ between countries and even regions. It is rare that a country will have a 'pure' informed or presumed consent system and it is common for there to be provision for the involvement of relatives within each legal system.¹⁶ The importance placed on relatives' opinions varies. The terms hard/strong and weak/soft have been used to describe the extent of emphasis placed on relatives' views. For example, although both Spain and Austria have a presumed consent law, in Spain the law is considered 'weak/soft' as doctors take active measures to ascertain that the next of kin does not object. In Austria the law is relatively 'strong/hard' in that organ recovery proceeds unless it is known that the deceased objected prior to death, and the views of relatives are not actively sought.¹⁸ Family involvement can affect donation rates. In 2006 in the UK the family refusal rate was 41%, whereas in Spain the rate was 15%.¹¹ There are also differences in how objections are recorded in a presumed consent system and in the extent to which clinicians attempt to elicit possible objection to organ removal.¹⁷

Consent law in the UK

In accordance with the Human Tissue Act 2004 (which came into force in 2006) the UK has an explicit consent legislative system that requires individuals to opt in to allow their organs to be used after death by signing a donor card, joining the NHS registry or indicating their wish to donate by filling in the relevant sections of their driving licence or passport application. If the donor has not consented before death the permission of a nominated representative is needed. If a representative has not been nominated the consent of a qualifying relative is necessary. Even if the individual has a donor card or has joined the NHS donor registry it is considered good practice to speak to relatives if possible.¹⁹

It has been reported that between 70% and 90% of the UK population are in favour of donating their organs, yet only approximately 25% are on the NHS organ donor register.^{5,20} As a result the family often has to decide whether or not to donate a relative's organs. The default (no action) position

in an informed consent system is not to donate and the refusal rate of relatives in the UK is around 40%.¹⁷ It has been proposed that having presumed consent as the default option may better reflect the wishes of the deceased^{17,21} and increase donation rates as it is effortless and because defaults generally represent the status quo.^{22,23} There have been several surveys of attitudes towards presumed consent law in the UK population and these are discussed in Chapter 3 (Surveys of attitudes to presumed consent).

Although it has been proposed that a change in legislation to presumed consent would increase donor rates^{5,7,21} the issue remains controversial, and a presumed consent law has previously been opposed and rejected in the UK.²⁴ Public and professional support is needed for any change in legislation and a call for evidence for the inquiry into the EU Commission's Communication on organ donation in 2007 allowed a number of groups and individuals to present their views on the topic of presumed consent.²⁵

A number of issues arose in opposition to presumed consent law, for example some Christian groups were concerned about issues such as the body effectively belonging to the state at death and the potential loss of choice and autonomy, the loss of the concept of organs being altruistic 'gifts' and the definition of death. The group Patient Concern also added that the number of individuals polled as willing to donate their organs may be artificially high because of the 'feel good' factor of giving a positive answer when asked. Arguments were also presented in favour of presumed consent law. For instance, the British Medical Association supported a shift to presumed consent involving consultation with relatives. They argued that having organ donation as the default position would relieve relatives from the burden of decision-making and would encourage a more positive view of the process. These are only some of the wide variety of views and opinions expressed in this call for evidence, highlighting the importance of establishing attitudes and opinion to gauge the level of support for presumed consent law.

Objectives of the review

The UK-wide Organ Donation Taskforce was established in 2006 to identify barriers to organ donation and recommend actions needed to increase organ donation and procurement within the current legal framework. Debate has also been

developing around different systems of consent for organ donation in the UK. In July 2007 the Chief Medical Officer supported the idea of an opt-out system with proper safeguards and good public information, and the Prime Minister has called for a public debate on the issue of presumed consent.²⁶ In recognition of the complex issues and widely differing viewpoints surrounding systems of consent, the UK Organ Donation Taskforce has been tasked with looking at the range of issues involved in an opt-out system of consent, taking into account the views of the public and of stakeholders. To inform the work of the UK Organ Donation Taskforce a systematic review

was commissioned on the 21 December 2007; the protocol for the review was agreed on the 5 March 2008 and the draft report was delivered on the 4 April 2008.

The primary objective of the review was to examine the impact of presumed consent legislation on organ donation rates by identifying, appraising and synthesising empirical studies that examined the impact of having a presumed consent or opt-out system. The secondary objective was to identify, appraise and synthesise data on attitudes of the public, professionals and any other stakeholders to presumed consent.

Chapter 2

Methods

Review methods

A systematic review was carried out in accordance with the methods outlined in guidance issued by the Centre for Reviews and Dissemination (CRD).²⁷ Searches were performed to identify a broad range of literature on presumed consent. Citations were downloaded into an ENDNOTE (version X1) library. Two reviewers independently screened all titles and abstracts. Full paper manuscripts of any titles/abstracts that were considered relevant were obtained where possible. The relevance of each paper was assessed independently by two reviewers according to the inclusion criteria below. Any discrepancies were resolved by consensus and if necessary a third reviewer was consulted. The quality assessors were not masked.

Search strategy

The following electronic databases were searched for published and unpublished literature on organ donation and presumed consent:

- MEDLINE
- MEDLINE In-Process
- EMBASE
- Cumulative Index to Nursing and Allied Health Literature (CINAHL)
- PsycINFO (psychological literature)
- Health Management Information Consortium (HMIC)
- PAIS International
- OpenSIGLE.

Individual search strategies were developed for each electronic database. Searches were conducted from inception to January 2008 and no language restrictions were applied. The full search strategy is presented in Appendix 2.

Searches were also carried out on the internet using the specialist search engine Intute: Health and Life Sciences – Medicine (www.intute.ac.uk/healthandlifesciences/; accessed 13 February 2008) and the meta-search engine Copernic (www.copernic.com; accessed 18 February 2008). The websites of selected organisations were also browsed

for additional information and the reference lists of included studies were checked.

Inclusion criteria

Studies investigating the impact of presumed consent on organ donation rates

The primary aim of the review was to identify empirical studies that examined the impact of having a presumed consent or opt-out system on organ donation rates. Studies meeting the following criteria were eligible for inclusion:

- Study design – studies comparing donation rates in a single country before and after the introduction of a presumed consent law and cross-sectional studies comparing donation rates in countries with and without presumed consent systems.
- Intervention – presumed consent systems for deceased organ donation introduced within a jurisdiction. A presumed consent system was defined as one in which a deceased person is considered to be an organ donor unless he/she has made known his/her opposition to this prior to death. Countries were considered as presumed consent jurisdictions when such a law is in place, even if the system operated de facto requires consent of relatives.
- Comparator – a system of presumed consent must have been compared with a non-presumed consent system (e.g. one in which individuals register as organ donors during their lifetime, one that requires relatives' consent, or one that requires all citizens to register their willingness or not to be an organ donor in the event of their death). This may have been within another jurisdiction or in the same jurisdiction before the introduction of a system of presumed consent.
- Population/setting – any jurisdiction in which a system for deceased organ donation had been introduced.
- Outcomes – the primary outcome of interest was the deceased organ donation rate (hereafter referred to as organ donation rate). Attitudes of the public, professionals and other

stakeholders, and any adverse consequences, were also of interest and were recorded when given. Any descriptive information about the context in which the system was introduced was recorded when reported, including reasons why a country had chosen to introduce or reject a presumed consent system.

Surveys of attitudes to presumed consent

The secondary objective of the review was to identify studies examining attitudes to presumed consent. To achieve this objective, surveys of attitudes (public or professional) towards organ donation were included, provided that they addressed the issue of presumed consent.

Data extraction

The following information was extracted from studies investigating the impact of presumed consent on organ donation rates: bibliographic details, country or countries studied, time period, study design, methods of analysis, factors considered in the analysis, other contextual factors, donation rates, and any other outcomes of interest. Data were extracted by one reviewer into the review management software EPPI-REVIEWER (version 3.0) and checked by a second reviewer.

From the surveys of attitudes, bibliographic details, the survey methods and a summary of the key findings were extracted into a Microsoft WORD document by one reviewer and checked by a second.

Quality assessment

The methodological quality of the studies assessing the impact of presumed consent was assessed using criteria adopted in a previous CRD review and derived from the Effective Public Health Practice Project (EPHPP) quality assessment tool for quantitative studies.²⁸ Quality assessment was performed by one reviewer and checked by a second. The criteria used were:

- Were appropriate countries/cohorts and time periods chosen?
- Were potential confounders sought and, if found, adjusted for in the analysis?

- Were the sources of data for outcomes (and explanatory factors) specified and did they appear credible?
- Was it reasonably likely that the observed effects were attributable to presumed consent effects alone?

The appropriateness of the statistical analysis was also assessed. A statistician was consulted when necessary.

The methodological quality of the surveys was assessed using a list of questions for the appraisal of surveys taken from *The Pocket Guide to Critical Appraisal* by Crombie.²⁹ Quality assessment was performed by one reviewer and checked by a second. The key questions were:

- Who was studied?
- How was the sample obtained?
- What was the response rate?

When sufficient details were available the following questions were applied:

- Design:
 - Are the aims clearly stated?
 - Is the design appropriate to the stated objectives?
 - Was the sample size justified?
 - Are the measurements likely to be valid and reliable?
 - Are the statistical methods described?
 - Was a pilot conducted?
- Conduct:
 - Did untoward events occur during the study?
- Analysis:
 - Were the basic data adequately described?
 - Do the numbers add up?
 - Was the statistical significance assessed?
- Interpretation:
 - How could selection bias arise?
 - Are important effects overlooked?
 - Can the results be generalised?

Analysis and synthesis

Given the diversity of the studies investigating the impact of presumed consent on organ donation rates in terms of design, setting and focus of the legislation, a narrative synthesis was undertaken. Studies were grouped based on study design and the results were interpreted in the context of their methodological strengths and weaknesses and

any contextual factors that might impact upon outcomes. As part of this process we investigated the similarities and differences between study findings.

The data from the surveys were synthesised, taking into account issues of importance identified during the quality assessment.

Chapter 3

Results

Study selection

The full literature search (encompassing database searches, internet searches and reference checking) identified 2434 references. The screening process reduced this number to 68 potentially relevant studies (*Figure 1*). Full paper copies of these articles were obtained and assessed for inclusion.

Of the 44 papers assessed as being potentially relevant for the primary review objective, 29 were excluded, mainly because they were discussion papers rather than empirical studies (see Appendix 3 for a full list of the excluded studies). A total of 13 studies reported in 15 publications met the inclusion criteria for the primary objective of the review.

A further 24 papers were screened for the secondary objective and 13 surveys were included. These surveys were reported in nine papers and in a range of secondary sources.^{5,30–32} Secondary sources were included as we were unable to retrieve the publications reporting the full set of data for four surveys.

Overview of the evidence

Table 2 provides details of the objectives and designs of the 13 comparative studies that were included. Full details are available in the data extraction tables (see Appendix 4). For the purpose of the synthesis the studies were grouped according to study design: between-country comparisons and before-and-after studies in a single country. The 13 surveys of attitudes to presumed consent are considered separately in Chapter 3 (Surveys of attitudes to presumed consent).

The largest grouping was between-country comparisons: seven studies^{22,33–38} compared multiple countries with presumed consent legislation with countries with informed consent systems, and one study³⁹ compared donation rates in an adult trauma centre in Baltimore, MD, with rates in an adult trauma centre in Vienna. With the exception of two studies^{38,39} the between-country comparisons investigated the impact of presumed consent legislation while taking account of other

possible factors influencing donation rates such as road traffic accident mortality. This type of study has the benefit of being able to consider between-country differences beyond the type of organ donation legislation and may help to explain variation in donation rates between countries. In practice, however, there were differences between the included studies in the range of factors explored and time frames across which they assessed donation rates.

Five studies^{40–44} reported organ donation rates before and after the introduction of presumed consent legislation in a single country. This type of study has the benefit of exploring the experience of individual countries, although the studies were limited in the extent to which they investigated (or indeed reported) the likely influence on donation rates of factors other than the change in legislation.

Between-country comparisons

The eight between-country comparison studies were published between 1996 and 2007, and included data from 1990 to 2002. The number of countries entered into the analysis and the rationale for the choice of countries varied between studies (*Table 2*). Four studies focused solely on European countries.^{22,34,35,38} One of these included members of Eurotransplant during the years 1992–4,³⁸ and the other three covered between 10 and 28 European countries in their analyses. Three studies included countries outside Europe; one selected Western Christian countries,³³ one selected Organization for Economic Cooperation and Development (OECD) countries³⁶ and one study aimed to include all countries (OECD and non-OECD) for which data were available.³⁷ The final study focused on hospitals in two different countries.³⁹ The countries included in the analysis of each study, and their classification as presumed consent or otherwise, are detailed in *Table 3*.

The studies were assessed for methodological quality and the results are summarised in *Table 4* (for full results see Appendix 4). The studies were grouped into those featuring a robust analysis with no major methodological flaws^{33,35–37} and those with

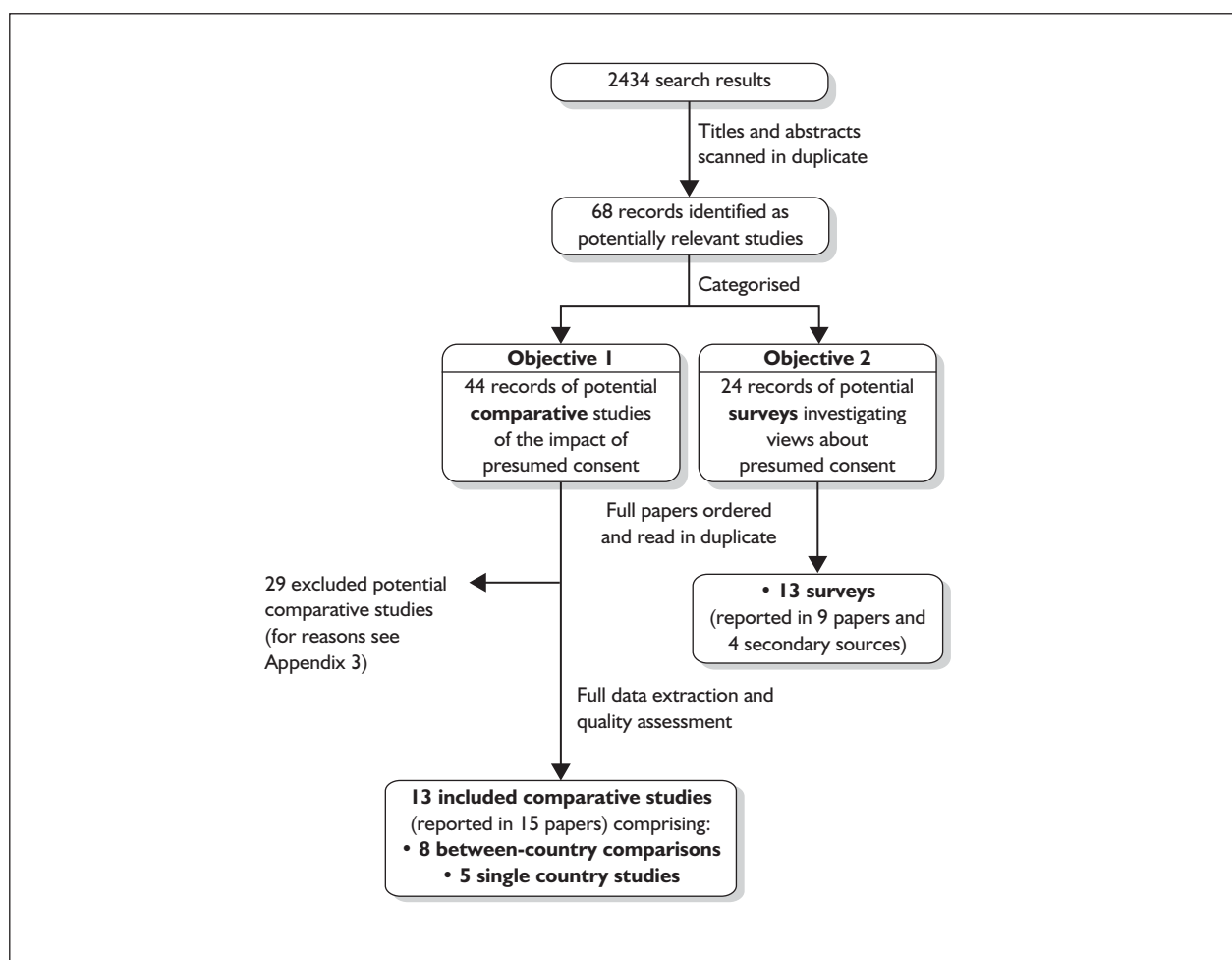


FIGURE 1 Flow of studies through the review process.

limitations.^{22,34,38,39} Accordingly, the findings of the studies considered to include a robust analysis, with no major methodological flaws, are given priority.

Impact of presumed consent on donation rates

The primary aim of all eight studies was to examine the influence of presumed consent on organ donation rates. The studies varied in their approach, although most used statistical analysis, the majority employing regression techniques (Table 4). All four of the studies considered to be robust used regression analysis and included between three and seven explanatory variables within their models (Table 4). The results of these studies are presented in the next section, followed by the results of the four weaker studies (Table 5).

Studies with no major methodological flaws

The study by Abadie and Gay³³ included data from 22 Western Christian countries over 10 years (1993–2002). A series of fixed regression

analyses incorporating different combinations of seven explanatory variables as well as presumed consent law were conducted. In all but one of these models, when other variables were held constant, presumed consent law was found to be significantly (at the 5% level) associated with increased rates of organ donation. Countries with presumed consent law had approximately 25–30% higher donation rates pmp than informed consent countries. In addition, a series of analyses was performed to test the robustness of the results and to check that the models fit the data. The main limitation of this study is in how countries were selected for inclusion. Countries were selected from an initial panel of 36, with some being excluded because of low transplantation rates, many of which were presumed consent countries. Thus it is possible that the impact of the presumed consent law was overestimated.

The practice of presumed consent rather than presumed consent law per se was the focus in the study by Gimbel *et al.*³⁵ European countries were included, of which only seven were considered

TABLE 2 Details of the included comparative studies

Author	Country/region included	Stated objective
Between-country comparison		
Abadie and Gay 2006 ³³	22 Western Christian countries	To analyse the impact of presumed consent laws on donation rates
Coppen <i>et al.</i> 2005 ³⁴	10 European countries 'sharing the same historical background and more or less the same status of health-care systems'	To establish whether different consent systems explain differences in donation rates between countries when differences in relevant mortality rates are taken into account
Gimbel <i>et al.</i> 2003 ³⁵	28 European countries	To determine if a presumed consent policy and other variables can be used to predict the deceased organ donation rate pmp
Healy 2005 ³⁶	17 OECD countries	To investigate the sources of variation in procurement rates of deceased human organs using time-series data from 17 OECD countries
Johnson and Goldstein 2004 ²²	17 countries	To examine the role of no-action default for agreement to organ donation (i.e. presumed consent) in increasing the number of potential donors
Neto <i>et al.</i> 2007 ³⁷	34 OECD and non-OECD countries	To estimate the impact of presumed consent law on the number of organ donations
Roels and De Meester 1996 ³⁸	Four countries that were principal members of Eurotransplant at the time of the study	To examine whether the relationship between existing legislation or policies on organ procurement and donation rates persisted in the previous 3 years particularly with regard to donation rates for thoracic organs within Eurotransplant
McCunn <i>et al.</i> 2003 ³⁹	Two adult trauma hospitals, one in the USA and one in Austria	To compare organ donation practices of two urban freestanding adult trauma hospitals, one in Baltimore, MD, USA and one in Vienna, Austria
Before-and-after studies		
Gnant <i>et al.</i> 1991 ⁴⁰	Austria	To report on the introduction of a presumed consent law in Austria and its impact on donation rates, and also the impact of structural changes
Low <i>et al.</i> 2006 ⁴¹	Singapore	To study the impact of the revision of the Human Organ Transplant Act in Singapore in 2004 on liver transplantation by comparing the number of potential suitable donors, liver recovery surgery and liver transplants 2 years before and 1 year after implementation
Roels <i>et al.</i> 1991 ⁴²	Belgium	To report on the impact of the 'Law on the procurement and transplantation of organs', June 1986, in Belgium on multiorgan procurement activities during the first 3 years after its implementation in February 1987
Soh and Lim 1992 ⁴³	Singapore	To compare kidney retrieval before and after the introduction of the Human Organ Transplantation Act 1987
Vanrenterghem <i>et al.</i> 1988 ⁴⁴	Leuven, Belgium	To review the impact of a new transplantation management policy introduced in 1978 and of the opting-out law, voted in 1986, on the quality and number of deceased kidney grafts
OECD, Organization for Economic Cooperation and Development; pmp, per million population.		

to have presumed consent in law and implement presumed consent in practice. A number of countries with presumed consent law were judged in practice to operate informed consent. The regression model incorporated variables for three additional explanatory factors (transplant capacity, religion and education). The practice

of presumed consent was found to be associated with a statistically significant increase (at the 5% level) in the organ donation rate of 6.14 donors pmp. The analysis did, however, exclude Spain as an outlier, a country with high donation rates and presumed consent in law, but not strongly enforced in practice. Spain was therefore considered by the

TABLE 3 Countries included in the analyses

	Studies with robust analyses				Studies with significant limitations			
	Abadie and Gay 2006 ³³	Gimbel et al. 2003 ^{35a}	Healy 2005 ³⁶	Neto et al. 2007 ³⁷	Coppen et al. 2005 ³⁴	Johnson and Goldstein 2004 ²²	McCunn et al. 2003 ³⁹	Roels and De Meester 1996 ³⁸
Years studied	1993–2002	1995–9	1990–2002	1998–2002	2000–2	1991–2001	2000	1992–4
Presumed consent countries								
Argentina				●				
Austria	●	●	●	●	●	●	●	●
Belgium	●	●	●		●			●
Bulgaria		○						
Costa Rica				●				
Croatia		○		●				
Czech Republic	●	●		●				
Estonia		○						
Finland	●	●	●	●				
France	●	○	●	●	●			
Greece		○		●				
Hungary	●	○		●				
Israel		○		●				
Italy	●	○	●	●	●			
Latvia		●		●				
Luxembourg		○						
Norway	●	○	●	●				
Panama				●				
Poland	●	○		●				
Portugal	●	●		●				
Slovak Republic		●		●				
Slovenia	●	○		●				
Spain	●		●	●	●			
Sweden	●	○	●	●	●			

authors to operate as an informed consent country. If Spain had been included, the magnitude of the impact of presumed consent practice would have been lower. Additionally, although the authors tested the model assumptions and fit, only one observation per country was included, meaning that the model overfitted the data. It is also unclear whether the single data point (time) chosen was appropriate for each country. The studies that used several time points per country are likely to be more reliable.

Healy³⁶ included data from 17 OECD countries over the period 1990–2002 in a mixed-effects regression analysis with variables for four explanatory factors [cerebrovascular accident (CVA) mortality, road traffic accident (RTA) mortality, GDP and health expenditure] as well as presumed consent law. The fit of the initial model was found to be poor because of the presence of outlier data from Spain and Italy; these countries both experienced a large increase in donation rates over

TABLE 3 Countries included in the analyses

	Studies with robust analyses				Studies with significant limitations			
	Abadie and Gay 2006 ³³	Gimbel <i>et al.</i> 2003 ^{35a}	Healy 2005 ³⁶	Neto <i>et al.</i> 2007 ³⁷	Coppen <i>et al.</i> 2005 ³⁴	Johnson and Goldstein 2004 ²²	McCunn <i>et al.</i> 2003 ³⁹	Roels and De Meester 1996 ³⁸
Informed consent countries								
Australia	○		○	○				
Brazil				○				
Canada	○		○	○				
Chile				○				
Denmark	○	○	○	○				
Germany	○	○	○	○	○			○
Ireland	○	○	○	○				
Lithuania		○						
Netherlands	○	○	○	○	○			○
New Zealand	○			○				
Romania		○		○				
Switzerland ^b		○	●	○	○			
UK	○	○	○	○	● ^c			
USA	○		○	○		○	○	
Venezuela				○				

●, included as presumed consent country; ○, included as informed consent country.

a This study investigated the effective practice of presumed consent law and categorised countries accordingly.

b Switzerland has a national informed consent law, but many of its constituent jurisdictions (cantons) have their own presumed consent laws.

c The UK is misclassified in this study.

the period studied. Thus the analysis was repeated excluding these countries; this did not greatly affect the coefficients obtained but substantially improved the fit of the model. Although the authors reported that donation rates were increased by 2.7 donors pmp in countries with presumed consent law this result was not statistically significant at the 5% level ($p = 0.07$). As with the study by Abadie and Gay³³ it is not clear whether the choice of countries may have affected the results of this study. There was no rationale provided other than OECD countries, of which there are currently 30 in total.

In the most recent study including the greatest number of countries, Neto *et al.*³⁷ used quantile regression to analyse data from 34 countries (all those for which data were available) over a 5-year period. The authors chose to use this new and developing method to minimise the impact of outliers (such as Spain) for the period 1998–2002. They also conducted a more traditional

regression analysis for comparison. The models incorporated variables for GDP per capita or health expenditure per capita (the two were found to be highly collinear) plus six other explanatory factors including presumed consent law. In all models presumed consent law was found to be statistically significantly associated (at the 5% level) with increased organ donation rates when other variables were accounted for. In the quantile regression models this positive effect of presumed consent law was reported to range from 21% to 26%. Although the authors performed some sensitivity analyses to test the robustness of the results they did not report any checking of the model fit and assumptions and so it is not clear how well the data were modelled in this analysis.

Studies with limitations

Coppen *et al.*³⁴ found no relationship between presumed consent law and donor rates once mortality from donor-providing causes was

TABLE 4 Quality assessment and analysis methods used in between-country comparison studies

Studies with robust analysis	Quality assessment ^a				Description of analysis	Factors considered in analysis	
	Selection	Comparability	Data collection	Attributable to intervention		Appropriate analysis	
Abadie and Gay 2006 ³³	✓*	✓	✓	?	✓	Fixed regression using panel (longitudinal) data. Different combinations of adjusting factors were considered in a series of models	Presumed consent law ✓ CVA mortality ✓ RTA mortality ✓ GDP ✓ Health expenditure ✓ Transplant capacity ✓ Religion (Catholicism) ✓ Education ✓ Legislative system ✓ Blood donation rate ✓ Internet access ✓
Neto et al. 2007 ³⁷	✓	✓	✓*	?	✓	Quantile regression for panel (longitudinal) data (based on Koenker. ⁴⁵ Two models were reported, one with GDP and one with health expenditure, as these variables were highly collinear. A traditional generalised least squares regression was also performed for comparison	Presumed consent law ✓ CVA mortality ✓ RTA mortality ✓ GDP ✓ Health expenditure ✓ Religion (Catholicism) ✓ Education ✓ Legislative system ✓ Blood donation rate ✓ Internet access ✓
Healy 2005 ³⁶	✓*	✓	✓*	?	✓	Linear mixed-effects regression using time series data. As the initial model did not fit the data, the analysis was repeated excluding outlier data (that of Spain and Italy)	Presumed consent law ✓ CVA mortality ✓ RTA mortality ✓ GDP ✓ Health expenditure ✓ Transplant capacity ✓ Religion (Catholicism) ✓ Education ✓ Legislative system ✓ Blood donation rate ✓ Internet access ✓
Gimbel et al. 2003 ³⁵	✓*	✓	×	?	✓	Linear ordinary least squares regression using single data point per country	Presumed consent law ✓ ^b CVA mortality ✓ RTA mortality ✓ GDP ✓ Health expenditure ✓ Transplant capacity ✓ Religion (Catholicism) ✓ Education ✓ Legislative system ✓ Blood donation rate ✓ Internet access ✓

Quality assessment ^a		Factors considered in analysis	
		Description of analysis	
	Appropriate analysis		
	Attributable to intervention		
	Data collection		
	Comparability		
	Selection		
Internet access			
Blood donation rate			
Legislative system			
Education	✓		
Religion (Catholicism)	✓		
Transplant capacity	✓		
Health expenditure			
GDP			
RTA mortality			✓
CVA mortality			✓
Presumed consent law	✓		✓
Studies with significant limitations	Johnson and Goldstein 2004 ²²	Multiple ordinary least squares regression using time series data. Few details are provided about the data and modelling methods used, there are inconsistencies in the data and there appear to be limitations in the analysis	
	Coppen <i>et al.</i> 2005 ³⁴	Correlation between mortality rates and donation rates calculated using Spearman's test. The authors state that the relationship between different systems of consent and rates for mortality, donation and donor efficiency was assessed using a t-test although details are not provided. One country is incorrectly categorised as having presumed consent law	
	Roels and De Meester 1996 ³⁸	Numbers of donated organs of each type and in total pmp per year were compared. A statistical analysis was not reported	No statistical analysis
	McCunn <i>et al.</i> 2003 ³⁹	Numbers of potential organ donors, actual organ donors, organs transplanted and family refusal rates were compared. A statistical analysis was not reported	No statistical analysis

CVA, cerebrovascular accident; GDP, gross domestic product; pmp, per million population; RTA, road traffic accident.

a Quality assessment: Selection: Were appropriate countries/cohorts/time periods chosen? Comparability: Were potential confounders sought and, if found, adjusted for in the analysis? Data collection: Were the sources of data for outcome and explanatory factors specified and do they appear to be credible? Attributable to intervention: Is it reasonably likely that the observed effects were attributable to presumed consent alone? Appropriate analysis: Was the analysis appropriate, with no major flaws? ✓, criterion met; ✓*, criterion partially met; ✗, criterion not met; ?, unclear from information provided whether criterion met (see Appendix 4 and text for further details).

b This study considered the effective practice of presumed consent rather than presumed consent law per se.

TABLE 5 Results of between-country comparison studies

	Presumed consent and donor rates	Other factors influencing donor rates
Studies with robust analysis		
Abadie and Gay 2006 ³³	When other variables are included in the model and held constant, presumed consent countries have an approximately 25–30% higher donation rate pmp per year than informed consent countries (statistically significant at 5% in all but one of the multiple regression models)	In one or more models the following variables were statistically significantly (at the 5% level) associated with donation rates: GDP per capita, common law, CVA mortality and RTA mortality
Neto <i>et al.</i> 2007 ³⁷	Presumed consent was statistically significantly associated with organ donation in both quantile regression models and in the conventional regression model ($p = 0.000$). Over the 25th–75th quartiles in the quantile regression models the effect of presumed consent varied from 21% to 26%	In the quantile regression models the following factors were statistically significantly (at less than the 5% level) associated with organ donation rates across all quartiles: RTA mortality, GDP per capita, health expenditure per capita and common law. The factors with the strongest impact on organ donation rates were GDP and health expenditure. The following were also statistically significant: CVA mortality in one of the models (across all quartiles); internet access (for 25th and 75th quartiles), Catholic country (for 25th quartile in one model, 25th and 50th quartile in the other)
Healy 2005 ³⁶	The authors state that a presumed consent regime is worth an additional 2.7 donors pmp when other variables are at their mean value (in the model excluding Spain and Italy); however, this result is not statistically significant at the 5% level ($p = 0.07$)	Number of road deaths (statistically significant only when model excluded Spain and Italy, $p = 0.00$)
Gimbel <i>et al.</i> 2003 ³⁵	Countries with presumed consent had on average an increased donation rate pmp that was 6.14 higher than the mean for countries without presumed consent if all other variables were held constant (statistically significant at the 5% level)	The following variables were statistically significantly (at the 5% level) associated with donation rates: transplant capacity, education, religion (Catholicism). Of all the factors in the model, transplant capacity had the greatest predictive strength

	Presumed consent and donor rates	Other factors influencing donor rates
Studies with significant limitations	<p>Coppen <i>et al.</i> 2005³⁴</p> <p>It is stated that a t-test showed no relation between presumed consent and donor efficiency (organ donors as a percentage of relevant mortality), but the results are not reported</p> <p>Johnson and Goldstein 2004²²</p> <p>The authors state that the donation rate pmp is 16.3% ($p < 0.02$) higher in presumed consent countries (16.4) than in informed consent countries (14.1), although the results of the regression analysis are not clearly reported</p> <p>Roels and De Meester 1996³⁸</p> <p>Organ donation rates were lower in the informed consent countries than in the presumed consent countries. The number of thoracic organs transplanted in the presumed consent countries was twice as high as the number in the informed consent countries</p> <p>McCunn <i>et al.</i> 2003³⁹</p> <p>There were 39 patients medically suitable for donation at the R. Adams Cowley shock trauma centre (STC), USA (informed consent) and 7 at the Lorenz Bohler Hospital (Lorenz), Austria (presumed consent); 46% became organ donors at STC and 100% at Lorenz; the number of organs transplanted was 69 at STC and 28 at Lorenz</p>	<p>The correlation between donation rates and mortality rates was 0.81 ($p < 0.01$)</p> <p>Impact of other factors not clearly reported</p> <p>Impact of other factors not investigated</p> <p>At STC family consent was not obtained in 5/21 cases because the family stated that the deceased had expressed a previous wish not to donate; in 16/21 cases the reasons were unclear</p>
CVA, cerebrovascular accident; GDP, gross domestic product; pmp, per million population; RTA, road traffic accident.		

accounted for in their analysis, which included data from 10 countries. However, they wrongly classified the UK as a presumed consent country and provided no details of the methods or results of this analysis, thus the results of the study should be treated with caution.

Johnson and Goldstein²² conducted a regression analysis including data from 17 countries over 10 years (1991–2001), incorporating variables for three additional factors besides presumed consent law. They state that presumed consent was associated with a (statistically significant) 16.3% increase in donation rates. However, they provided limited information about the data and methods used, there were inconsistencies in the report and they appear not to have accounted for the effect of including multiple data points (time) from each country in their analysis; therefore, the results must be treated with caution.

McCunn *et al.*³⁹ compared data from a single year from two hospitals, the R. Adams Cowley Shock Trauma Centre in Baltimore, MD, USA (an informed consent country) and the Lorenz Bohler Hospital in Vienna, Austria (a presumed consent country). At the Austrian hospital, 100% of the seven patients identified as medically suitable for donation became donors, whereas in the American hospital only 46% of the 39 identified patients became donors. In five of the cases in which consent was not obtained the family stated that the deceased had expressed a wish not to donate. In the remaining 16 cases the reasons for family refusal were unknown. This study provides limited information on the impact of presumed consent law as only one hospital from each country was investigated, the sample sizes were very small and the authors indicated that there were important differences between the two hospitals in terms of demographics and injury types of admitted patients.

Roels and De Meester³⁸ compared the donation and transplantation rates among members of the Eurotransplant organisation over a 3-year period (1992–4). Organ donation rates and rates of organ transplantation were found to be higher in presumed consent countries (Austria and Belgium) than in informed consent countries (Netherlands and Germany). This study is limited in that there was no statistical analysis, a small number of countries were included and the authors did not consider other factors that may have impacted on organ donation rates besides presumed consent law.

Other factors influencing donation rates

Although the studies primarily focused on the impact of presumed consent law or practice on donation rates a range of other factors were investigated as potential influences on organ donation rates. These were either incorporated into the regression models as additional explanatory variables or were discussed within the text of the papers. The factors include mortality rates from causes most likely to provide organ donors, the transplant co-ordination infrastructure, the wealth and health expenditure of a country, religion, education, legislative system, and measures of attitude towards organ donation and access to information.

Mortality from donor-providing causes

Mortality rates for CVA and RTAs were considered in four of the studies^{33,34,36,37} as a large proportion of organ donors die from these causes. The organ procurement rate would naturally be expected to depend to some extent on the supply of potential donors.

In the three studies that had no major methodological flaws and used robust analyses,^{33,36,37} mortality from RTAs was found to have a statistically significant positive association with donation rate. Of note, in the study by Healy³⁶ RTA death was the only factor that was statistically significantly associated with organ donation rates (this study did not find a statistically significant link between organ donation rates and presumed consent law). The association with death from CVA was not as clear as that for RTA mortality, but it was a statistically significant predictor of donation rate (in at least one regression model) in two of the studies.^{33,37} Coppen *et al.*³⁴ also reported that CVA or RTA was the cause of death of 80% of donors according to national transplant centre sources. In this study combined CVA and RTA mortality correlated with donation rates; however, it is unclear how reliable the analysis was.

Transplant co-ordination infrastructure

Organ donation rates might also be expected to depend on the extent and efficiency of a country's transplant co-ordination. Transplant capacity, defined as the number of transplant centres pmp, was included in two studies,^{22,35} but only one of these studies reported any results.³⁵ This study was also classified as having no major methodological flaws and a robust analysis. Transplant capacity was statistically significantly associated with donation rates and within the statistical model it was the factor with the greatest predictive strength, greater

than presumed consent practice, religion and education. Healy³⁶ also discussed the importance of the organ procurement and transplant system, although did not incorporate it in the analysis. This model identified Spain and Italy as outliers with statistically significant increases in organ donation rates over a 12-year time period. For both of these presumed consent countries it was suggested that the increase was due to extensive investment in hospitals and procurement organisations.

Wealth and health expenditure

Differences between countries in terms of wealth and health-care expenditure were considered to explain some of the variation in organ donation rates in three of the studies,^{33,36,37} all of which had robust analyses and no major methodological flaws. GDP per capita and health expenditure per capita were considered separately in the studies by Abadie and Gay³³ and Neto *et al.*³⁷ as they were found to be highly collinear. The study by Healy³⁶ used public health expenditure as a percentage of GDP rather than health expenditure per capita. Neto *et al.*³⁷ found GDP per capita and health expenditure per capita to be the strongest predictors of donation rates in their model, stronger than presumed consent law. In the analysis by Abadie and Gay³³ GDP per capita was statistically significantly associated with donation rates, and Healy³⁶ also reported a positive association of GDP with organ donation rates, although it is not clear whether this reached statistical significance. A further robust study by Gimbel *et al.*³⁵ considered including income in the analysis, but chose instead to use education; they suggested that the two variables would correlate and should therefore not both be included.

Religion

Religion was investigated as a factor likely to influence donation rates in four of the studies,^{22,33,35,37} although one of these, by Johnson and Goldstein,²² did not report results that can be considered reliable. All of the studies focused on Catholicism, either using the percentage of the population describing themselves as Catholic^{22,35} or defining a country as Catholic if at least 50% of the population described themselves as such.^{33,37} It has been suggested that Catholicism may be associated with favourable attitudes towards organ donation as the religion officially recognises organ transplantation as a 'service of life'. Catholicism was found to be a statistically significant predictor of donation rates in the study by Gimbel *et al.*³⁵ and of importance in some sections of the regression model in the study by Neto *et al.*³⁷ However, Abadie

and Gay,³³ who specifically only included Western Catholic and Protestant countries, found no statistically significant association between religion and donation rates. The differences between the results of the three studies with robust analyses and no major methodological flaws may be explained by the fact that they included different samples of the included countries. Neto *et al.*,³⁷ for example, was the only study that included Latin American and South American countries. The influence of other religious beliefs on organ donation rates was not investigated. Neto *et al.*³⁷ referred to a study which suggested that Islam and Judaism may have a negative effect on donation rates,⁴⁶ but stated that it was not possible to investigate the impact of these religions in their study because of the limited range of religious beliefs in the sample used. Indeed, among the countries included in the between-country comparisons, only Israel is not predominantly Christian.

Education

A variable for education was included in the analyses of two studies,^{22,35} one of which was classified as having a robust analysis and no major methodological flaws.³⁵ This study by Gimbel *et al.* included the percentage of the population in higher education to assess the influence of social demographics on organ donation rates. They interpreted the statistically significant association of education and organ donation rates in their model as meaning that on average a 1% increase in the number of citizens enrolled in higher education relates to an increase in organ donation rate of 2.96 donors pmp. The other study failed to report any results relating to this variable.²²

Legislative system

The legislative system (common law versus civil law) was investigated in two studies having robust analyses and no major methodological flaws.^{33,37} It was thought that there may be a difference between donation rates under a common law legal system with its emphasis on individual rights and donation rates under a civil law system, which places more emphasis on the rights of the state.³⁷ Common law was statistically significantly associated with increased donation rates in both studies.

Social preferences towards organ donation

One study³³ with a robust analysis and no major methodological flaws investigated blood donation rate as an indicator of social preferences towards organ donation. Although blood donation rate per capita was positively associated with organ donation rates this was not statistically significant.

Access to information

One study³⁷ having a robust analysis and no major methodological flaws used internet access as a proxy measure for access to information in the analysis as it was believed to be one of the most effective ways to spread information about organ donation. The percentage of the population with internet access correlated significantly with organ donation rate in some areas of the quantile regression model, suggesting a possible link between greater access to information and increased organ donation rates.

Summary

Of the eight studies that investigated the impact of presumed consent law on donation rates by comparing data from different countries, four had no major methodological flaws and a sufficiently robust analysis to provide reliable results. However, these are not experimental studies and any relationship between organ donation rates and presumed consent (or other factors) is one of association only, and not cause and effect. All four studies used regression analysis on national data from between 17 and 34 mainly European countries. Three of these studies found that presumed consent was statistically significantly associated with increased rates of organ donation. One study reported that a presumed consent regime provided additional donors, but this result was not statistically significant. The estimates of the magnitude of the effect of presumed consent varied. Two studies reported an approximately 20–30% increase in organ donors, and the other studies reported increases of 2.7 and 6.1 donors pmp.

All of the studies incorporated variables for other factors likely to impact on organ donation rates into their models. Factors found to be more important than presumed consent legislation in predicting donation rates in at least one study were mortality from RTAs, the transplant capacity of a country, GDP per capita and health expenditure per capita. Thus, although overall the evidence suggests that presumed consent law is associated with increased organ donation rates there are also other important factors that are associated with the variation in organ donation rates between countries.

Before-and-after studies

The before-and-after studies focused on three countries: Singapore,^{41,43} Belgium^{42,44} and Austria.⁴⁰

The main outcomes of interest in these studies were organ retrieval or procurement, organ donation and actual organ transplants (*Table 6*). The terminology differed slightly between studies and the assumption has been made that organ retrieval, harvesting and procurement refer to the same process.

None of the studies reported outcomes such as population attitudes to the change in legislation or gave any contextual information. None of the studies met more than one quality criterion in full. The key weakness of these before-and-after studies was the limited exploration of other changes that may have taken place within the countries around the same time as the implementation of presumed consent legislation, such as infrastructure changes (*Table 7*). This creates considerable uncertainty as to whether any changes in donation rates were directly attributable to the change in legislation alone.

Austria

Gnant *et al.*⁴⁰ compared organ donation rates in a single transplantation centre in Austria before and after the introduction of presumed consent legislation in 1982. Under this legislation families of the deceased are not entitled to object to organ donation. There has been a non-donor registry in use since 1995. Before the 1982 legislation Austria did not have any organ donation legislation (see Appendix 1).

The transplantation centre covered a population of 3.6 million over 32 km² and compared three time periods: 1965–81 when there was no specific organ donation legislation; 1982–5 following the introduction of a decentralised donor guidance and organ retrieval system based on 1982 presumed consent legislation as well as organ donation information campaigns; and 1986–90 following the employment of doctors as full-time transplant co-ordinators organising procurement and counselling donor guidance at peripheral intensive care units. In the prelegislation period there was an average of 4.6 donors [standard deviation (SD) 2.9; it is unclear from the paper whether the variance reported is a SD or standard error (SE) – the assumption has been made that this is a SD] pmp per year. In the 4 years immediately following the introduction of presumed consent legislation (1982–5) this increased to 10.1 (SD 4.4) pmp per year and in the 5 years following the introduction of full-time organ transplantation co-ordinators this increased to 27.2 (SD 10.2) pmp year. In 1990 there were 42 donors pmp at the transplantation

TABLE 6 Characteristics of before-and-after studies

Study details and year legislation implemented	Presumed consent region and time period	Comparator and time period	Outcomes
Austria			
Gnant <i>et al.</i> 1991 ⁴⁰ 1982 presumed consent law	Single transplantation centre with a catchment area of 32 km ² and 3.6 million inhabitants 1982–5 following legislation; 1986–90 following employment of full-time transplantation co-ordinators	Same transplantation centre 1965–81	Donors per million inhabitants per year
Belgium			
Roels <i>et al.</i> 1991 ⁴² 1986 presumed consent law	Countrywide 1987–9 for organ retrieval; 1988 for transplants	Same country 1982–5 (for organ retrieval); 1984 (for transplants)	Kidney transplants; kidney, heart and liver transplants; kidney, heart and liver retrieval
Vanrenterghem <i>et al.</i> 1988 ⁴⁴	Leuven Collaborative Group for Transplantation (LCGT; 19 nephrology units) 1987 and first 9 months of 1988	Same region 1978–86	Kidneys procured; kidney transplantations performed by the LCGT; number of collaborating hospitals with donor procurement activities
Singapore			
Soh and Lim 1992 ⁴³ 1987 presumed consent law (for kidneys only) ^a	Countrywide 1988–90	Same country 1970–90	Kidneys procured
Low <i>et al.</i> 2006 ⁴¹ 2004 amendment to presumed consent legislation to cover other organs	Countrywide July 2004–June 2005 Following June 2004, amendment to HOTA, which was extended to include transplantation of the liver, heart and corneas under presumed consent (HOTA) legislation	Same country July 2002–June 2004	Referrals (imminent deaths that may be potential donors); suitable donors; liver recovery surgeries; number of liver transplants; causes of death and other characteristics of referred deaths
HOTA, Human Organ and Transplantation Act. a Medical Act 1972 provided for the voluntary donation of organs; this legislation continued 1988–90 alongside Human Organ and Transplantation Act 1987.			

centre compared with a countrywide rate of 31.9 pmp. The number of actual transplants was only available from a small-scale graph and so precise figures were not available from the paper, although it is clear from the graph that there was a trend towards increasing transplants. The prelegislation donation rate used was an average of annual data from a 16-year period, which may not be an appropriate baseline if there was a trend towards increasing donor rates over this long period.

It is difficult to unravel the effects of the presumed consent legislation, the education campaigns that accompanied the legislation, the structural changes in 1986 to assist the procurement of organs and any other centre-specific or countrywide changes that may have happened over the long time period under consideration. The authors comment that it remained unclear whether the increased number of donations was due to the legislation or was a consequence of increased motivation

TABLE 7 Quality assessment of before-and-after studies

Criteria	Gnant <i>et al.</i> 1991 ⁴⁰	Low <i>et al.</i> 2006 ⁴¹	Roels <i>et al.</i> 1991 ⁴²	Soh and Lim 1992 ⁴³	Vanreenterghem <i>et al.</i> 1988 ⁴⁴
<i>Selection:</i> Were appropriate countries/cohorts/time periods chosen?	x	✓*	✓	x	?
<i>Comparability:</i> Were potential confounders sought and, if found, adjusted for in the analysis?	✓*	x	x	x	x
<i>Data collection:</i> Were the sources of data for outcome and explanatory factors specified and do they appear to be credible?	?	✓	x	x	?
<i>Attributable to intervention:</i> Is it reasonably likely that the observed effects were attributable to presumed consent alone?	x	x	x	x	x

✓, criterion met; ✓*, criterion partially met; x, criterion not met; ?, unclear from information provided whether criterion met.

because of other factors. They argue that the rate of road traffic deaths in Austria is unlikely to be an explanation for higher donation rates as only 30% of all organ donors are RTA fatalities. However, specific data for the time period in question are not reported.

Belgium

Two studies were identified investigating the impact of presumed consent legislation in Belgium, one of which was countrywide⁴² and one of which focused on the Leuven region.⁴⁴ The presumed consent law was introduced in Belgium in 1986 and there has been a combined registry (registration as a donor and registration to opt out of organ donation) since 1987 (see Appendix 1). Under the legislation families of the deceased should be informed that organ retrieval will take place and can potentially object.

Roels and De Meester⁴² compared organ retrieval and number of transplants in the 4 years before legislation (1982–5) with that in the 3 years following legislation (1987–9). The mean number of kidney retrievals in the 4 years before legislation was 18.9 pmp per year. Following the introduction of presumed consent legislation this increased to 37.5 pmp in 1987, 38 pmp in 1988 and 41.3 pmp in 1989. Heart and liver retrieval showed a similar increasing trend (Table 8). Before-and-after data on organ transplants were not reported pmp. There were 234 kidney, heart or liver transplants before legislation (1984) and 561 in 1988.

Other factors that may have influenced organ donation rates over the time period were not investigated and therefore it is unclear whether the changes in retrieval and transplantation rates were related to the change in legislation alone. The authors do comment that the presumed consent law in Belgium was consolidated by a nationwide campaign about the benefits of organ transplantation as well as ongoing efforts to inform health-care professionals about organ procurement procedures. They suggest that it was unlikely that the increase in donors was due to a high number of RTA fatalities as there had been a decrease in the number of people admitted from RTAs dying in intensive care within 30 days of admission.

Vanreenterghem *et al.*⁴⁴ report on kidney procurement and transplantation in the Leuven Collaborative Group for Transplantation (LCGT), which comprises 19 nephrology units. The data reported were fairly limited as the focus of the paper was graft survival. The authors state that in the years before the law change (specific years on which this is based are not stated), on average 75 kidneys per year were procured and this increased to 150 in 1987. The data for the first 9 months of 1988 suggested a similar level of procurement for that year (data for this and number of transplants were only available as small-scale graph). The number of collaborating hospitals with donor procurement activities increased from a mean of less than five before 1985 to 15 in 1987. As with Roels and De Meester³⁸ other factors that may have influenced organ donation rates over the time period were not investigated; it is therefore

TABLE 8 Comparison of donor rates in Belgium before and after the introduction of presumed consent legislation⁴²

	Kidney retrieval	Heart retrieval	Liver retrieval	Kidney transplants	Kidney, heart and liver transplants
Prelegislation (mean 1982–85)	18.9 pmp/year, n = 187/year	0.9 pmp/year, n = 9/year	0.7 pmp/year, n = 7/year	n = 220, 1984	n = 234, 1984
1987	37.5 pmp, n = 371	7.8 pmp, n = 77	4.2 pmp, n = 42		
1988	38.0 pmp, n = 377	9 pmp, n = 89	6.7 pmp, n = 66	n = 342	n = 561
1989	41.3 pmp, n = 409	11.9 pmp, n = 118	10.7 pmp, n = 106		

pmp, per million population.

unclear whether the changes in retrieval and transplantation rates were related to the change in legislation alone. One potential influencing factor may have been the increase in the number of hospitals involved with the collaboration, although this itself may have been influenced by the introduction of presumed consent. The data reported cover only the first 18 months after the legislation and so provide a fairly limited picture of the transplant donation rates and transplant rates following the legislation.

Singapore

Presumed consent legislation was first introduced in Singapore in 1987 under the Human Organ Transplant Act (HOTA) (see Appendix 1). Under this legislation presumed consent applied to kidneys only. Before that the system had been one of informed consent under the Medical (Therapy, Education and Research) Act 1972. In 2004 HOTA was amended to include kidneys, heart, liver and corneas under presumed consent. Two of the included papers investigated the impact of presumed consent legislation, one the 1987 legislation⁴³ and one the 2004 amendment.⁴¹ The presumed consent law applies to non-Muslim Singapore citizens, age 21–60 years and of sound mind.

Soh and Lim⁴³ compared the number of kidneys procured in the 17 years before the 1987 legislation (1970–87) with the number procured in the 3 years following the legislation (1988–90). Donation rates increased from an average of 4.7 per year to 31.3 per year. The authors state that, following the introduction of presumed consent for kidneys in 1987, the informed consent system based on the Medical Act 1972 was also still in operation. It is unclear how these operated in tandem. Of the 94 kidneys procured from 1988 to 1990, 41.5% were obtained under the informed consent system and 58.5% under the presumed consent system. The

period before presumed consent legislation covers 17 years and so it is not possible to assess whether there was a trend towards increasing donor rates prelegislation.

Other factors that may have influenced organ donation rates over the time period were not investigated and therefore it is unclear whether the changes in retrieval and transplantation rates were related to the change in legislation alone. The substantial proportion of kidneys procured after 1987 under the informed consent legislation suggests that other factors may have been influencing donation rates. The number of kidneys procured through voluntary donation (or opting in) increased from 4.7 per year before 1988 to 13 per year after 1988. The authors comment that the success of the presumed consent law for kidney donation may have been partly attributable to the intense public and professional discussions before the introduction of the law, possibly reflected in the increase in informed consent donations.

Low *et al.*⁴¹ compared liver donation in the 2 years before (July 2002–June 2004) and the 1 year after the 2004 amendment to HOTA. The number of referred deaths and potential liver donors were similar before and after the extension of presumed consent to cover liver donation (*Table 9*). The authors point out that there were no statistically significant differences in the characteristics of the referred deaths in the two time periods and this is reflected in the unchanged potential donor rates. The number of liver retrieval surgeries increased from 5 per year to 13 per year and the number of liver transplants from 3.5 per year to 5 per year. The discrepancy between the number of livers retrieved and the number transplanted was mainly due to the high incidence of hepatic steatosis (fatty liver) in the retrieved livers. The timescale covered post legislation in this study is short and therefore provides a fairly limited picture of the transplant donation and transplant rates following

the legislation, especially given the small number of retrieval surgeries and transplants.

As with all of the above studies it is unclear whether the changes in retrieval and transplantation rates were related to the change in legislation alone. The authors point out that the impact of the legislative change may have been compounded by factors such as different socioeconomic status of potential donors and the educational campaign conducted during the introduction of the revised law. They also note that the effect of presumed consent legislation may not be generalisable to other countries because of the ethnic and cultural characteristics of the country.

Summary

Five of the included studies investigated the impact of the introduction of presumed consent on organ donation rates using a before-and-after design. This provides data on a very limited subset, three in total, of the countries that have introduced presumed consent legislation. None of these studies reported any information about the impact of presumed consent on public attitudes. All of the studies reported an increase in organ donation rates following the introduction of a presumed consent system. However, there was limited exploration in the studies of other changes that may have taken place within the specific countries around the same time as the implementation of presumed consent legislation. As a result it is uncertain whether any changes in donation rates were directly attributable to the change in legislation alone.

Surveys of attitudes to presumed consent

Overview of the surveys

A total of 13 surveys that collected data on views about organ donation and presumed consent were identified. Of the 13 identified we were able to obtain full reports relating to nine: one focused on professional views⁴⁷ and eight on public views.^{48–55} A full quality assessment of these surveys was

conducted (Appendix 5). We are aware of four further UK surveys that are relevant. However, although some data from these surveys are reported in a range of secondary sources,^{30–32,56} we have been unable to obtain the original reports containing the precise questions asked and details of the methods used; therefore, there is insufficient information to allow quality assessment of these four surveys to be undertaken. The four surveys were commissioned by the Department of Health in 1999, the National Kidney Research Fund in 2000, Watchdog Healthcheck in 2001 and by the BBC in 2005. A brief summary of the results of these studies is available in a British Medical Association document on presumed consent and, in the absence of the full reports, the results have been taken from this and other secondary sources.^{30–32,56} The results of these four surveys are reported separately.

It is unlikely that all surveys investigating attitudes to presumed consent have been identified. In particular, large omnibus-type surveys, which tend not to be published in peer-reviewed journals and indexed on search databases, may have been missed.

With two exceptions^{49,54} the surveys of public views were from countries with informed consent systems for organ donation. In one survey of members of the International Society for Heart and Lung Transplantation (ISHLT)⁴⁷ the majority of participants were from countries without presumed consent legislation (*Table 10*). Surveys took place between the mid-1970s and 2007, with the 2007 survey being of people in the UK.⁵⁵ Descriptions of the survey methods used were fairly limited in the full reports. Two reported using a random sample stratified or weighted by population characteristics, although full details of how the samples were constructed are not reported.^{49,50} A third survey also used a weighted sample.⁵⁵ This was a YouGov survey, which used a base sample of people who have internet access; therefore, although the sample may match key demographic characteristics of the UK population, it may not be representative. A fourth survey used a random sample based on a telephone directory, biasing

TABLE 9 Comparison of liver donor rates in Singapore before and after the 2004 amendment to HOTA⁴¹

	Referred deaths	Potential liver donors	Liver retrieval surgery	Liver transplants
Pre amendment	<i>n</i> = 167 (83.5/year)	<i>n</i> = 70 (35/year)	<i>n</i> = 10 (5/year)	<i>n</i> = 7 (3.5/year)
Post amendment	<i>n</i> = 80 (80/year)	<i>n</i> = 34 (34/year)	<i>n</i> = 13 (13/year)	<i>n</i> = 5 (5/year)

the sample to people who had a telephone.⁵¹ The remaining surveys (based on full reports) used non-randomised samples and therefore it is unlikely that they are representative of the population in their respective countries (*Table 10*). Details of sampling methods were not available for the four UK surveys for which data were obtained from secondary sources.^{30–32,56}

The public surveys varied in how they framed the questions on presumed consent (*Table 11*). For example, two surveys^{31,51} provided detailed statements of what they meant by presumed consent, whereas the others reported less detailed information. Three asked respondents about a 'hard/strong' form of presumed consent in which there is no consultation with next of kin.^{49,52,53} One study suggested that transplantation would not proceed if it would cause severe distress to relatives, but did not suggest how this would be established.⁵⁵ Only one asked explicitly, using a positive framing, whether the wishes of relatives should be considered.⁵⁰ For two of the four UK surveys for which data were obtained from secondary sources the framing of the question(s) on presumed consent is unknown.

Results of the surveys

Health-care professionals

In a survey of 739 members (from 15 countries) of the ISHLT, carried out in 2002, 74% thought that the introduction of presumed consent in a country would have a positive impact on organ donation rates. However, only 39% agreed that presumed consent was the single most effective way to increase the organ donation rate. Other changes that more than 50% of respondents thought would improve donation rates were indirect compensation, improved education on donation, having more medical staff to talk with families and having legally binding donor cards.⁴⁷ The relatively low response rate (33.5%) means that these opinions may not be representative of all ISHLT members, and the results may not be generalisable to all health-care professionals as the ISHLT only covers those in transplant-related professions.

UK population surveys

Data were obtained from eight UK surveys, four from full reports,^{50,52,55} one of which was conducted over 30 years ago,⁵² and four from secondary sources,^{30–32,56} which have been grouped separately. In the earliest survey that used a non-random sample,⁵² 74% of respondents stated that doctors should not have the power to remove kidneys from

people who had recently died without consulting their next of kin; 65% did not agree to the proposal of changing the law to one of presumed consent, whereas 34% did agree. A more recent survey⁵⁰ conducted in 2004 of a random sample of 1009 Scottish adults found that 53% of people surveyed were opposed and 37% were in agreement with doctors being automatically allowed to take organs for transplantation, unless the deceased was against it. The majority of respondents (74%) agreed that the wishes of relatives should be considered before doctors are automatically allowed to take organs for transplantation. In the most recent survey of the general population,⁵⁵ from YouGov, 64% of respondents said that they supported a change to a system in which, for adults, consent for transplantation is presumed unless the individual has registered an objection or it is clear that to proceed would cause severe distress to the relatives. There is a much greater level of support for presumed consent in this recent survey than in the one conducted in the mid-1970s and the one in 2004. This may reflect a genuine change in views or it may reflect differences in the sample surveyed or differences in the wording of the questions asked.

One survey aimed to determine the knowledge about and attitudes towards organ donation and transplantation among the Asian community in Glasgow via a public forum.⁴⁸ In total, 61% of attendees were in agreement with the concept of presumed consent, although it is unclear exactly how this was defined. It is unlikely that these results are representative of the wider Asian community. The sample comprised people who actively chose to attend the forum, and the forum and survey were conducted in English only. Additionally, the survey was conducted during the forum, which may have influenced responses. The highest level of support for presumed consent was found among respondents aged over 60 (81%), and the lowest in the 40–49 years age group (33%); however, sample numbers were small with fewer than 20 people in each age group.

Two other UK surveys also investigated demographic differences in attitudes. In the most recent survey by YouGov,⁵⁵ the proportion in support of presumed consent was fairly similar across age, gender, social class and geographical region, although there was some variation. In the 2004 survey carried out in Scotland,⁵⁰ those who stated that they were unwilling to donate all of their organs tended to be male, over 65 years and from the least privileged social group; substantially

TABLE 10 Details of included surveys

Author	Country	Date of survey	Participants	Survey methods	Aspects covered in questionnaire
Baines <i>et al.</i> 2002 ⁴⁸	Scotland	Unclear; pre 2001	80 members of the Asian community in Glasgow and the west of Scotland (88.9% response rate); 48.8% female; 17.5% aged 20–29 years, 23.8% 30–39 years, 22.5% 40–49 years, 16.2% 50–59 years, 20% 60+ years; 60% Muslim, 17.5% Hindu, 10% Christian, 2.5% Sikh, 7.5% atheist, 2.5% other religions; annual income £10,000–30,000 61.2%, £30,000–60,000 38.8%	Non-random sample. Attendees of the Ethnic Transplant Forum, the aim of which was to promote awareness of transplant issues affecting Asians, targeted at the Asian community in Glasgow and Asian patients awaiting kidney transplant in the west of Scotland. Attendees were given self-completion questionnaires	Awareness of donor card and National Donor Registry; attitude to presumed consent; attitude to required request; opinion on whether their religion allows organ donation; willingness to donate live organs; opinion on the best medium to promote awareness in the Asian community
Conesa <i>et al.</i> 2003 ⁴⁹	Spain	Unclear	2000 people over 15 years old: 51% female; mean age 41.2 years	Random sample from the Murcia region of Spain stratified by age, sex and geographical location; self-completion questionnaire	Attitude to organ donation; attitude to presumed consent legislation
Haddow 2006 ⁵⁰	Scotland	February–March 2004	1009 people 16 years and older: 52% female; 35% 25–44 years old; 20% socioeconomic grouping AB, 28% C1, 21% C2, 31% DE	Random sample weighted to match Scottish population; self-completion questionnaire	Attitude to organ donation; attitude to cash incentives; attitude to soft and hard presumed consent
Klenow and Youngs 1995 ⁵¹	USA	January 1990	414 residents of a midwestern metropolitan community (53.4% response rate); 55.9% female; 55% 25–44 years old; over 80% had some post-high-school education; 41% professional/managerial; 64% Protestant, 27% Catholic; over 99% white	Random sample of 824 based on telephone directory; self-completion questionnaire	Attitude to donor card; attitude to required request of next of kin; attitude to presumed consent
Moores <i>et al.</i> 1976 ⁵²	UK	Unclear; pre 1976	500 people from across the UK; demographic details not provided	Non-random sample described as representative of age, sex and social class, using an interview schedule	Attitude to organ donation; attitude to presumed consent
Oz <i>et al.</i> 2003 ⁴⁷	15 countries	April 2002	739 members of the International Society for Heart and Lung Transplantation (ISHLT) (33.5% response rate); 81.7% were from countries without presumed consent legislation	1821 ISHLT members were emailed with an invitation to complete a questionnaire; 400 members without email or internet access as well as others that requested it were mailed a paper version	Opinions on how to improve organ donation; attitude to presumed consent; attitude to indirect compensation

Author	Country	Date of survey	Participants	Survey methods	Aspects covered in questionnaire
Rodrigue <i>et al.</i> 2006 ⁵³	USA	July 2001–December 2004	561 family members who had recently been asked for consent to donate the organs of a family member; 348 had consented to donation and 213 had refused; 77% female; mean age 47.6 years (range 18–85 years); 80% white, 16% black or African American; 76% post-high-school education	Non-random sample using telephone interview. Recruited from several sources	Attitude to financial incentives; attitude to donor authorisation; attitude to presumed consent
Roels <i>et al.</i> 1997 ⁵⁴	Belgium	January 1997	1306 residents of Flanders. Belgium: 466 young adults aged 18–29 years, 595 parents age 30–59 years and 245 grandparents aged 60+ years; 56% female; for the majority of the sample (60%) the highest educational level was secondary school	Non-random sample. Questionnaires were sent to 500 young adults at the same time as their invitation for a mandatory routine medical check-up. They were asked to pass copies of the questionnaire to their parents and grandparents	Attitudes to organ donation and transplantation after 10 years of presumed consent legislation in place
YouGov 2007 ⁵⁵	UK	9–11 October 2007	2034 British adults: 55% female; 11% 18–24 years, 22% 25–34 years, 15% 35–44 years, 18% 45–54 years, 34% 55+ years; 49% socioeconomic grouping ABC1	Random sample from a base sample of 185,000. An email was sent with an invitation to take part in the survey	Willingness to donate organs after death; attitude to presumed consent
Additional survey data obtained from a secondary source⁵⁶ (full reports not obtained)					
BBC 2005 ³⁰	UK	May 2005	2067 people over 16 years old	Described as representative sample (further details not stated)	Attitudes to presumed consent
Department of Health 1999 ³¹	UK	May 1999	1757 people	Omnibus survey using face-to-face interviews (further details not stated)	Preferences between the status quo and change to a system of presumed consent
National Kidney Research Fund 2000 ³²	UK	July 2000	1976 people	Omnibus survey (further details not stated)	Attitudes to presumed consent
Watchdog Healthcheck	UK	February 2001	Almost 52,000 people	Telephone poll (further details not stated)	Attitudes to presumed consent

TABLE 11 Results of included surveys

Author	Questions relating to presumed consent	Results: overall attitude	Results: variation in attitude by demographic characteristics
Baines <i>et al.</i> 2002 ⁴⁸	Attitude to presumed consent following definition of the concept (further details not provided)	61% agreed with the concept of presumed consent	Agreement with presumed consent by age group was 64% of those aged 20–29, 58% of those aged 30–39, 33% of those aged 40–49, 77% of those aged 50–59 and 81% of those over 60 years
Conesa <i>et al.</i> 2003 ⁴⁹	With regard to donating the organs of a deceased person, when do you think the next of kin should be asked for permission?	72% considered it necessary to request family consent for organ donation, principally if the dead person had not expressed an opinion about organ donation during life	The subgroups with a negative attitude to presumed consent legislation were aged over 40 years, had a low educational level, had no previous experience with organ donation or transplantation, had no experience in prosocial activities, refused to accept cadaver manipulation and had a lack of knowledge of the brain-death concept. There were no differences in attitudes by sex or geographical location
	How would you consider a legislation that grants the state access to the organs of a deceased person without the need for previous permission?	24% agreed with the presumed consent law; 53% thought it was an abuse of authority	
Haddow 2006 ⁵⁰	Doctors should be automatically allowed to take organs for transplantation unless the deceased was against it	53% were opposed to doctors being automatically allowed to take organs for transplantation and 37% agreed	17% stated that they were unwilling to donate all of their organs. This group tended to be male, from the least privileged socioeconomic group and aged over 65 years. This 'unwilling group' were more likely to agree with the soft version of presumed consent (80%) than the hard version (23%)
	The wishes of relatives should be considered before doctors are automatically allowed to take organs for transplantation	74% agreed that the wishes of relatives should be considered before organs are automatically taken and 16% disagreed	
Klenow and Youngs 1995 ⁵¹	This (presumed consent) type of law allows for the removal of organs from deceased persons without the presence of an organ donor card or the approval of next of kin, unless authorities are aware of a specific objection. Objections could be indicated, for example, by carrying a donor card, registration by central computer or direct questioning of next of kin. Would you favour or oppose the passing of such a law in your state?	On a 7-point Likert scale, 72% opposed presumed consent legislation (48% were strongly opposed), 13% were in favour and 16% were neutral	Respondents 25 years or younger were the most supportive of presumed consent and those aged 25–44 years were the least supportive

Author	Questions relating to presumed consent	Results: overall attitude	Results: variation in attitude by demographic characteristics
Moores <i>et al.</i> 1976 ³²	Do you feel doctors should have the power to remove kidneys from people who have recently died without consulting their next of kin?	74% stated that doctors should not have the power to remove kidneys without consulting next of kin	None reported
	Last year a member of parliament tried to change the law so that anyone who did not want his kidneys removed would need to register his wishes in some manner. Would you approve of such a change?	65% did not approve of changing the law to one of presumed consent and 34% agreed	
Oz <i>et al.</i> 2003 ⁴⁷	Assuming all proper safeguards are in place, do you think presumed consent would have a positive impact on organ donation rates?	74% thought presumed consent would improve organ donation rates. Other practices that more than 50% of respondents thought would improve organ donation rates were indirect compensation, improved education of the public, increasing medical personnel available to talk with families and legally binding donor cards	None reported
		39% agreed that the single most effective way to increase organ donation was implementing presumed consent legislation	
		84% agreed that next of kin should be consulted regarding organ donation; 77% did not think that consultation should be required if the potential donor had already signed a donor card	

continued

TABLE 11 Results of included surveys (continued)

Author	Questions relating to presumed consent	Results: overall attitude	Results: variation in attitude by demographic characteristics
Rodrigue et al. 2006 ⁵³	<p>If a person dies and has not documented that they wanted to be an organ donor, organs should be removed without getting the family's permission</p> <p>There should be a law which assumes that everyone who dies is a potential organ donor, unless it is documented that they did not want to be a donor</p>	<p>Next of kin who had agreed to organ donation: 95% disagreed or strongly disagreed (41% strongly) that organs should be removed without family permission if a person has not documented that they want to be a donor. Next of kin who had not agreed to organ donation: 97% disagreed or strongly disagreed (67% strongly) with this statement</p> <p>Next of kin who had agreed to organ donation: 73% disagreed or strongly disagreed with a presumed consent law. Next of kin who had not agreed to organ donation: 81% disagreed with presumed consent law</p>	<p>The authors state that for attitude to presumed consent, donation attitudes accounted for the most variance in the model, followed by demographic characteristics and next-of-kin donation decision. No further details were provided</p>
Roels et al. 1997 ⁵⁴	<p>Attitudes in general towards organ donation</p> <p>Attitudes towards donating their own organs</p> <p>Whether they would object to removal of their next-of-kin's organs</p> <p>Who should decide about removal of their own organs after death</p> <p>Asked about knowledge of Belgian presumed consent legislation and the opportunity to register an explicit will</p>	<p>80% were in favour of organ donation; 48% unconditionally positive, 32% positive with reservations</p> <p>44% agreed that the decision about removal of their own organs after death should be made by themselves only</p>	<p>The proportion in favour of donation decreased with increasing age: 86% of young adults, 83% of parents and 64% of grandparents were in favour</p> <p>85% of young adults, 83% of parents and 60% of grandparents were in favour of donating their own organs</p> <p>72% of young adults, 75% of parents and 54% of grandparents were in favour of removal of next-of-kin's organs</p> <p>39% of respondents under 60 years stated that the decision about removal of their own organs should be taken by themselves in agreement with their relatives; 25.7 of grandparents held this view</p> <p>76% of young adults and 88% of grandparents stated that they had not registered an explicit will as allowed under Belgian law or did not plan to do so</p>

Author	Questions relating to presumed consent	Results: overall attitude	Results: variation in attitude by demographic characteristics
YouGov 2007 ⁵⁵	It has been suggested that the UK should shift to an opt-out system in which, for adults, consent for transplantation is presumed unless the individual has either registered an objection or it is clear that to proceed would cause severe distress to the relatives. Would you support such a change?	64% supported a change to a presumed consent system as described, 23% did not and 14% said that they did not know	Among men 63% were in support, 25% were not and the rest did not know; among women 64% were in support, 20% were not and 16% did not know. The proportion in support seemed fairly similar across the five age bands, with the lowest support among those aged 18–24 years, and across the two social groupings Results across geographical regions were similar, with Scotland having the largest proportion in support at 74% and the south (excluding London) having 60% in support, which was the lowest
Additional survey data obtained from a secondary source⁵⁶ (full reports not obtained)			
BBC 2005 ³⁰	Do you agree/disagree that there should be a change in the law to an opt-out system?	60% of respondents supported a change in the law to an opt-out system	None reported
Department of Health 1999 ³¹	How do you feel about the idea of donating your organs under the current system (description provided)?	68% were willing to donate their organs under the current system, 14% were against and 18% did not know	Of those who reported having a donor card, 47% were in favour of the current system, 41% were in favour of an opt-out system and 12% had no preference
	How do you feel about donating your organs under the opt-out system (description provided)?	50% were in favour of donating their organs under the opt-out system, 32% were against and 18% did not know	
	How would you feel in the case of a child in your immediate family?	50% expressed a preference for the current system, 28% supported a shift to presumed consent and 22% reported no preference	
National Kidney Research Fund 2000 ³²	Which of these two systems would you prefer to see in place in the UK?	57% supported a system of presumed consent	None reported
Watchdog Healthcheck	Not reported	78% of respondents supported a shift to presumed consent	None reported

more of these respondents were in agreement with the soft/weak version of presumed consent than the hard/strong version.

It is difficult to interpret the findings of the remaining four UK surveys in the absence of detail about the survey methods and how the questions were framed. The information relating to these surveys was taken from secondary sources. Overall, among these four surveys it appears that there was variability in the level of support for presumed consent ranging from a low of 28% in support of a shift to presumed consent in 1999, to 57% in 2000, to 78% in 2001 and 60% in 2005. It is unclear whether this reflects a shift towards increasing support for presumed consent or differences in the survey methods and framing of the questions asked.^{30–32,56}

Surveys of the public from countries other than the UK

In a survey conducted in Spain,⁴⁹ 53% considered legislation that grants the state access to the organs of a deceased person without the need for previous permission as an abuse of authority and 24% agreed with such a law. Arguably, the wording of the response options in this survey presented polarised and emotive language, which may have influenced responses. The majority of respondents agreed that the wishes of relatives should be considered before organs are automatically taken. The survey further investigated attitudes of various subgroups and found more negative attitudes to informed consent when respondents were over 40 years old, had a low educational level, had no previous experience with organ donation or in prosocial activities, refused to accept cadaver manipulation and had a lack of knowledge about the concept of brain death. The authors conclude that presumed consent legislation should not be implemented in Spain because it may be opposed. Presumably this refers to a change in the legislation to hard/strong presumed consent as Spain already has presumed consent legislation in place; under the current system doctors ascertain that next of kin do not object, which has been described as a weak form of presumed consent.

The survey conducted in Belgium⁵⁴ by the University Hospital Gathuisberg and the School of Public Health took place 10 years after the introduction of presumed consent and considered the views of young adults, their parents and their grandparents. The majority were in favour of organ donation although the proportion in support was lower among grandparents (64%) than among young adults (86%) and parents (83%). In total,

44% of respondents agreed that the decision about the removal of their own organs after death should be made by themselves only; 39% of respondents under 60 years agreed that the removal of their own organs should be taken by themselves in agreement with their relatives. Slightly fewer grandparents held this view (26%). It is unclear how representative these views are of the general population as the samples were not random.

There were two surveys from the USA. One was conducted by North Dakota State University and took a sample of the general population.⁵¹ The majority (72%) was opposed to presumed consent legislation, 13% were in favour and 16% were neutral. The 25 years and younger age group was most supportive of presumed consent and those aged 25–44 years were least supportive. The second survey⁵³ was of a sample of family members who had recently been asked for consent to donate the organs of a family member. This was carried out by medical institutions in Boston and Florida. In this study the majority of participants (both those who had and had not consented to the donation of their next-of-kin's organs) disagreed with presumed consent; 95% of those who had agreed to donation, and 97% of those who had not, disagreed or strongly disagreed that if a person dies and has not documented that they want to be an organ donor then organs should be removed without the family's permission. In addition, 73% and 81%, respectively, disagreed or strongly disagreed that there should be a law which assumes that everyone who dies is a potential organ donor unless it has been documented that he/she did not want to be. This survey was specifically interested in the views of families who had personal experience with the organ donation transplantation system and it is unclear to what extent these views might be similar in the general population.

Summary

A total of 13 surveys that included questions on organ donation and presumed consent was identified, although full reports were unavailable for four of these and secondary sources had to be relied upon. Eight surveys (including four with full reports) were from the UK. The four surveys providing details about their methods varied in how they phrased the questions on presumed consent, whether it was a 'hard/strong' or 'soft/weak' version of presumed consent and whether they explicitly asked about seeking the views of families of the deceased. These factors are likely to have influenced the results that were obtained.

Given that full details were unavailable for four surveys it would be inappropriate to draw overall conclusions about public views in the UK. However, based on the information available, two of the earliest studies, conducted in 1976 and 1999, reported the lowest levels of support, with 34% and 28% in favour of presumed consent respectively. With the exception of one survey conducted

in Scotland, in which support was low, surveys conducted from 2000 onwards have reported at least 60% of respondents being in support of presumed consent. With the exception of one survey from Belgium, where there is presumed consent legislation, the majority of respondents in surveys from outside the UK seemed opposed to presumed consent.

Chapter 4

Discussion

The evidence base

A systematic review was conducted to examine the impact of presumed consent legislation on organ donation rates. The primary aim was to identify, appraise and synthesise empirical studies that examined the impact of a presumed consent system on organ donation rates. Studies comparing a system of presumed consent with a non-presumed consent system (e.g. one in which individuals register as organ donors during their lifetime) were included in the review. This resulted in the inclusion of studies comparing donation rates in countries with and without presumed consent, and studies comparing donation rates in a single country before and after the introduction of a presumed consent law.

The introduction of presumed consent legislation in the UK is likely to be controversial and therefore a secondary aim was to identify, appraise and synthesise data on attitudes to presumed consent. The studies included were surveys.

Between-country comparisons

Eight studies compared donation rates in countries with and without presumed consent. After quality assessment, four of these were considered to have no major methodological flaws and a sufficiently robust analysis to provide reliable results, although it is uncertain whether the observed effects on donation rates were associated with presumed consent legislation alone. These four studies all used regression analyses to examine the associations between presumed consent and donation rates in between 17 and 34 (mainly) European countries, covering the years 1990–2002. They also investigated a range of other factors likely to be associated with donation rates.

Presumed consent was statistically significantly associated with increased organ donation rates in three of the four studies. The fourth study reported that a presumed consent regime provided additional donors, but this result was not statistically significant. Thus, overall, the evidence from this set of studies suggests that there is a positive association between presumed consent

legislation and organ donation rates. The estimates of magnitude of effect varied: two studies reported a 20–30% increase in organ donation; one reported an increase of 2.7 donors pmp; and one reported an increase of 6.1 donors pmp. There was no evidence on the impact of presumed consent law on population subgroups.

The studies highlighted other important factors contributing to the variation in organ donation rates between different countries. All four robust studies incorporated a range of variables into their models. Factors reported to be more important than presumed consent legislation in predicting donation rates in at least one study were mortality from RTAs, the transplant capacity of a country, GDP per capita and health expenditure per capita. Other important factors included a common law legal system, religion (Catholicism), education, CVA mortality, and access to information (via the internet).

There are a number of issues to consider when interpreting the evidence from this set of studies. First, this particular study design, involving secondary analysis of data from countries with and without presumed consent legislation, can only provide evidence about the correlations between factors. It cannot determine cause and effect, that is, it does not provide evidence that presumed consent legislation leads to higher donation rates.

Second, although it is clear that there are factors other than presumed consent associated with organ donation rates, the studies available do not clarify their relative importance. Each study included explanatory factors depending on what was considered important in explaining differences in the particular data set. Consequently, the factors reported, and their relative importance compared with presumed consent, varied between the studies. Additionally, some of the measures may represent the same underlying differences and be correlated, such as education and wealth.

Additionally, there are potentially important factors that were not explored. For example, the only religion investigated was Catholicism, which was considered to have a positive impact on attitudes

to organ donation. Other religions such as Islam and Judaism have been reported to have a negative effect on organ donation rates,⁴⁶ but this was not investigated in any of the included studies. The overall effect of religion would be expected to vary between different countries according to their particular religious constitution.

Presumed consent is not a binary variable. There are gradations in the legislation itself and in how the legislation is interpreted. The key gradation has been characterised as 'strong/hard' and 'weak/soft' presumed consent. This has been used to describe the level of family consultation about donation of a deceased's organs within a presumed consent default. One study partly addressed this issue by comparing countries according to how the legislation was implemented in practice rather than according to the actual legislation in place.³⁵ The other studies do not take into account any variations between countries with a presumed consent system in terms of the content of the legislation or how it is implemented. Related to this, another important unexplored factor is the way in which families of potential donors are approached. Whether the legislative system in place is one of presumed or informed consent, if it involves contact with the families, the procedures in place and the way that families are approached are likely to be important factors in whether consent is given. However, by their nature these studies are unable to investigate such issues and this is an important area for further exploration.

The countries represented in the analyses also need to be considered when interpreting the results. They were mostly from western Europe and there was also significant overlap between the study samples. A number of countries, including the UK, were included in all studies, and this duplication of data may mean that the studies are naturally biased towards giving similar results.

Before-and-after studies

Five studies compared organ donation rates before and after the introduction of presumed consent legislation in a single country. The countries assessed were Austria, Belgium and Singapore, capturing data from 1965 through to 2005. The studies consistently reported an increase in organ donation rates following the introduction of presumed consent legislation. Importantly, however, there was very limited investigation of any other changes taking place at the same time. As a result it is uncertain whether changes

in donation rates were directly attributable to a change in legislation alone or whether, for example, education and awareness programmes, infrastructural changes or positive media coverage of transplantation issues⁵⁷ played a role. Importantly, none of these studies reported any information about the impact of presumed consent on public attitudes or provided any contextual information. Again, there was no evidence on the impact of presumed consent law on population subgroups.

This is a very limited subset of the countries in Europe and worldwide that have a presumed consent system in place. Although as wide a range of sources as possible were searched for published and unpublished studies in the time available it would seem unlikely that no other before-and-after evaluations have been conducted. It is unclear whether the evaluations that have been included are representative of all of the evaluations that may have been carried out. Notably, we did not identify any studies focusing on Spain, the country with the highest organ donation rates, or Brazil, a widely cited example of an unsuccessful law change to presumed consent. The success in Spain is attributed to a series of infrastructural changes to the whole transplantation system rather than to the fact that it has a presumed consent law;¹³ however, we found no studies that directly examined the effect of the introduction of the law in 1979. In Brazil, the introduction of presumed consent law in 1998, without support from medical organisations and against a background of public distrust of the government and negative media reports, led to its rapid abolition.⁵⁸ Again, we identified no empirical studies examining the Brazil experience.

Surveys

Eight surveys from the UK and four from other countries that investigated public attitudes to presumed consent were identified. With the exception of a survey conducted in Belgium and one in Spain they were all conducted in countries with an informed consent system in place.

There was variation among the UK surveys in the level of support for presumed consent. The two earliest studies, conducted in 1976 and 1999, reported the lowest levels of support. A survey from Scotland conducted in 2004 showed similar low levels of support. In the remaining surveys, all conducted since 2000, at least 60% of respondents were in favour of presumed consent. Data on variation in attitudes by demographic

characteristics such as age, gender and social class were available from three UK studies. The findings across the three studies were equivocal, although the groups surveyed, the questions asked and the analyses conducted were dissimilar.

In the survey from Belgium, which has presumed consent legislation, the majority of respondents were in favour of organ donation. There was, however, some evidence of a difference in attitudes among different generations; support for organ donation was lower among grandparents than among parents and young adults. The results of this survey need to be treated with caution as it is unclear how representative it is of the general population in Belgium. In the remaining three non-UK surveys, two from the USA and one from Spain, the majority of respondents disagreed with presumed consent. There was an indication from one US survey and the Spanish survey of a variation in attitude with age: the 25–44 years age group were least supportive in the former and the over 40 years age group in the latter. There was also one survey of transplant-related health professionals from 15 countries in which less than 40% considered presumed consent to be the single most effective way to increase donation rates.

In terms of applicability the UK surveys are of the most relevance to the UK setting. However, it is inappropriate to reach firm conclusions in the absence of information relating to the methods used and the framing of questions in four of the surveys.

Strengths and weaknesses of the review

The main strength of this review is that it was conducted using systematic methods that aimed to identify relevant studies, appraise their quality and synthesise their results in a transparent, unbiased and reproducible way.

Although as wide a range of sources as possible was searched for published and unpublished studies in the time available there is always the risk that

studies have been missed, particularly unpublished studies. For example, it was not feasible to contact relevant bodies in presumed consent countries to enquire about unpublished or unindexed studies.

The short time frame for carrying out the review also meant that the scope of the review was somewhat limited. For example, it was not possible to fully explore the issues surrounding the impact of presumed consent law and the factors that might affect the success or otherwise of introducing such a law in the UK.

Although not a shortcoming of the review, the methodological weaknesses in the available evidence base need to be considered. Ideally evidence would be derived from high-quality studies directly examining the impact of presumed consent law on organ donation rates as well as other outcomes of interest (e.g. attitudes of the public and health professionals, registration on opt-out registers) while considering other changes taking place alongside the change in law (e.g. investment in and changes to transplant co-ordination infrastructure, education and awareness campaigns). Ideally such evaluations would be available from all countries in which a presumed consent law has been introduced.

The before-and-after studies that we identified were weak methodologically, provided limited data and represented only three countries. Of the studies that compared legislation across different countries only four conducted analyses that were considered to be of sufficient quality to be reliable. Although providing evidence of value, this type of study is limited in that it can only indicate associations between different factors. Surveys provided some data on attitudes, but are incomplete (detailed information relating to four surveys was unavailable) and limited in terms of exploration across different sociodemographic groups. In addition, attitudes alone are unlikely to be a reliable predictor of behaviour. This is already reflected in the gap between high expressed support for organ donation in UK surveys and lower rates of registration on the organ donor register.

Chapter 5

Conclusions

Taking the limitations of the included studies into consideration, the summarised findings are:

- Presumed consent alone is unlikely to explain the variation in organ donation rates between different countries. A combination of legislation, availability of donors, transplantation system organisation and infrastructure, wealth and investment in health care, as well as underlying public attitudes to and awareness of organ donation and transplantation, may all play a role, although their relative importance is unclear. The between-country comparison studies overall point to presumed consent law being associated with increased organ donation rates (even when other factors are accounted for), although it cannot be inferred from this that the introduction of presumed consent legislation per se leads to an increase in donation rates. The before-and-after studies suggest an increase in donation rates following the introduction of presumed consent legislation; however, it is not possible to rule out the influence of other factors on donation rates.
- It is important to note that the survey evidence is incomplete and the variation in attitudes between surveys may reflect differences in methods and the phrasing of questions. Some surveys suggest a lack of public support for presumed consent, both in the UK and in other countries. However, more recent UK surveys provide evidence of support for presumed consent.

Implications for policy

This systematic review was commissioned to inform the work of the UK Organ Donation Taskforce, which has been tasked with looking at the range of issues involved in an opt-out system of consent. The evidence identified and included in this review relates only to the specific questions posed and does not address all of the issues relevant to the work of the UK Organ Donation Taskforce and therefore it cannot be fully informative with respect to policy. In addition, it is important to

be aware of the methodological limitations of the evidence that we have identified and appraised. The available evidence suggests that presumed consent legislation is associated with an increase in organ donation rates, although the size of the association varied between studies. A number of other factors also appear to be associated with organ donation rates, such as transplant capacity, GDP per capita and health expenditure per capita. It is therefore important to consider such factors when attempting to predict the impact of changing to a presumed consent system. It is also important to take into account the likely public response to presumed consent should legislation be changed. The limited and incomplete evidence available from surveys suggests variable levels of support. In addition, consideration needs to be given to potential variation in attitudes between different sociodemographic subgroups.

Implications for research

When a change in legislation occurs it is important to evaluate and monitor the impact on donor rates, as well as on a range of other factors such as registration to opt out. Further reviews of the literature could investigate the factors that are likely to modify donor rates, such as the procedures for family involvement. The way in which families of any potential donors are approached is likely to be an important factor and a review of qualitative research examining the experience of relatives in this context would be useful. The information obtained could be used to determine a priori the factors to be investigated in any evaluation of a change in legislation. At the same time contextual information should be gathered, such as transplant capacity and any concurrently running media campaigns.

Public views about presumed consent are important and therefore it is necessary to have a complete understanding of likely acceptance. In any future surveys the framing of each question should be considered carefully and, given the strong possibility of providing what is viewed as a socially acceptable answer, the survey should be designed to minimise this as much as possible. Importantly,

any future surveys need to be large enough to investigate variations in attitudes across different sociodemographic groups. This information could then be used to identify groups with whom it would

be particularly important to engage with about presumed consent.



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Contribution of authors

Amber Rithalia (Research Fellow) contributed to the protocol, study selection, data extraction, quality assessment, data synthesis and report writing. Catriona McDaid (Research Fellow) contributed to data extraction, quality assessment,

data synthesis and report writing. Sara Suekarran (Research Fellow) was involved in data extraction, quality assessment and report writing. Gill Norman (Research Fellow) contributed to the protocol, study selection and data extraction. Lindsey Myers (Information Specialist) devised the search strategy, carried out the literature searches, managed the references and wrote the search methodology sections of the report. Amanda Sowden (Deputy Director) contributed to the protocol, checking of data extraction and quality assessment and report writing and had overall responsibility for the project.



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Appendix I

Organ donation legislation by country

Please note that the information provided in this appendix is gathered from a variety of sources and may not be up to date. The accuracy of the information has not been checked.

Country	Type of consent	Legislation (section of law and date)	Further information on organ donation legislation and practice in the country	Information gathered from
Argentina	PC	December 2005		Mizraji <i>et al.</i> ^a and Neto <i>et al.</i> ³⁷
Australia	IC	1982	Donor registry since November 2000	Appendix C, Abadie and Gay ³³ Source: Australian Ministry of Health (www.health.gov.au/nhmrc/publications/fullhtml/e33.htm)
Austria	PC	Section 62A, 1 June 1982	Non-donor registry since 1995. Families have no say in the decision	Appendix C, Abadie and Gay ³³ Source: Price, ^b p. 88
Belgium	PC	13 June 1986	Combined registry since 1987. Price ^b states that only 1.8% of Belgians were registered as non-donors up to the year 2000 Families should be informed and could potentially object to organ donation. Price ^b cites Kennedy <i>et al.</i> The case of 'presumed consent' in organ donation. <i>Lancet</i> 1998; 351 :1650–2; family refusal is below 10% so far in Belgium	Appendix C, Abadie and Gay ³³ Source: Belgian Government website (www.belgium.be/eportal/application?origin=searchResults.jsp&event=bea.portal.framework.internal.refresh&pageid=contentPage&docId=3049 ; accessed 24 March 2004)
Brazil	IC	10.221 in 2001	PC commenced 1 January 1998. At this time every Brazilian citizen became a potential donor after death, unless he/she had registered an objection against donation in personal documents. However, this law was highly criticised by different institutions. Because of this pressure the Brazilian government abolished PC Law No. 9.434 1997 brought in PC; the law was regulated by Decree No. 2.268 in 1998; PC was replaced with consented donation by Law No. 10.221 in 2001	Peron <i>et al.</i> ^c and Neto <i>et al.</i> ³⁷
Bulgaria	PC	1996	In practice, consent from the next of kin is required	Appendix C, Abadie and Gay ³³ Source: Machado ^d

continued

Country	Type of consent	Legislation (section of law and date)	Further information on organ donation legislation and practice in the country	Information gathered from
Canada	IC	Uniform Human Tissue Donation Act of 1980	The date of enactment in state law varies: Alberta: Human Tissue Act 1967; British Columbia: Human Tissue Gift Act 1974; Manitoba: Human Tissue Gift Act 1987; New Brunswick: Human Tissue Gift Act 1973 and Human Tissue Gift Act 1986; Newfoundland: Act No. 78 of 1966; Nova Scotia: Human Tissue Gift Act 1964; Ontario: Human Tissue Gift Act 1982; Prince Edward Island: Human Tissue Donation Act 1992; Quebec: Civil Law of 1993 Articles 42, 43 and 44	Appendix C, Abadie and Gay ³³ Source: Price; ^b for Quebec, personal communication with Mance Cleroux of Quebec Transplant
Chile	IC	Law No. 19451 of 29 March 1996	Title III. The removal of organs from deceased persons (Sections 7–12). Under Section 8 any fully competent person may donate his body or parts thereof for organ transplantation for therapeutic purposes. Section 9 lays down that the donor's wishes are to be expressed in a declaration signed in the presence of a notary. Further details at www.who.int/idhl-rils/results.cfm?language=english&type=ByCountry&strRefCode=Chile&strTopicCode=IVC	Neto <i>et al.</i> ³⁷ and WHO International Digest of Health Legislation (www.who.int/idhl-rils/frame.cfm?language=english ; accessed 17 March 2008)
Costa Rica	PC	Law No. 7409 of 12 May 1994	Chapter III, Section 9 lays down that organs or anatomical materials may be removed from deceased persons if the latter have not left a record of their opposition thereto. Section 10 says that any person may express his wish not to have organs or other anatomical materials removed after his death. Details are given of the procedures for submitting and recording this information. Section 11 requires all persons when renewing their identity papers to complete a form in which they express their consent or opposition to the donation of organs, anatomical materials, or parts thereof after their death. Further details at www.who.int/idhl-rils/results.cfm?language=english&type=ByCountry&strRefCode=Costa&strTopicCode=IVC	Neto <i>et al.</i> ³⁷ and WHO International Digest of Health Legislation (www.who.int/idhl-rils/frame.cfm?language=english ; accessed 17 March 2008)
Croatia	PC	2000		Appendix C, Abadie and Gay ³³ Source: personal communication with Igor Porzanovic from Network Croatia
Czech Republic	PC	Act 285/2002 of 30 May 2002	A new law was passed on 1 September 2002 that established a stronger version of PC than the previous law. No registry in place for non-donors	Expert peer reviewer and Appendix C, Abadie and Gay ³³ Sources: Blasszauer ^e and www.radio.cz/en/article/44780
Denmark	IC	Law No. 402v of 13 June 1990 and as amended by Law No. 432 of 29 May 2001	Previously PC in practice by Law No. 246 of 9 June 1967. Combined registry since 1990	Expert peer reviewer and Appendix C, Abadie and Gay ³³ Source: personal communication with Håkan Gäbel of Socialstyrelsen

Country	Type of consent	Legislation (section of law and date)	Further information on organ donation legislation and practice in the country	Information gathered from
Estonia	PC			Appendix C, Abadie and Gay ³³ Source: Eurotransplant
Finland	PC	Act No. 101/2001 of 2 February 2001	Previously Law No. 355 of 26 April 1985 and Ordinance No. 724 of 23 August 1985	Expert peer reviewer and Appendix C, Abadie and Gay ³³ Source: personal communication with Håkan Gäbel of Socialstyrelsen
France	PC	Caillavet Law (No. 76–1181) of 22 December 1976 and the Bioethics Law No. 94–654 of 29 July 1994	Non-donor registry since 1990 as well as a donor card system. In practice, families can override the intent of deceased relatives	Appendix C, Abadie and Gay ³³ Source: personal communication with Philippe Tuppin and Geneviève Olivier of Etablissement Français des Greffes
Germany	IC	Act on the Donation, Removal and Transplantation of Organs of 5 November 1997	Before the law Germany was already IC in practice. No existing registry in place	Appendix C, Abadie and Gay ³³ Source: personal communication with Claudia Hagel of Deutsche Stiftung Organtransplantation
Greece	PC	Law 2737 of August 27 1999	Was already a PC country in practice by Law No. 821 of 1978 modified by Law No. 1383 of 2 August 1983	Appendix C, Abadie and Gay ³³ Source: Canellopoulou-Bottis ^f
Hungary	PC	Ordinance No. 18 of 4 November 1972	Non-donor registry since 1999	Appendix C, Abadie and Gay ³³ Sources: Machado ^d and personal communication with Håkan Gäbel of Socialstyrelsen
Ireland	IC			Appendix C, Abadie and Gay ³³ Sources: Irish Donation Network and Beaumont Hospital
Israel	PC	Anatomy and Pathology of 1953		Appendix C, Abadie and Gay ³³ Source: Grunfeld ^g

continued

Country	Type of consent	Legislation (section of law and date)	Further information on organ donation legislation and practice in the country	Information gathered from
Italy	PC	Law No. 91 of 1 April 1999	In practice, families are consulted before organs extracted; they can object to donation and do so in 15–20% of cases. Combined registry since 2000	Expert peer reviewer and Appendix C, Abadie and Gay ³³ Sources: Venettoni ^h and personal communication with Caterina Delvecchio of Italian National Transplant Centre
Latvia	PC			Appendix C, Abadie and Gay ³³ Source: Eurotransplant
Lithuania	IC			Appendix C, Abadie and Gay ³³ Source: Eurotransplant
Luxembourg	PC	25 November 1982		Appendix C, Abadie and Gay ³³ Source: Machado ^d
Netherlands	IC	24 May 1996	Before 1996 the country was already an IC country in practice. Combined registry since 1998. All inhabitants of the Netherlands aged 12 and above can register their wishes pertaining to organ and tissue donation in a central Donor Registry. By filling in a donor form and sending it to the (so-called) Donor Registry they can specify their wishes ('yes' or 'no'). At the moment about 37% of Dutch people have made such a registration, with the other 63% asking family/relatives to make a decision about donation. Family refusal is currently around 80%. If someone is registered as a donor it is not possible for family/relatives to object; however, when doctors find that psychological damage will be done to someone when donation does take place they will likely refuse to carry out the operation. In the Donor Registry, 37% of Dutch people have registered and 54% have said that they want to be a donor	Appendix C, Abadie and Gay ³³ Source: personal communication with Elise van Hees of NIGZ-Donorvoorlichting
New Zealand	IC	Human Tissue Act of 1964	Families have a say in the process of organ donation. Organ donation services include a driver's license database recording if the individual is a donor or not	Appendix C, Abadie and Gay ³³ Source: personal communication with Sharon Woollaston, New Zealand Ministry of Health
Norway	PC	Law No. 6 of 9 February 1973	In practice the relatives have a say in the decision and can potentially object. If no relative can be found, organs can be harvested. Norway does not have a registry for opting out. A patients' organisation has introduced a donor card, available at pharmacies, but it is not universally known and has no official or legal status	Appendix C, Abadie and Gay ³³ Source: personal communication with Håkan Gäbel of Socialstyrelsen

Country	Type of consent	Legislation (section of law and date)	Further information on organ donation legislation and practice in the country	Information gathered from
Panama	PC	Law No. 52 of 12 December 1998	'Legal presumption of donation' (the wish to donate is presumed if a person has abstained during his lifetime from exercising his right to refuse the removal of organs or anatomical parts from his body after his death and if, within a period of 6 hours from the occurrence of brain death or before the beginning of a medicolegal autopsy, the members of the deceased's family do not present at least prima facie evidence of their status and express their opposition to such donation). Further details at www.who.int/idhlriils/results.cfm?language=english&type=ByTopic&strTopicCode=IVC&strRefCode=Pan	Neto <i>et al.</i> ³⁷ and WHO International Digest of Health Legislation (www.who.int/idhl-rils/frame.cfm?language=english ; accessed 17 March 2008)
Poland	PC	Article No. 91–408 of August 30 1990	Non-donor registry in place since 1996. Under the law of 26 October 1995, Article 4, Poland applies a strong PC policy	Appendix C, Abadie and Gay ³³ Source: Price, ^b p. 94
Portugal	PC	No. 12 of 22 April 1993	Non-donor registry in place since 1994	Appendix C, Abadie and Gay ³³ Sources: Machado ^d and personal communication with Håkan Gäbel of Socialstyrelsen
Romania	IC	1998	Before 1998 it was already an IC country in practice. Combined registry in place since 1996	Appendix C, Abadie and Gay ³³ Source: personal communication with Håkan Gäbel of Socialstyrelsen
Singapore	PC	Human Organ Transplant Act 1987	Authorities may remove organs after death: (1) the designated officer of a hospital may, subject to and in accordance with this section, authorise, in writing, the removal of any organ from the body of a person who has died in the hospital for the purpose of the transplantation of the organ to the body of a living person; (2) no authority shall be given under subsection (1) for the removal of the organ from the body of any deceased person (a) who has during his lifetime registered his objection with the Director to the removal of the organ from his body after his death, (b) who is neither a citizen nor a permanent resident of Singapore, (c) who is below 21 years of age unless the parent or guardian has consented to such removal, (d) who is above 60 years of age, (e) whom the designated officer, after making such inquiries as are reasonable in the circumstances, has reason to believe was not of sound mind, unless the parent or guardian has consented to such removal or (f) who is a Muslim	WHO International Digest of Health Legislation (www.who.int/idhl-rils/frame.cfm?language=english ; accessed 17 March 2008)

continued

Country	Type of consent	Legislation (section of law and date)	Further information on organ donation legislation and practice in the country	Information gathered from
Slovak Republic	PC	24 August 1994, Section 47		Appendix C, Abadie and Gay ³³ Source: Price, ^b p. 94
Slovenia	PC	2000	Already practised PC by the Law of the Transplantation of Human's Body Parts of 1996	Appendix C, Abadie and Gay ³³ Sources: Price ^b and Eurotransplant
Spain	PC	No. 30 of 30 October 1979	The family has a right to veto the deceased's decision to donate. In practice this happens in only 21% of cases	Appendix C, Abadie and Gay ³³ Source: personal communication with Ana Garcia Pozo of Organización Nacional de Trasplantes, Ministerio de Salud y Consumo (www.msc.es/Diseno/informacionProfesional/profesional_trasplantes.htm)
Sweden	PC	1996	Between 1987 and 1996 Sweden was an IC country; before 1987 the country was PC. Families can potentially veto donations if the wishes of the deceased relative are unknown (relatives now say 'no' in 50% of cases in which organ donation is considered – in half of those cases they claim that the deceased was opposed but this may not be the case). Combined registry but mainly used as a non-donor registry	Appendix C, Abadie and Gay ³³ Sources: Machado ^d and personal communication with Håkan Gåbel of Socialstyrelsen
Switzerland	IC (but see further information)	Federal Order of 22 March 1996	The country is divided into cantons that have their own legislation. The following cantons have PC legislation: Appenzell (laws of 1974 and 1992); Argovie (1987); Bale-Campagne (1988); Bale-Ville (1981); Berne (1984); Geneva (1996); Grisons (1984); Lucerne (1981); Neuchatel (1995); Nidwald (1981); St-Gall (1979); Turgovia (1985); Valais (1996); Vaud (1985); Zurich (1991)	Appendix C, Abadie and Gay ³³ Source: personal communication with Klinger Susanne of Swisstransplant
UK	IC	The Human Tissue Act 2004 (England, Wales and Northern Ireland), the Human Tissue Act 2006 (Scotland) and the Human Organ Transplants Act 1989	Donor registry has been considered An 'opt in' donor registry has been in existence since 1994 – currently about 25% of the population are registered	Expert peer reviewer and Appendix C, Abadie and Gay ³³ Source: personal communication with Phil Pocock of UK Transplant and UK Transplant website (www.uktransplant.org.uk/about_transplants/legislation/legislation.htm)

Country	Type of consent	Legislation (section of law and date)	Further information on organ donation legislation and practice in the country	Information gathered from
USA	IC	Uniform Anatomical Gift Act of 1968, revised in 1987	Donor registries in 31 states; registers are being considered in some other states	Appendix C, Abadie and Gay ³³ Sources: United Network for Organ Sharing (www.unos.org/intheNews/factsheets.asp?fs=6) and private communication with Jim Burdick, HRSA
Venezuela	IC			Neto et al. ³⁷

IC, informed consent; PC, presumed consent; WHO, World Health Organization.

a Mizraji R, Alvarez I, Palacios RI, Fajardo C, Berrios C, Morales F, et al. Organ donation in Latin America. *Transplant Proc* 2007;**39**:333–5.

b Price D. *Legal and ethical aspects of organ transplantations*. Cambridge: Cambridge University Press; 2001.

c Peron AL, Rodrigues AB, Leite DA, Lopes JL, Ceschim PC, Alter R, et al. Organ donation and transplantation in Brazil: university students' awareness and opinions. *Transplant Proc* 2004;**36**:811–3.

d Machado N. *Using the bodies of the dead: legal, ethical and organizational dimensions of organ transplantation*. Aldershot: Dartmouth; 1998.

e Blasszauer B. *Hungary: the ethics of presumed consent in ethical eye transplants*. Strasbourg: Council of Europe Publishing; 2003.

f Canellopoulou-Bottis M. A new law on organ donation in Greece: one more effort to advance transplants. *Eur J Health Law* 2000;**7**:427–39.

g Grunfeld GB. Ethical issues in organ transplantation in Israel. *Eubios J Asian Int Bioeth* 1996;**6**:169.

h Venetoni S, Costa A, Di Ciccio P, Ghirardini A, Mattucci D, Santangelo G, et al. Italy's successful restructuring programme. In Morris P, editor. *Ethical eye: transplants*. Strasbourg: Council of Europe Publishing; 2003. pp. 105–16.

Appendix 2

Search strategy

The core search strategy used for this review was as follows:

1. Presumed Consent/
2. Informed Consent/
3. (presum\$adj3 consent\$).ti,ab.
4. (assum\$adj3 consent\$).ti,ab.
5. (tacit adj3 consent\$).ti,ab.
6. opt out.ti,ab.
7. opting out.ti,ab.
8. or/1–8
9. Tissue Donors/
10. ((cadaver or deceased) adj2 donor\$).ti,ab.
11. ((postmortem or post mortem) adj2 donor\$).ti,ab.
12. ((deceased or dead) adj2 donor\$).ti,ab.
13. ((organ or organs) adj3 donor\$).ti,ab.
14. ((transplant or transplantation) adj2 donor\$).ti,ab.
15. (tissue adj3 donor\$).ti,ab.
16. "Tissue and Organ Procurement"/
17. "Tissue and Organ Harvesting"/
18. ((cadaver or deceased) adj2 (donat\$or harvest\$)).ti,ab.
19. ((postmortem or post mortem) adj2 (donat\$or harvest\$)).ti,ab.
20. ((deceased or dead) adj2 (donat\$or harvest\$)).ti,ab.
21. ((organ or organs) adj3 (donat\$or procure\$or harvest\$)).ti,ab.
22. (tissue adj3 (donat\$or procure\$or harvest\$)).ti,ab.
23. or/9–22
24. 8 and 23
25. Animals/
26. Humans/
27. 25 not (25 and 26)
28. 24 not 27
29. (editorial or historical article or letter).pt.
30. 28 not 29

This strategy was designed for searching MEDLINE through the Ovid interface and was adapted as appropriate for all other databases searched, taking into account differences in indexing terms and search syntax for each database.

Full details of all databases searched and search strategies are provided below.

MEDLINE and MEDLINE In-Process: Ovid (<http://gateway.ovid.com/athens>)

The MEDLINE search covered the date range 1950–January 2008 (Week 1). The search was carried out on 15 January 2008 and identified 1675 records.

1. Presumed Consent/
2. Informed Consent/
3. (presum\$adj3 consent\$).ti,ab.
4. (assum\$adj3 consent\$).ti,ab.
5. (tacit adj3 consent\$).ti,ab.
6. opt out.ti,ab.
7. opting out.ti,ab.
8. or/1–8
9. Tissue Donors/
10. ((cadaver or deceased) adj2 donor\$).ti,ab.
11. ((postmortem or post mortem) adj2 donor\$).ti,ab.
12. ((deceased or dead) adj2 donor\$).ti,ab.
13. ((organ or organs) adj3 donor\$).ti,ab.
14. ((transplant or transplantation) adj2 donor\$).ti,ab.
15. (tissue adj3 donor\$).ti,ab.
16. "Tissue and Organ Procurement"/
17. "Tissue and Organ Harvesting"/
18. ((cadaver or deceased) adj2 (donat\$or harvest\$)).ti,ab.
19. ((postmortem or post mortem) adj2 (donat\$or harvest\$)).ti,ab.
20. ((deceased or dead) adj2 (donat\$or harvest\$)).ti,ab.
21. ((organ or organs) adj3 (donat\$or procure\$or harvest\$)).ti,ab.
22. (tissue adj3 (donat\$or procure\$or harvest\$)).ti,ab.
23. or/9–22
24. 8 and 23
25. Animals/
26. Humans/
27. 25 not (25 and 26)
28. 24 not 27
29. (editorial or historical article or letter).pt.
30. 28 not 29

EMBASE: Ovid (<http://gateway.ovid.com/athens>)

The EMBASE search covered the date range 1980–2008 (Week 2). The search was carried out on 15 January 2008 and identified 760 records.

1. informed consent/
2. (presum\$adj3 consent\$.ti,ab.
3. (assum\$adj3 consent\$.ti,ab.
4. (tacit adj3 consent\$.ti,ab.
5. opt out.ti,ab.
6. opting out.ti,ab.
7. or/1–6
8. donor/or organ donor/
9. cadaver donor/
10. ((cadaver or deceased) adj2 donor\$.ti,ab.
11. ((postmortem or post mortem) adj2 donor\$.ti,ab.
12. ((deceased or dead) adj2 donor\$.ti,ab.
13. ((organ or organs) adj3 donor\$.ti,ab.
14. ((transplant or transplantation) adj donor\$.ti,ab.
15. (tissue adj3 donor\$.ti,ab.
16. transplantation/or organ transplantation/
17. ((cadaver or deceased) adj2 (donat\$or harvest\$)).ti,ab.
18. ((postmortem or post mortem) adj2 (donat\$or harvest\$)).ti,ab.
19. ((deceased or dead) adj2 (donat\$or harvest\$)).ti,ab.
20. ((organ or organs) adj3 (donat\$or procure\$or harvest\$)).ti,ab.
21. (tissue adj3 (donat\$or procure\$or harvest\$)).ti,ab.
22. or/8–21
23. 7 and 22
24. ANIMAL/
25. Human/
26. 24 not (24 and 25)
27. 23 not 26
28. (editorial or letter).pt.
29. 27 not 28

CINAHL: Ovid (<http://gateway.ovid.com/athens>)

The CINAHL search covered the date range 1982–December 2007 (Week 1). The search was carried out on 15 January 2008 and identified 371 records.

1. Consent/
2. (presum\$adj3 consent\$.ti,ab.
3. (assum\$adj3 consent\$.ti,ab.
4. (tacit adj3 consent\$.ti,ab.
5. opt out.ti,ab.
6. opting out.ti,ab.

7. or/1–6
8. Transplant Donors/
9. ((cadaver or deceased) adj2 donor\$.ti,ab.
10. ((postmortem or post mortem) adj2 donor\$.ti,ab.
11. ((deceased or dead) adj2 donor\$.ti,ab.
12. ((organ or organs) adj3 donor\$.ti,ab.
13. ((transplant or transplantation) adj donor\$.ti,ab.
14. (tissue adj3 donor\$.ti,ab.
15. Organ Procurement/
16. “Tissue and Organ Harvesting”/
17. ((cadaver or deceased) adj2 (donat\$or harvest\$)).ti,ab.
18. ((postmortem or post mortem) adj2 (donat\$or harvest\$)).ti,ab.
19. ((deceased or dead) adj2 (donat\$or harvest\$)).ti,ab.
20. ((organ or organs) adj3 (donat\$or procure\$or harvest\$)).ti,ab.
21. (tissue adj3 (donat\$or procure\$or harvest\$)).ti,ab.
22. or/8–21
23. 7 and 22
24. (letter or editorial).pt.
25. 23 not 24

PsycINFO: Ovid (<http://gateway.ovid.com/athens>)

The PsycINFO search covered the date range 1806–January 2008 (Week 2). The search was carried out on 15 January 2008 and identified 36 records.

1. informed consent/
2. (presum\$adj3 consent\$.ti,ab.
3. (assum\$adj3 consent\$.ti,ab.
4. (tacit adj3 consent\$.ti,ab.
5. opt out.ti,ab.
6. opting out.ti,ab.
7. or/1–6
8. ((cadaver or deceased) adj2 donor\$.ti,ab.
9. ((postmortem or post mortem) adj2 donor\$.ti,ab.
10. ((deceased or dead) adj2 donor\$.ti,ab.
11. ((organ or organs) adj3 donor\$.ti,ab.
12. ((transplant or transplantation) adj donor\$.ti,ab.
13. (tissue adj3 donor\$.ti,ab.
14. tissue donation/
15. ((cadaver or deceased) adj2 (donat\$or harvest\$)).ti,ab.
16. ((postmortem or post mortem) adj2 (donat\$or harvest\$)).ti,ab.

17. ((deceased or dead) adj2 (donat\$or harvest\$)).ti,ab.
18. ((organ or organs) adj3 (donat\$or procure\$or harvest\$)).ti,ab.
19. (tissue adj3 (donat\$or procure\$or harvest\$)).ti,ab.
20. or/8–19
21. 7 and 20

HMIC: Ovid (<http://gateway.ovid.com/athens>)

The HMIC search covered the date range 1979–November 2007. The search was carried out on 17 January 2008 and identified 39 records.

1. consent/or informed consent/
2. (presum\$adj3 consent\$).ti,ab.
3. (assum\$adj3 consent\$).ti,ab.
4. (tacit adj3 consent\$).ti,ab.
5. opt out.ti,ab.
6. opting out.ti,ab.
7. or/1–6
8. donors/or organ donors/
9. ((cadaver or deceased) adj2 donor\$).ti,ab.
10. ((postmortem or post mortem) adj2 donor\$).ti,ab.
11. ((deceased or dead) adj2 donor\$).ti,ab.
12. ((organ or organs) adj3 donor\$).ti,ab.
13. ((transplant or transplantation) adj donor\$).ti,ab.
14. (tissue adj3 donor\$).ti,ab.
15. organ donation/
16. organ procurement/
17. ((cadaver or deceased) adj2 (donat\$or harvest\$)).ti,ab.
18. ((postmortem or post mortem) adj2 (donat\$or harvest\$)).ti,ab.
19. ((deceased or dead) adj2 (donat\$or harvest\$)).ti,ab.
20. ((organ or organs) adj3 (donat\$or procure\$or harvest\$)).ti,ab.
21. (tissue adj3 (donat\$or procure\$or harvest\$)).ti,ab.
22. or/8–21

PAIS: CSA Illumina (www.csa.lco.uk/csailumina/login.php)

The PAIS search covered the date range 1972 to date. The search was carried out on 17 January 2008 and identified 18 records.

1. DE=informed consent
2. KW=(presum* within 3 consent*)
3. kW=(assum* within 3 consent*)

4. KW=(tacit within 3 consent*)
5. KW=(opt out)
6. KW=(opting out)
7. #1 or #2 or #3 or #4 or #5 or #6
8. KW=((cadaver or deceased) within 2 donor*)
9. KW=((postmortem or post mortem) within 2 donor*)
10. KW=((deceased or dead) within 2 donor*)
11. KW=((organ or organs) within 3 donor*)
12. KW=(transplant donor* or transplantation donor*)
13. KW=(tissue within 3 donor*)
14. KW=((cadaver or deceased) within 2 (donat* or harvest*))
15. KW=((postmortem or post mortem) within 2 (donat* or harvest*))
16. KW=((deceased or dead) within 2 (donat* or harvest*))
17. KW=((organ or organs) within 3 (donat* or procure* or harvest*))
18. KW=(tissue within 3 (donat* or procure* or harvest*))
19. #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18
20. #7 and #19

OpenSIGLE: Internet (<http://opensigle.inist.fr/>)

The OpenSIGLE website search was carried out on 17 January 2008. Details of 19 potentially relevant documents were downloaded for consideration by the reviewer.

The search function 'Browse – Communities and Collections' was used to identify the '06 – Biological and medical sciences' and the '05 – Humanities, psychology and social sciences' collections. Searches were carried out within these collections using the terms: ((donor* or donat* or harvest* or procure*) AND (tissue or organ or organs or cadaver or deceased or postmortem or "post mortem" or deceased or dead))

Internet

Internet searching was carried out via the specialist search engine Intute: Health and Life Sciences – Medicine and the meta-search engine Copernic.

Intute: Health and Life Sciences – Medicine: Internet (www.intute.ac.uk/healthandlifesciences/)

The Intute: Health and Life Sciences – Medicine search was carried out on 13 February 2008. The

search function 'Browse – Medicine browse using MeSH keywords' was used to identify web resources. Resources indexed with the following MeSH keywords were scanned for relevance:

Informed Consent
 Informed Consent/legislation & jurisprudence
 Informed Consent/standards
 Tissue Donors
 Tissue and Organ Harvesting
 Tissue and Organ Procurement
 In addition, the following terms were entered line-by-line in the 'advanced search':
 (presum* OR assume* OR tacit) AND consent*
 "opt-out" OR "opt out"
 "opting-out" OR "opting out"
 (cadaver OR deceased) AND donor*
 postmortem donor*
 ("post mortem" OR "post-mortem") AND donor*
 (deceased OR dead) AND donor*
 (organ OR organs) AND donor*
 (transplant OR transplantation) AND donor*
 tissue AND donor*
 (cadaver or deceased) AND (donat* or harvest*)
 postmortem AND (donat* or harvest*)
 ("post mortem" OR "post-mortem") AND donat*
 ("post mortem" OR "post-mortem") AND harvest*
 (deceased or dead) AND (donat* or harvest*)
 (organ or organs) AND (donat* or procure*)
 (organ or organs) AND harvest*
 tissue AND (donat* or procure* or harvest*)

The web resources identified through Intute were scanned and five potentially relevant documents were downloaded for consideration by the reviewers.

Copernic (www.copernic.com)

The Copernic search was carried out on 18 February 2008.

The search interface for Copernic allows only simple searching. The following terms were entered line-by-line:

presumed consent [Exact phrase]
 presum consent organ [All words]
 presum consent donor [All words]
 presum consent donat [All words]
 assum consent organ [All words]
 assum consent donor [All words]
 assum consent donat [All words]
 tacit consent organ [All words]
 tacit consent donor [All words]
 tacit consent donat [All words]

"opt out" organ [All words]
 "opt out" donor [All words]
 "opt out" donat [All words]
 "opting out" organ [All words]
 "opting out" donor [All words]
 "opting out" donat [All words]

The web resources identified through Copernic were scanned and nine potentially relevant web pages were downloaded for consideration by the reviewers.

Organisational websites

Searches performed on Intute and Copernic identified relevant organisational websites worthy of further investigation. Searches of the following organisational websites were carried out.

Department of Health – Transplantation: Internet (www.dh.gov.uk/en/Healthcare/Secondarycare/Transplantation/index.htm)

The Department of Health Transplantation web pages search was carried out on 15 February 2008. Six potentially relevant documents were downloaded for consideration by the reviewers.

Department of Health – Consent: Internet (www.dh.gov.uk/en/PublicHealth/Scientificdevelopmentgeneticsandbioethics/Consent/index.htm)

The Department of Health Consent web pages search was carried out on 15 February 2008. Two potentially relevant documents were downloaded for consideration by the reviewers.

Human Tissue Authority: Internet (www.hta.gov.uk/about_hta.cfm)

The Human Tissue Authority website search was carried out on 15 February 2008. One potentially relevant document was downloaded for consideration by the reviewers.

The Internet Journal of Law, Healthcare and Ethics: Internet (www.ispub.com/ostia/index.php?xmlFilePath=journals/ijlhe/front.xml)

Issues of the journal, from volume 1(1) 2000 to volume 5(1) 2007, were scanned for relevant material on 15 February 2008. Three potentially relevant articles were downloaded for consideration by the reviewers.

**The Danish Council of Ethics:
Internet (www.etiskraad.dk)**

The Danish Council of Ethics website search was carried out on 15 February 2008. One potentially relevant document was downloaded for consideration by the reviewers.

**Council of Europe: Internet
(www.coe.int)**

The Council of Europe website search was carried out on 15 February 2008. Three potentially relevant documents were downloaded for consideration by the reviewers.

**European Society for Organ
Transplantation: Internet
(www.esot.org)**

The European Society for Organ Transplantation (ESOT) website search was carried out on 15 February 2008. No relevant documents were identified.

**European Transplant Coordinators
Organization: Internet (www.etco.org)**

The European Transplant Coordinators Organization (ETCO) website search was carried out on 15 February 2008. No relevant documents were identified.

**bmj.com Collected Resources – Organ
Donation: Internet ([www.bmj.com/
cgi/collection/organ_donations](http://www.bmj.com/cgi/collection/organ_donations))**

The BMJ Organ Donation Collected Resources web pages search was carried out on 18 February 2008. One potentially relevant article was downloaded for consideration by the reviewers.

**UK Transplant: Internet ([www.
uktransplant.org.uk/ukt/](http://www.uktransplant.org.uk/ukt/))**

The UK Transplant website search was carried out on 18 February 2008. No relevant documents were identified.

**Continuing Medical Education (CME)
on Transplantation: Internet ([http://
www.cmeontransplantation.com](http://www.cmeontransplantation.com))**

The CME on Transplantation website search was carried out on 18 February 2008. No relevant documents were identified.

**MRC Centre for Transplantation:
Internet ([www.kcl.ac.uk/schools/
medicine/research/transplantation](http://www.kcl.ac.uk/schools/medicine/research/transplantation))**

The MRC Centre for Transplantation web pages search was carried out on 18 February 2008. No relevant documents were identified.

**Sheffield Institute of Biotechnological
Law and Ethics: Internet ([www.
shef.ac.uk/law/sible/index.html](http://www.shef.ac.uk/law/sible/index.html))**

The Sheffield Institute of Biotechnological Law and Ethics (SIBLE) web pages search was carried out on 18 February 2008. No relevant documents were identified.

**UK Clinical Ethics Network: Internet
(www.ethics-network.org.uk)**

The UK Clinical Ethics Network website search was carried out on 18 February 2008. No relevant documents were identified.

**World Health Organization –
Transplantation: Internet ([www.
who.int/transplantation/en](http://www.who.int/transplantation/en))**

The WHO Transplantation web pages search was carried out on 18 February 2008. No relevant documents were identified.

**Agence de la Biomédecine:
Internet ([www.agence-
biomedecine.fr/en/index.asp](http://www.agence-biomedecine.fr/en/index.asp))**

The Agence de la Biomédecine website search was carried out on 18 February 2008. No relevant documents were identified.

**Organizacion Nacional de
Trasplantes: Internet (www.ont.es)**

The Organizacion Nacional de Trasplantes (ONT) website search was carried out on 18 February 2008. No relevant documents were identified.

**Scandiatransplant: Internet
(www.scandiatransplant.org)**

The Scandiatransplant website search was carried out on 19 February 2008. No relevant documents were identified.

**ALLIANCE-O: Internet
(www.alliance-o.org)**

The ALLIANCE-O website search was carried out on 19 February 2008. Two potentially relevant documents were downloaded for consideration by the reviewers.

**The Swedish National Council on
Medical Ethics: Internet (www.smer.se)**

The Swedish National Council on Medical Ethics (SMER) website search was carried out on 19 February 2008. No relevant documents were identified.

The Norwegian Biotechnology Advisory Board: Internet (www.bion.no)

The Norwegian Biotechnology Advisory Board website search was carried out on 19 February 2008. No relevant documents were identified.

The National Advisory Board on Health Care Ethics: Internet (www.etene.org)

The National Advisory Board on Health Care Ethics (ETENE) website search was carried out on 19 February 2008. No relevant documents were identified.

Nordic Committee on Bioethics: Internet (www.ncbio.org)

The Nordic Committee on Bioethics website search was carried out on 20 February 2008. No relevant documents were identified.

Belgian Advisory Committee on Bioethics: Internet (www.health.fgov.be/bioeth/index.html)

The Belgian Advisory Committee on Bioethics website search was carried out on 20 February 2008. No relevant documents were identified.

Comité Consultatif National d’Ethique: Internet (www.ccne-ethique.fr)

The Comité Consultatif National d’Ethique (CCNE) website search was carried out on 20 February 2008. No relevant documents were identified.

German Reference Centre for Ethics in the Life Sciences: Internet (www.drze.de)

The German Reference Centre for Ethics in the Life Sciences (DRZE) website search was carried out on 20 February 2008. No relevant documents were identified.

Irish Council for Bioethics: Internet (www.bioethics.ie)

The Irish Council for Bioethics website search was carried out on 20 February 2008. No relevant documents were identified.

National Bioethics Committee: Internet (www.palazzochigi.it/bioetica)

The National Bioethics Committee website search was carried out on 20 February 2008. No relevant documents were identified.

Centre for Ethics and Health of the Netherlands: Internet (www.ceg.nl)

The Centre for Ethics and Health of the Netherlands (CEG) website search was carried out on 20 February 2008. No relevant documents were identified.

National Council of Ethics for the Life Sciences: Internet (www.cnecv.gov.pt)

The National Council of Ethics for the Life Sciences (CNECV) website search was carried out on 21 February 2008. No relevant documents were identified.

European Group on Ethics in Science and New Technologies: Internet (http://ec.europa.eu/european_group_ethics/index_en.htm)

The European Group on Ethics in Science and New Technologies (EGE) website search was carried out on 21 February 2008. No relevant documents were identified.

Australian Health Ethics Committee: Internet (www.nhmrc.gov.au/ethics/human/ahec/index.htm)

The Australian Health Ethics Committee (AHEC) website search was carried out on 21 February 2008. No relevant documents were identified.

UNESCO International Bioethics Committee: Internet (http://portal.unesco.org/shs/en/ev.php-URL_ID=1372&URL_DO=DO_TOPIC&URL_SECTION=201.html)

The International Bioethics Committee (IBC) website search was carried out on 21 February 2008. No relevant documents were identified.

Commission on Ethics, Science and Technology: Internet (www.ethique.gouv.qc.ca)

The Commission on Ethics, Science and Technology (CEST) website search was carried out on 21 February 2008. One potentially relevant document was downloaded for consideration by the reviewers.

Toi te Taiao – the Bioethics Council: Internet (www.bioethics.org.nz)

New Zealand’s Bioethics Council website search was carried out on 21 February 2008. No relevant documents were identified.

**Bioethics Advisory Committee: Internet
(www.bioethics-singapore.org)**

The Bioethics Advisory Committee (BAC) website search was carried out on 25 February 2008. No relevant documents were identified.

**National Bioethics Advisory
Commission: Internet ([http://
bioethics.georgetown.edu/nbac](http://bioethics.georgetown.edu/nbac))**

The National Bioethics Advisory Commission (NBAC) website search was carried out on 25 February 2008. No relevant documents were identified.

**British Transplantation Society:
Internet (www.bts.org.uk)**

The British Transplantation Society website search was carried out on 25 February 2008. No relevant documents were identified.

**Eurotransplant: Internet
(www.transplant.org)**

The Eurotransplant website search was carried out on 25 February 2008. No relevant documents were identified.

Appendix 3

Excluded studies

Excluded potential comparative papers	Reason for exclusion
Rosental R, Bicans J, Schevelev V. Impact of the presumed consent law on kidney procurement in Latvia. <i>Transplant Proc</i> 1996; 28 :371 ⁵⁹	Comparator is conscription under Soviet rule (Latvia)
Soh P, Lim SM. Impact of the opting-out system on kidney procurement in Singapore. <i>Transplant Proc</i> 1991; 23 :2523 ⁶⁰	Duplicate of an included study ⁴³
TNO, Prevention and Health. <i>Evaluation of the Dutch law on organ donation</i> . Leiden: TNO, Prevention and Health; 2001 ⁶¹	Cannot retrieve
Benoit G, Spira A, Nicoulet I, Moukarzel M. Presumed consent law: results of its application/outcome from an epidemiologic survey. <i>Transplant Proc</i> 1990; 22 :320–2 ⁶²	Studies reasons for failure of organ procurement rather than impact of presumed consent law
Ross SE, Nathan H, O'Malley KF. Impact of a required request law on vital organ procurement. <i>J Trauma</i> 1990; 30 :820–4 ⁶³	Studies impact of required request or routine inquiry law rather than presumed consent law
Brewer JC, Hunt MJ, Seely MS. Routine inquiry of organ and tissue donation: the Oregon experience. <i>Crit Care Nurs Clin North Am</i> 1994; 6 :567–74 ⁶⁴	
Matesanz R, Miranda B, Felipe C. Organ procurement in Spain: impact of transplant coordination. <i>Clin Transplant</i> 1994; 8 :281–6 ⁶⁵	Studies impact of infrastructural changes rather than change in law
Aigner G. An overview of legal aspects in organ transplantation – what are the family rights? <i>Ann Transplant</i> 2004; 9 :11–14 ⁶⁶	Discussion papers, not empirical studies
Auquier P, Reviron D, Erin CA, Sari I, Manuel C, Mercier P. Cadaver kidney transplantation: ethics and consent. <i>Eur J Epidemiol</i> 1995; 11 :495–9 ¹	
Bagheri A. Organ transplantation laws in Asian countries: a comparative study. <i>Transplant Proc</i> 2005; 37 :4159–62 ⁶⁷	
Buckley TA. The shortage of solid organs for transplantation in Hong Kong: part of a worldwide problem. <i>Hong Kong Med J</i> 2000; 6 :399–408 ⁶⁹	
Carmi A. Organ transplantation in the mirror of the recent world-wide legislation. <i>Med Law</i> 1996; 15 :341–9 ⁷⁰	
Chelminski PR. The procurement of vital organs: a synopsis of policy from various nations and the ethical implications of policy options. <i>Ren Fail</i> 1996; 18 :151–72 ⁷¹	
Fuenzalida-Puelma HL. Organ transplantation: the Latin American legislative response. <i>Bull Pan Am Health Organ</i> 1990; 24 :425–45 ⁷²	
Gevers JKM. [Organ Donation Act: against an objection system]. <i>Ned Tijdschr Geneesk</i> 2005; 149 :277 ⁷³	
Gevers S, Janssen A, Friele R. Consent systems for post mortem organ donation in Europe. <i>Eur J Health Law</i> 2004; 11 :175–86 ¹⁶	
Gundle K. Presumed consent: an international comparison and possibilities for change in the United States. <i>Camb Q Healthc Ethics</i> 2005; 14 :113–18 ⁷⁴	
Hessing DJ. The social dilemma of organ donation: opting in or opting out – is that the question? In Shanteau J, Harris RJ, editors. <i>Organ donation and transplantation: psychological and behavioral factors</i> . Washington, DC: American Psychological Association; 1992. pp. 71–82 ⁷⁵	
Janssen A, Gevers S. Explicit or presumed consent and organ donation post-mortem: does it matter? <i>Med Law</i> 2005; 24 :575–83 ¹⁴	
Jensen TR. Organ procurement: various legal systems and their effectiveness. <i>Houst J Int Law</i> 2000; 22 :555–84 ⁵⁸	

continued

Excluded potential comparative papers	Reason for exclusion
Koene RAP. [Evaluation of the Dutch Organ Donation Act: mostly disappointments]. <i>Ned Tijdsch Geneesk</i> 2002; 146 :652–4 ⁷⁶	
Kokkedee W. Kidney procurement policies in the Eurotransplant region. 'Opting in' versus 'opting out'. <i>Soc Sci Med</i> 1992; 35 :177–82 ⁷⁷	
Matesanz R. Deceased organ donation: comparison of legislation in various countries of Europe. <i>Nephrol Dial Transplant</i> 1998; 13 :1632–5 ⁷⁸	
Michielsens P. Presumed consent to organ donation: 10 years' experience in Belgium. <i>J R Soc Med</i> 1996; 89 :663–6 ⁶⁸	
Scott O, Jacobson E. Implementing presumed consent for organ donation in Israel: public, religious and ethical issues. <i>Isr Med Assoc J</i> 2007; 9 :777–81 ⁷⁹	
Stuart FP, Veith FJ, Cranford RE. Brain death laws and patterns of consent to remove organs for transplantation from cadavers in the United States and 28 other countries. <i>Transplantation</i> 1981; 31 :238–44 ⁸⁰	
Welin S, Lundin S. [Organ transplantation, ethics and culture in Japan. Japanese citizens may choose between cardiac death and brain death]. <i>Lakartidningen</i> 2001; 98 :662–5 ⁸¹	
Wilcox SA. Presumed consent organ donation in Pennsylvania: one small step for Pennsylvania, one giant leap for organ donation. <i>Dickinson Law Rev</i> 2003; 107 :935–51 ⁸²	
Wolfslast G. Comparative European legislation on organ procurement. <i>Baillieres Clin Anaesthesiol</i> 1999; 13 :117–19 ⁸³	

Appendix 4

Data extraction tables

Study methods	Results	Quality assessment
<p>Abadie and Gay 2006³³</p> <p>Study design: Between-country comparison</p> <p>PC countries included in the analysis (time period of interest, details of PC system):</p> <p>Austria (1993–2002) – PC law passed June 1982; non-donor registry since 1995</p> <p>Belgium (1993–2002) – PC law passed June 1986; combined registry since 1987; families should be informed and have potential to object</p> <p>Czech Republic (1994–2002) (1993 was not included because of inconsistencies in data on road traffic deaths) – PC law passed 1984; a stronger PC law was passed September 2002; no registry for non-donors</p> <p>Finland (1993–2002) – PC law passed 1985</p> <p>France (1993–2002) – PC country by Caillavet Law 1976, by Bioethics Law 1994; non-donor registry since 1990 plus donor card system; in practice family can override intent of deceased</p> <p>Hungary (1993–2002) – PC law passed November 1972; non-donor registry since 1999</p> <p>Italy (1993–2002) – PC laws June 1967, December 1975 and April 1999; combined registry since 2000; in practice family is consulted before organ extraction</p> <p>Norway (1993–2002) – PC law February 1973; no registry; family consulted before extraction and can potentially refuse; if no family members are found organs can be extracted; Donor cards present but do not have legal status</p> <p>Poland (1993–2002) – PC laws August 1990 and October 1995; non-donor registry since 1996</p> <p>Portugal (1994–2002) – (1993 not included because of change in legislation); PC law April 1993; non-donor registry since 1994</p>	<p>Donor rates (summary of results): The authors state that PC countries have an approximately 25–30% higher donation rate pmp per year than IC countries when other variables are held constant</p> <p>Coefficients from the regression analysis showing influence of PC when specific variables are included in the model:</p> <p>Model (M), variable(s) in model: coefficient (SE), <i>p</i>-value for PC variable, <i>r</i>² for the model:</p> <p>M1, PC only: 0.1559 (0.1352), ns; <i>r</i>² = 0.0587</p> <p>M2 PC excluding Spain: 0.1027 (0.1316), ns, <i>r</i>² = 0.0342</p> <p>M3 PC, GDP per capita: 0.2615 (0.1206), <i>p</i> = 0.1, <i>r</i>² = 0.2111</p> <p>M4 PC, health expenditure per capita: 0.2577 (0.1233), <i>p</i> = 0.1, <i>r</i>² = 0.2124</p> <p>M5 PC, GDP per capita, Catholic country, common law: 0.2839 (0.1294), <i>p</i> = 0.05, <i>r</i>² = 0.2754</p> <p>M6 PC, GDP per capita, Catholic country, common law, MVA and CVA deaths: 0.2562 (0.1386), <i>p</i> = 0.1, <i>r</i>² = 0.3216</p> <p>Deaths: 0.3111 (0.1238), <i>p</i> = 0.05, <i>r</i>² = 0.3111</p> <p>M8 PC, GDP per capita, common law, MVA and CVA deaths (excl Spain): 0.2493 (0.1164), <i>p</i> = 0.05, <i>r</i>² = 0.3636</p> <p>M7 PC, GDP per capita, common law, MVA and CVA</p> <p>An additional regression analysis was conducted in which blood donations per 1000 population (log) was also entered into the model as a proxy for social preferences:</p>	<p>Were appropriate countries/cohorts and time periods chosen? Partial. Time period seems appropriate. A total of 14 studies excluded for various reasons, which may have biased the findings, e.g. with the exception of one country the countries excluded on the basis of low kidney transplantation rates were PC countries and so this may have biased the findings in favour of PC</p> <p>Were potential confounders sought and, if found, adjusted for in the analysis? Yes</p> <p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? Yes</p> <p>Is it reasonably likely that the observed effects were attributable to PC effects alone? Unclear</p> <p>Statistician's comments:</p> <p>Strengths: The model accounts for clustering of observations with countries and uses longitudinal data over 10 years. Tests robustness of results by (1) considering different combinations of adjusting factors in a series of eight models, (2) using a different model specification pooling data from all years to test if country effects are pooling with the presence of consent laws and (3) including social preferences as a proxy for social attitudes to organ donation. <i>r</i>² and specification test results given, indicating the adequacy of fit of the model to the data</p> <p>Weaknesses: Some unexplained loss of observations in the model</p>

Study methods	Results	Quality assessment
Slovenia (1998–2000) (data of deceased donation only available for these dates) – PC since 2000 (was previously PC by law of 1996)	M9 PC, GDP per capita, Catholic country, common law, MVA and CVA deaths, blood donations: 0.2940 (0.1334) $p = 0.05$, $r^2 = 0.3705$	
Spain (1993–2002) – PC law 1979; in practice organs extracted with consent of families	M10 PC, GDP per capita, common law, MVA and CVA deaths, blood donations: 0.3613 (0.1158), $p = 0.05$, $r^2 = 0.3494$	
Sweden (1993–2002) – PC law 1996; previously IC between 1987 and 1996; family may veto donation if wishes of deceased are not known; combined registry in place	Which factors were statistically significant predictors of donor rates? List of factors (including PC); statistical significance of individual factors depended on the other factors entered into the model: PC (at 5% level) in M3, M4, M5, M7 and M8 (and M9 and M10), GDP per capita (at 5% level) in M6, M7 and M8, common law (at 5% level) in M8 (and M9 and M10), MVA and CVA (at 5% level) in M8	
Comparator (time period of interest, details of comparator system):		
Australia (1993–2002) – IC law 1982; donor registry since 2000		
Canada (1993–2002) – IC 1980	Family refusal rates: Not applicable	
Denmark (1993–2002) – IC law June 1990; previously PC by law of 1967; combined registry since 1990	Registration as non-donors: Not applicable Other outcomes: Not applicable	
Germany (1993–2002) – IC law November 1997; previously IC; no registry in place		
Ireland (1993–2002) – IC country; no law in place but follows UK guidelines		
Netherlands (1993–2002) – IC law May 1996; previously IC; combined registry since 1998; families make decisions for non-registered relatives and have a small influence on registered relatives	Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? No	
New Zealand (1993–2002) – IC law 1964		
UK (1993–2002) – IC laws 1961 and 1989; donor registry since 1994		
USA (1993–2002); IC law 1968, revised 1987; donor registries in several states		

continued

Study methods	Results	Quality assessment
<p>Was a rationale provided for the country/time period chosen? Yes (specify). In total, 22 countries were chosen for the regression analysis from the original 36 western Christian countries (Catholic and Protestant). This was to reduce variability in social norms (Bulgaria, Greece, Israel, Japan, Romania and Turkey excluded); countries for which data were not available were excluded (Bulgaria, Croatia, Cyprus, Estonia, Japan, Latvia, Lithuania and Romania); countries with a population under 1 million were excluded (Cyprus and Luxembourg); Switzerland was excluded because of legislation on organ donation defaults differing by region; countries that have not reached a rate of 20 kidney transplants pmp per year were excluded (Croatia, Greece, Slovak Republic, Romania and Turkey; the authors stated that this was because these countries may have a lack of transplant facilities and therefore legislative defaults would be unlikely to affect donation rates)</p>	<p>Outcomes: Deceased organ donation rates pmp (log)</p> <p>Details of analysis: Fixed regression using panel (longitudinal) data, with years as fixed effects, and accounting for clustering of observations with countries. A series of regression models were used, with different combinations of adjusting factors, to study how presumed consent legislation is related to deceased organ donation rates (log). Several sensitivity analyses and alternative models were used to test the robustness of the results. r^2 was calculated to test the fit of the model to the data</p>	
<p>Was there a regression analysis? Yes</p> <p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? Yes (provide list of original factors explored). The authors stated that the medical literature indicated that a number of factors other than legislative defaults have been hypothesised to affect the number of organ donations</p>		

Study methods	Results	Quality assessment
<p>Which potential confounding/explanatory factors were explored in the analysis? CVA deaths per 1000 population (log); motor vehicle deaths per 1000 population (log); countries that were predominantly Catholic; GDP per capita (constant 1995 US\$) (log); health expenditure per capita (constant 1995 US\$) (log); PC countries; legislative system (common law); blood donations per 1000 population (2001 data)</p> <p>Coppen et al. 2005³⁴</p> <p>Study design: between-country comparison</p>	<p>Donor rates (summary of results): Not applicable</p> <p>Which factors were statistically significant predictors of donor rates? List of factors (including PC). The correlation between donation rates and mortality rates was 0.81 ($p < 0.01$). A graphical illustration of variability in the number of organ donors as a percentage of relevant mortality (donor efficiency) is provided, which the authors state shows variability in donor efficiency among both PC and IC countries. It is stated that a t-test showed no relationship between PC and donor efficiency, but the results are not reported</p> <p>Family refusal rates: Not applicable</p> <p>Registration as non-donors: Not applicable</p> <p>Other outcomes: Not applicable</p>	<p>Were appropriate countries/cohorts and time periods chosen? No. The study wrongly classifies 2 of the 10 included countries – the UK and Sweden – as having a system of PC. This clearly renders any analysis of the impact of PC null</p> <p>Were potential confounders sought and, if found, adjusted for in the analysis? Partial</p> <p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? Yes. Mortality rates for CVA and RTA deaths were derived from the WHO database, using the <i>International Statistical Classification of Diseases and Related Health Problems</i>, 10th Revision (ICD-10). National organ donation rates were derived from the national organ transplant centres using the definition of the Council of Europe</p>
<p>PC countries included in the analysis (time period of interest, details of PC system): Austria, Belgium, France, Italy, Spain, Sweden and the UK</p> <p>Comparator (time period of interest, details of comparator system): Germany, Netherlands, Switzerland</p> <p>Was a rationale provided for the country/time period chosen? Yes (specify). Countries that 'shared the same historical background and had more or less the same status of health-care systems' were selected to restrict the number of confounding factors. National organ donations for the period 2000–2, a period when 'no major fluctuations in organ donation rates were observed', were used to calculate annual means. Mortality data were based on the period of 3 most recent years for which data were available, 1999–2001, with the exception of Belgium, for which data for 1995–7 were used</p> <p>Outcomes: 3-year mean organ donation rates per million inhabitants; donor rates as a proportion of relevant mortality (combined CVA and RTA) (donor efficiency)</p> <p>Details of analysis: Annual means were calculated from the 3-year data, controlling for random fluctuations between years. The correlation between mortality rates and donation rates was calculated using Spearman's test.</p>	<p>Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? No</p>	<p>Is it reasonably likely that the observed effects were attributable to PC effects alone? No</p> <p>Additional comments: The data sources appear reliable but the time periods used are inconsistent in some instances; there is a discrepancy between the donation data period and the mortality data period, which is particularly apparent in the case of Belgium. Results for the impact of PC are not presented but must be inferred from an illustration of donor efficiency and from the statement that the analysis showed a non-significant result</p>
		continued

Study methods	Results	Quality assessment
<p>The authors state that the relationship between different systems (of consent) and rates for mortality, donation and donor efficiency was assessed using a <i>t</i>-test, but details and results of this analysis are not provided</p>		
<p>Was there a regression analysis? No. A simple correlation analysis was conducted</p>		
<p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? Yes (provide list of original factors explored). Mortality due to CVA and RTA was selected because 80% of those who became organ donors died from these causes (data derived from national transplant centres)</p>		
<p>Which potential confounding/explanatory factors were explored in the analysis? The combined CVA and RTA mortality rate for people aged 0–65 years was used</p>		
<p>Gimbel et al. 2003³⁵</p>		
<p>Study design: Between-country comparison</p>	<p>Donor rates (summary of results): Countries with PC had on average an increased donation rate pmp, which was 6.14 higher than the mean for countries without PC if all other variables were held constant. The overall adjusted r^2 was 0.82. The overall <i>F</i>-test for fitness of the model showed a statistic of 26.17 ($p < 0.05$)</p>	<p>Were appropriate countries/cohorts and time periods chosen? Partial. The countries included represented a comprehensive attempt to include European countries; however, Spain was excluded purely because of outlier status. It is not clear how the time period was selected</p>
<p>PC countries included in the analysis (time period of interest, details of PC system): Austria; Belgium – PC; family informed; Bulgaria – PC legislation but implementation varies; PC not followed in practice; Czech Republic – PC and family informed; Finland – PC and family informed; France – PC legislation but in practice IC; Greece – PC legislation but in practice IC; Hungary – PC legislation but in practice IC; Italy – PC legislation but in practice IC; Latvia; Luxembourg – PC legislation but in practice IC; Norway – PC legislation but in practice IC; Poland – PC legislation but implementation varies; PC not followed in practice; Portugal; Slovak Republic; Slovenia – PC legislation but in practice IC; Sweden – PC legislation but implementation varies, recent changes; Switzerland – PC legislation but implementation varies, dependent on canton</p>	<p>Which factors were statistically significant predictors of donor rates? List of factors (including PC). Transplant capacity had a standardised regression coefficient of 0.57. PC had a standardised regression coefficient of 0.46. Education had a standardised regression coefficient of 0.42. Religion had a standardised regression coefficient of 0.29. All variables were statistically significant at the $p < 0.05$ level</p>	<p>Were potential confounders sought and, if found, adjusted for in the analysis? Yes</p> <p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? No</p> <p>Is it reasonably likely that the observed effects were attributable to PC effects alone? Unclear</p>
<p>Comparator (time period of interest, details of comparator system): Croatia, Denmark, Estonia, Germany, Ireland, Israel, Lithuania, Netherlands, Romania and the UK</p>	<p>Family refusal rates: Not applicable</p> <p>Registration as non-donors: Not applicable</p> <p>Other outcomes: Not applicable</p>	<p>Statistician's comments:</p> <p><i>Strengths:</i> Assesses correlation between explanatory variables; results for this are satisfactory; model assumptions have been tested</p>

Study methods	Results	Quality assessment
<p>Was a rationale provided for the country/time period chosen? Yes (specify). European countries were included in the study. Yugoslavia, Spain, Turkey and the Russian Federation were excluded, Spain because it was considered an extreme outlier, the other countries because of minimal participation in organ transplantation or absence of reliable data. Data were collected for years ranging from 1995–9, but data were not available for all countries in a given year. In total, 87.5% of countries participating in transplantation were included</p> <p>Outcomes: Deceased donation rate pmp per year.</p> <p>Details of analysis: Linear OLS regression was used to regress the dependent variable (deceased donation rates) against the four independent variables. Overall r^2 was calculated and an F-test performed to measure fitness of the model. Standard regression coefficients were calculated and the significance of independent variables was assessed at the 5% significance level. Collinearity of the explanatory variables was investigated and the model assumptions were tested</p> <p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? No</p> <p>Which potential confounding/explanatory factors were explored in the analysis? Percentage of population describing themselves as Roman Catholic; percentage of population enrolled in tertiary education; number of transplant programmes pmp as defined in the International Transplant Directory (2000); PC – the actual practice of donation policy; the consent policy that is implemented in practice, which may differ from that defined by legislation</p>	<p>Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? Yes (specify). Income was considered potentially relevant but was excluded from the analysis because of its predicted high correlation with education</p>	<p>Weaknesses: Excludes Spain outright (rather than performing sensitivity analysis); only 28 observations so model overfits the data (four variables mean that 40 observations are needed); lack of descriptive data</p> <p>Additional comments: The authors highlight that the independent variables in the analysis may actually represent other constructs. The following countries were classified as having PC legislation in place but in practice operate an IC policy; it is not clear whether the legislation was a factor in the analysis: France, Greece, Hungary, Italy, Luxembourg, Norway and Slovenia. In addition, the following countries were classified as having PC legislation in place, but practice was described as variable with PC not implemented: Bulgaria and Poland</p>

continued

Study methods	Results	Quality assessment
<p>Gnant et al. 1991⁴⁰</p> <p>Study design: Before and after (single country)</p> <p>PC countries included in the analysis (time period of interest, details of PC system): Austria; a single transplantation centre with a catchment area of 32 km² and 3.6 million inhabitants; 1982–5 and 1986–90; PC law introduced in 1982 (adults can opt out with written statement of dissent, relatives cannot object to transplantation)</p> <p>Comparator (time period of interest, details of comparator system): Same country preimplementation; same transplantation centre; 1965–81 (PC law introduced in 1982); there was no special organ donation law in this period, retrieval was on the basis of relatives consent</p> <p>Was a rationale provided for the country/time period chosen? Yes (specify). The authors were interested in the impact of structural changes at their transplant centre as well as the change in law. For the 'after' analysis two time periods were identified based on structural changes that took place: period 2: 1982–5, regulating organ donation information campaigns took place and a decentralised donor guidance and organ retrieval system was introduced based on the 1982 PC law; period 3: 1986–90, employment of full-time transplantation co-ordinators organising procurement and counselling donor guidance at peripheral intensive care units</p> <p>Outcomes: Donors per million inhabitants per year</p> <p>Details of analysis: Narrative, annual data were represented in graphs, mean outcome data were calculated for each of the three time periods of interest</p> <p>Was there a regression analysis? No</p> <p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? Not applicable</p>	<p>Donor rates (summary of results): Donors per million inhabitants per year: period 1 (1965–81): 4.6 (SD? 2.9); period 2 (1982–5): 10.1 (SD? 4.4), $p < 0.01$ vs period 1; period 3 (1986–90): 27.2 (SD? 10.2), $p < 0.0001$ vs period 2</p> <p>Which factors were statistically significant predictors of donor rates? Not applicable</p> <p>Family refusal rates: Not applicable</p> <p>Registration as non-donors: Not applicable</p> <p>Other outcomes: Not applicable</p> <p>Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? Yes (specify). Infrastructural changes accompanying the law change are described. The authors also state that the incidence of the relevant causes of death did not increase within the period of observation</p>	<p>Were appropriate countries/cohorts and time periods chosen? No. The 'before' data appears to cover 16 years, which is not an appropriate comparison with the 'after' data time periods of 4 years. The sample is also just one transplantation centre</p> <p>Were potential confounders sought and, if found, adjusted for in the analysis? Partial. The additional impact of structural changes was investigated, and the structural changes that accompanied the law change were described</p> <p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? Unclear. Presumably all data are from transplantation centre records but this is not explicitly stated</p> <p>Is it reasonably likely that the observed effects were attributable to PC effects alone? No. The authors describe structural changes accompanying the law change, which may have also had an impact. Also the before-and-after comparison is not reliable</p> <p>Additional comments: Donor rate for 1990 was 42 donors pmp, compared with overall Austrian value of 31.9</p>

Study methods	Results	Quality assessment
<p>Which potential confounding/explanatory factors were explored in the analysis? None</p> <p><i>Healy 2005</i>³⁶</p> <p>Study design: Between-country comparison</p> <p>PC countries included in the analysis (time period of interest, details of PC system):</p> <p>Austria – registry type: no; population covered: 0.05%; required request: yes; kin veto: no</p> <p>Belgium – registry type: no and yes; population covered: 2%; required request: no; kin veto: yes</p> <p>Finland – registry type: no data; population covered: no data; required request: no data; kin veto: no data</p> <p>France – registry type: no; population covered: 0.05%; required request: yes; kin veto: yes. Passed new PC laws in 1990 and 1999 superseding PC laws from the 1970s</p> <p>Italy – registry type: yes and no; population covered: no data; required request: yes; kin veto: yes. Passed new PC laws in 1990 and 1999 superseding PC laws from the 1970s</p> <p>Norway – registry type: none; population covered: no data; required request: no data; kin veto: yes</p> <p>Spain – registry type: no data; population covered: no data; required request: no data; kin veto: yes</p> <p>Sweden – registry type: yes and no; population covered: 13%; required request: yes; kin veto: yes</p> <p>Switzerland – registry type: no data; population covered: no data; required request: no data; kin veto: no data. National legislation is IC but 15/23 cantons have PC laws</p>	<p>Donor rates (summary of results):</p> <p>CVA incidents: beta-coefficient (SE) -0.003 (0.00), p-value 0.53; excluding Spain and Italy beta-coefficient (SE) 0.006 (0.00), p-value 0.07</p> <p>Road deaths: beta-coefficient (SE) 0.016 (0.02), p-value 0.30; excluding Spain and Italy beta-coefficient (SE) 0.033 (0.01), p-value 0.00</p> <p>GDP: beta-coefficient (SE): 0.007 (0.00), p-value 0.60; excluding Spain and Italy beta-coefficient (SE) 0.012 (0.00), p-value 0.05</p> <p>Health expenditure: beta-coefficient (SE) -0.602 (0.54), p-value 0.27; excluding Spain and Italy beta-coefficient (SE): -0.553 (0.34), p-value 0.11</p> <p>PC: beta-coefficient(SE): 3.316 (2.01), p-value 0.12; excluding Spain and Italy beta-coefficient (SE) 2.719 (1.36), p-value 0.07</p> <p>A PC regime is worth an additional 2.7 donors pmp when other variables are at their mean value</p> <p>Which factors were statistically significant predictors of donor rates? Number of road deaths (excluding Spain and Italy) at $p < 0.05$ level</p> <p>Family refusal rates: Not applicable</p> <p>Registration as non-donors: Not applicable</p> <p>Other outcomes: Not applicable</p>	<p>Were appropriate countries/cohorts and time periods chosen? Partial. Time period reasonable. Rationale not presented for countries included/excluded</p> <p>Were potential confounders sought and, if found, adjusted for in the analysis? Yes</p> <p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? Partial. The number of deceased donors was provided by Transplant Procurement Management (2004) and national organ procurement agencies</p> <p>Is it reasonably likely that the observed effects were attributable to PC effects alone? Unclear</p> <p>Statistician's comments:</p> <p><i>Strengths:</i> Accounts for time series data by modelling the correlation between successive years; treats countries as a random effect to allow for clustering of factors within a country; tests fit of model, repeats analysis without outliers (better fit of model); discusses reasons for outliers</p> <p><i>Additional comments:</i> The authors state that in the analysis, excluding Spain and Italy, GDP, road fatalities and deaths by CVA incident had positive and significant effects on procurement rates although only road fatalities were statistically significant at $p < 0.05$</p>

continued

Study methods	Results	Quality assessment
<p>Comparator (time period of interest, details of comparator system):</p> <p>Australia – registry type: yes; population covered: 24%; required request: no data; kin veto: yes</p> <p>Canada – registry type: yes; population covered: no data; required request: no data; kin veto: yes</p> <p>Denmark – registry type: yes and no; population covered: 4.25%; required request: yes; kin veto: no data</p> <p>Germany – registry type: pending; population covered: no data; required request: no data; kin veto: yes</p> <p>Ireland – registry type: none; population covered: no data; required request: no data; kin veto: yes</p> <p>Netherlands – registry type: yes and no; population covered: 29%; required request: yes, but if a donor is registered the family's wishes carry less weight; kin veto: yes. If the donor is registered the family's wishes carry less weight</p> <p>UK – registry type: yes; population covered: 15%; required request: no; kin veto: yes</p> <p>USA – registry type: yes; population covered: no data; required request: yes; kin veto: yes</p>	<p>Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? The authors state that the following factors may also impact on organ donation rates and the introduction of PC law: welfare regime – corporatist, liberal, social democratic Catholic countries; countries based on civil compared with common law</p>	
<p>Was a rationale provided for the country/time period chosen? No, although the authors state that they aimed to go beyond including purely OECD countries</p>		
<p>Outcomes: Number of deceased donors procured pmp (data obtained from Transplant Procurement Management 2004 and national organ procurement agencies)</p>		
<p>Details of analysis: A linear, mixed-effects model with a random effect for each country was used to produce fixed-effects coefficients for each outcome. Time series data were incorporated by modelling the correlation between successive years. As the model did not fit the data a diagnostic plot of standardised residuals by country was performed. As the data for Italy and Spain were outliers the analysis was performed with and without these countries</p>		

Study methods	Results	Quality assessment
<p>The relative change in procurement rate for each country from its 1990–4 mean to 1998–2002 mean was shown by graph. Countries with no increase in procurement scored 1, net growth countries scored above 1 and net loss countries scored below 1</p>		
<p>Was there a regression analysis? Yes</p>		
<p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? No</p>		
<p>Which potential confounding/explanatory factors were explored in the analysis? CVA deaths pmp; RTA deaths pmp; GDP: US\$ purchasing power parity (PPP); public health spending as a percentage of GDP; PC</p>		
<p><i>Johnson and Goldstein 2004;</i>²² <i>Johnson and Goldstein 2003</i>²³</p>		
<p>Study design: Between-country comparison</p>		
<p>PC countries included in the analysis (time period of interest, details of PC system):</p>	<p>Donor rates (summary of results): Donation rate pmp is 16.3% ($p < 0.02$) higher in PC countries (16.4) than in IC countries (14.1)</p>	<p>Were appropriate countries/cohorts and time periods chosen? Unclear</p>
<p>Austria (1991–2001) – Opt-out registry established 1995; effective consent rate 99.99%</p>	<p>Which factors were statistically significant predictors of donor rates? List of factors (including PC): PC: significant effect on donation rate ($p < 0.02$); impact of other factors not reported</p>	<p>Were potential confounders sought and, if found, adjusted for in the analysis? Yes</p>
<p>Belgium (1991–2001) – Opt-out registry established 1987; effective consent rate 98%</p>	<p>Family refusal rates: Not applicable</p>	<p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? Unclear. Data from L. Roels, but his sources are not stated</p>
<p>Czech Republic (1991–2001)</p>	<p>Registration as non-donors: Not applicable</p>	<p>Is it reasonably likely that the observed effects were attributable to PC effects alone? No</p>
<p>Finland (1991–2001)</p>	<p>Other outcomes: Not applicable</p>	<p>Statistician's comments:</p>
<p>France (1991–2001) – Opt-out registry established 1998; effective consent rate 99.91%</p>	<p>Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? No</p>	<p>Weaknesses: Insufficient detail about data and modelling methods; no accounting for country effect within the analysis (i.e. multiple years from the same country); although the use of alternative models is mentioned, no details are provided; results are poorly reported</p>
<p>Greece (1991–2001)</p>		
<p>Hungary (1991–2001) – Opt-out registry established 1999; effective consent rate 99.997%</p>		

continued

Study methods	Results	Quality assessment
Norway (1991–2001)		<p>Additional comments: The effective consent rate was estimated from registry data (except for Germany). This is defined as the number of people who had opted in (in IC countries) or the number of people who had not opted out (in PC countries). It is not clear whether Switzerland was included in the model or, if so, whether it was included as an IC country. r^2 for the overall analysis seems low (0.268)</p>
Poland (1991–2001) – opt-out registry established 1996; effective consent rate 99.95%		
Portugal (1991–2001) – opt-out registry established 1994; effective consent rate 99.65%		
Spain (1991–2001)		
Sweden (1991–2001) – opt-out registry established 1996; effective consent rate 91.73%		
Comparator (time period of interest, details of comparator system):		
Denmark (1991–2001) – opt-in registry established 1990; effective consent rate 4.25%		
Germany (1991–2001) – effective consent rate 12% (data from transplant organisation and national poll)		
Ireland (1991–2001)		
Netherlands (1991–2001) – opt-in registry established 1998; effective consent rate 28.79%		
UK (1991–2001) – opt-in registry established 1994; effective consent rate 16.9%		
Was a rationale provided for the country/time period chosen? No		
Outcomes: Donors pmp (least squares mean). The authors state that donation rate data were provided by L. Roels, and results are based on data from Gábel and contact with some organ donation registries		
Details of analysis: Multiple OLS regression analysis with dependent variable as number of donors pmp, and independent variables for PC, infrastructure, education and religion, as well as for the years before 2001 (i.e. 1991–2000). Modelling methods are poorly reported. It appears that the model does not account for country effect (i.e. the fact that there are multiple years from the same country)		

Study methods	Results	Quality assessment
<p>The authors report assessing robustness of the data using alternative models but no details are provided</p> <p>Was there a regression analysis? Yes</p> <p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? No. The authors state that they used factors from Gimbel <i>et al.</i>³⁵</p> <p>Which potential confounding/explanatory factors were explored in the analysis? Log % Roman Catholic; proportion having higher education; transplant centres pmp</p> <p>Low et al. 2006⁴¹</p> <p>Study design: Before and after (single country)</p> <p>PC countries included in the analysis (time period of interest, details of PC system): Singapore (July 2004–June 2005); following June 2004 amendment to HOTA, which was extended to include transplantation of the liver, heart and corneas under PC legislation</p> <p>Comparator (time period of interest, details of comparator system): Same country preimplementation (July 2002–June 2004). Before July 2004 the PC legislation (HOTA) in Singapore applied only to kidney transplantation. The 24 months before the law change were compared with the 12 months following implementation</p> <p>Was a rationale provided for the country/time period chosen? No</p> <p>Outcomes: Number of referrals (imminent deaths that may be potential donors); number of suitable donors; number of liver recovery surgeries; number of liver transplants; causes of death and other characteristics of referred deaths were also reported</p> <p>Details of analysis: A comparison of numbers of events per year for each outcome in the two time periods examined was provided</p>	<p>Donor rates (summary of results):</p> <p>Referred deaths: $n = 247$; pre-HOTA change: $n = 167$ (6.95 cases/month; 83.5/year), post-HOTA change: $n = 80$ (6.67 cases/month; 80/year)</p> <p>Potential liver donors: $n = 104$; pre-HOTA change: $n = 70$ (35/year), post-HOTA change: $n = 34$ (34/year)</p> <p>Liver retrieval surgery: $n = 23$; pre-HOTA change: $n = 10$ (5/year), post-HOTA change: $n = 13$ (13/year)</p> <p>Liver transplants: $n = 12$; pre-HOTA change: $n = 7$ (3.5/year), post-HOTA change: $n = 5$ (5/year)</p> <p>Although there was no change in imminent death referrals or number of suitable donors, the number of retrieved organs and number of liver transplants did increase</p> <p>Which factors were statistically significant predictors of donor rates? List of factors (including PC): Causes of death: there were no significant differences in the characteristics of referred deaths between the two periods (pre and post revision of HOTA)</p>	<p>Were appropriate countries/cohorts and time periods chosen? Partial</p> <p>Were potential confounders sought and, if found, adjusted for in the analysis? No</p> <p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? Yes. Data came from the sole national liver transplant programme during this period (at the National University Hospital)</p> <p>Is it reasonable likely that the observed effects were attributable to PC effects alone? No</p> <p>Additional comments: The authors acknowledge that they did not identify potential donors who were not referred to the transplant programme. They also state that the study is limited by the short time period analysed following the implementation of the revised HOTA legislation</p>

continued

Study methods	Results	Quality assessment
<p>Was there a regression analysis? No</p> <p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? Not applicable</p> <p>Which potential confounding/explanatory factors were explored in the analysis? Number of deaths by CVS incident; number of deaths by motor vehicle; PC – the impact of the extension of the PC law (HOTA) to non-renal organs was evaluated, including non-consent from next of kin, and groups excluded from the law (minors aged under 21, non-residents, persons aged over 60, Muslims) were included in the analysis; other causes of death (in addition to CVS and motor vehicle deaths) – brain tumours, other causes; reasons for rejection of referred deaths including medical contraindications, brain death criteria not being fulfilled, death during evaluation, documented refusal of organ donation by deceased, referral withdrawn, and coroner's inquiry</p>	<p>Family refusal rates:</p> <p>Pre-HOTA change: 60/70 cases (86%) consent could not be obtained; 32 would have fallen outside of revised HOTA criteria because of age (over 60 or under 21 years), Muslim religion or non-resident status. Consent rate among those who would have been included under HOTA was 10/38 (26%)</p> <p>Post HOTA change: 21/34 cases (62%) consent could not be obtained, of which 15 fell outside of revised HOTA criteria because of age (over 60 years), Muslim religion or non-resident status. Consent rate among those included under HOTA was 13/19 (68%)</p> <p>Registration as non-donors: Not applicable</p> <p>Other outcomes: Not applicable</p> <p>Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? Yes (specify). The authors note that the impact of the legislative change may have been compounded by factors such as different socioeconomic status of the potential donors and the educational campaign conducted during the introduction of the revised law. They also note that the results may not be generalisable to other countries, given the predominantly Chinese ethnicity and Asian cultural values of Singapore. Also noted was the high incidence of hepatic steatosis in livers recovered during the period following legislative change, which was principally responsible for the discrepancy between the number of livers recovered and the number transplanted</p>	<p>Were appropriate countries/cohorts and time periods chosen? No. One year only and only one centre under each legislation</p> <p>Were potential confounders sought and, if found, adjusted for in the analysis? No. There were substantial differences between the two centres in terms of admissions and population demographics</p>
<p>McCunn et al. 2003³⁹</p> <p>Study design: Other (specify). Comparison of two trauma centres in different countries</p> <p>PC countries included in the analysis (time period of interest, details of PC system): Austria (2000); considered a donor unless you have registered that you do not want to be a donor; no further permission is required</p>	<p>Donor rates (summary of results): Number of patients medically suitable for donation (2000): STC 39, Lorenz 7; number of organ donors (2000): STC 18 (46%), Lorenz 7 (100%); number of organs transplanted (2000): STC 69, Lorenz 28</p> <p>Which factors were statistically significant predictors of donor rates? Not applicable</p>	<p>Were appropriate countries/cohorts and time periods chosen? No. One year only and only one centre under each legislation</p> <p>Were potential confounders sought and, if found, adjusted for in the analysis? No. There were substantial differences between the two centres in terms of admissions and population demographics</p>

Study methods	Results	Quality assessment
<p>Lorenz Bohler Hospital, Vienna – 130-bed trauma centre</p> <p>Comparator (time period of interest, details of comparator system): USA (2000); IC system using organ donor cards and final decision resting with the family</p> <p>R. Adams Cowley Shock Trauma Centre, Baltimore, MD – 100-bed hospital</p>	<p>Family refusal rates: At STC consent was not obtained in 5/21 cases because the family stated that the deceased had expressed a previous wish not to donate; in 16/21 cases the reasons were unknown. Lorenz – not applicable</p> <p>Registration as non-donors: Not applicable</p> <p>Other outcomes: Not applicable</p>	<p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? Yes. Data obtained from each of the centres</p> <p>Is it reasonably likely that the observed effects were attributable to PC effects alone? No</p>
<p>Was a rationale provided for the country/time period chosen? No</p> <p>Outcomes: Number of organ donors; number of organs transplanted; number of potential donors; number for whom consent was not obtained; reasons for failure to obtain consent</p>	<p>Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? Yes (specify). They compare the admission demographics of the two centres and the mechanism of injury for admissions:</p> <p>Both centres were urban free-standing adult trauma centres.</p>	
<p>Details of analysis: Number of donors and organs reported; no statistical analysis</p>	<p>Number of ER admissions/year: STC 5646, Lorenz 59,958</p>	
<p>Was there a regression analysis? No</p>	<p>Number of inpatient admissions: STC 2582, Lorenz 5600</p>	
<p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? Not applicable</p>	<p>Number of ICU admissions: STC 701, Lorenz 410</p>	
<p>Which potential confounding/explanatory factors were explored in the analysis? None</p>	<p>Vienna was described as white, Catholic and European. In Maryland, 71% of the population is white, 25% is black and the remaining population is Hispanic, Asian, Pacific Islander and Native American. Of those professing a religion, one-quarter are Catholic and other large groups are Protestant and Jewish. In the Baltimore metropolitan area 40% are white and 60% 'non-white'</p>	

continued

Study methods	Results	Quality assessment
<p>Neto et al. 2007³⁷</p> <p>Study design: Between-country comparison</p> <p>PC countries included in the analysis (time period of interest, details of PC system): Argentina (1998–2002); Austria (1998–2002); Costa Rica (1998–2002); Croatia (1998–2002); Czech Republic (1998–2002); Finland (1998–2002); France (1998–2002); Greece (1998–2002); Hungary (1998–2002); Israel (1998–2002); Italy (1998–2002); Latvia (1998–2002); Norway (1998–2002); Panama (1998–2002); Poland (1998–2002); Portugal (1998–2002); Slovak Republic (1998–2002); Slovenia (1998–2002); Spain (1998–2002); Sweden (1998–2002)</p> <p>Comparator (time period of interest, details of comparator system): Australia (1998–2002); Brazil (1998–2002); Brazil – changed to PC in 1998 but changed back to IC in 2000; Canada (1998–2002); Chile (1998–2002); Denmark (1998–2002); Germany (1998–2002); Ireland (1998–2002); Netherlands (1998–2002); New Zealand (1998–2002); Romania (1998–2002); Switzerland (1998–2002); UK (1998–2002); USA (1998–2002); Venezuela (1998–2002)</p> <p>Was a rationale provided for the country/time period chosen? Yes (specify). Countries for which data were available were included. The authors stated that they wanted to include a wider range of countries than previous analyses that had focused on OECD countries</p> <p>Outcomes: Deceased organ donation pmp (log); data obtained from Transplant Procurement Organisation, WHO, World Bank and Sociedad Latinoamericana de Nefrología e Hipertensión</p>	<p>Donor rates (summary of results):</p> <p><i>Analysis including log GDP per capita – coefficient (p-value):</i></p> <p>PC: Standard regression of panel data (PD) 0.4039 (0.000), quantile regression model 25th quartile 0.2230 (0.000), 50th quartile 0.2440 (0.000), 75th quartile 0.2150 (0.000)</p> <p>Log death by brain vascular disease: PD 0.1417 (0.003), 25th –0.0030 (0.479), 50th 0.0590 (0.160), 75th 0.0390 (0.262)</p> <p>Log number of deaths by traffic accident: PD 0.3078 (0.000), 25th 0.2350 (0.000), 50th 0.2170 (0.000), 75th 0.2390 (0.000)</p> <p>Log GDP per capita: PD 0.9546 (0.000), 25th 0.8180 (0.000), 50th 0.7420 (0.000), 75th 0.6420 (0.000)</p> <p>Log internet access: PD 0.1156 (0.004), 25th 0.0680 (0.009), 50th –0.0116 (0.196), 75th 0.0200 (0.033)</p> <p>Catholic country: PD 0.1722 (0.001), 25th 0.1550 (0.000), 50th 0.0480 (0.054), 75th 0.0240 (0.235)</p> <p>Common law: PD 0.1281 (0.001), 25th 0.0700 (0.001), 50th 0.1230 (0.000), 75th 0.1230 (0.000)</p> <p>Constant: PD –8.9367 (0.000), 25th –6.6620 (0.000), 50th –5.7550 (0.000), 75th –4.706 (0.000)</p> <p><i>Analysis using log health expenditure per capita:</i></p> <p>PC: PD 0.3829 (0.000), 25th 0.2540 (0.000), 50th 0.2630 (0.000), 75th 0.2370 (0.000)</p> <p>Log death by brain vascular disease: PD 0.1990 (0.000), 25th 0.1430 (0.017), 50th 0.1430 (0.012), 75th 0.1020 (0.044)</p>	<p>Were appropriate countries/cohorts and time periods chosen? Yes</p> <p>Were potential confounders sought and, if found, adjusted for in the analysis? Yes</p> <p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? Partial. The general sources are specified and seem credible, although it is unclear where specific data were obtained with the exception of organ donation</p> <p>Is it reasonably likely that the observed effects were attributable to PC effects alone? Unclear</p> <p>Statistician's comments:</p> <p><i>Strengths:</i> Uses conventional and quantile regression models and presents results of both analyses; appears to have performed sensitivity analyses using different model specifications</p> <p><i>Weaknesses:</i> No checking of model fit or assumptions</p>

Study methods	Results	Quality assessment
<p>Details of analysis: Quantile regression for panel (longitudinal) data (based on Koenker⁴⁵); conventional regression analysis (GLS) for panel data were performed to regress the dependent variable (log deceased organ donation) against the eight independent variables. Two different models were used: one included the log of total health expenditure and excluded GDP per capita and vice versa as these variables were found to be highly collinear. Some sensitivity analyses are reported but few details are provided</p>	<p>Log death by traffic accident: PD 0.1772 (0.001), 25th 0.2260 (0.000), 50th 0.1830 (0.000), 75th 0.2200 (0.000)</p> <p>Log health expenditure per capita: PD 0.6180 (0.000), 25th 0.5210 (0.000), 50th 0.4710 (0.000), 75th 0.4240 (0.000)</p> <p>Log internet access: PD 0.1812 (0.000), 25th 0.1220 (0.000), 50th 0.0250 (0.053), 75th 0.0400 (0.001)</p> <p>Catholic country: PD 0.2439 (0.000), 25th 0.1110 (0.000), 50th 0.0460 (0.011), 75th -0.0010 (0.480)</p> <p>Common law: PD 0.1970 (0.000), 25th 0.1100 (0.000), 50th 0.1740 (0.000), 75th 0.1520 (0.000)</p> <p>Constant: PD -4.2819 (0.000), 25th -3.1480 (0.000), 50th -2.2660 (0.002), 75th -1.7370 (0.004)</p>	
<p>Was there a regression analysis? Yes</p>		
<p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? Unclear. The authors state that the variables chosen are based on earlier analyses, those of Abadie and Gay,³³ Healy,³⁶ and Anbarci and Caglayan⁴⁶</p>		
<p>Which potential confounding/explanatory factors were explored in the analysis? Number of deaths by brain vascular disease per 100,000 population; number of deaths by traffic accident per 100,000 population; Catholic or non-Catholic: a country was classified as Catholic if > 50% of the population were Catholic; GDP per capita; total health expenditure per capita; presence of PC law; percentage of population with access to the internet (as a proxy measure for information); whether there was a common law legal system (emphasis on individual rights as opposed to civil law, which places more emphasis on the state rights)</p>	<p>Which factors were statistically significant predictors of donor rates?</p> <p>In the quantile regression model using log GDP per capita: PC, number of deaths by traffic accident, GDP per capita, internet access (for 25th and 75th quartiles), Catholic country (for 25th quartile), common law</p> <p>In the quantile regression model using log health expenditure per capita: PC, number of deaths by brain vascular disease, number of deaths by traffic accident, health expenditure per capita, internet access (for 25th and 75th quartiles), Catholic country (for 25th and 50th quartiles), common law</p> <p>In the first model GDP per capita had the biggest impact on organ donation and in the second model it was health expenditure per capita</p>	
	<p>Family refusal rates: Not applicable</p>	
	<p>Registration as non-donors: Not applicable</p>	
	<p>Other outcomes: Not applicable</p>	

continued

Study methods	Results	Quality assessment
<p>Roels and De Meester 1996³¹</p> <p>Study design: Between-country comparison</p> <p>PC countries included in the analysis (time period of interest, details of PC system): Austria (January 1992–December 1994); Belgium (January 1992–December 1994)</p> <p>Comparator (time period of interest, details of comparator system): Germany (January 1992–December 1994); Netherlands (January 1992–December 1994)</p> <p>Was a rationale provided for the country/time period chosen? Yes (specify). The principal members of Eurotransplant at the time of study (Luxembourg is not included) were included. These countries were regarded as comparable with regard to educational, cultural and socioeconomic variables. Substantial differences in organ donation rates had been apparent before 1990 and the time period (1992–1994) was selected to examine whether these differences had persisted</p> <p>Outcomes: Mean number of thoracic organs retrieved pmp per year in total; mean number of hearts retrieved pmp per year; mean number of lungs retrieved pmp per year; mean number of thoracic organs transplanted pmp per year</p> <p>Details of analysis: The numbers of donated organs of each type and in total pmp per year were compared. A statistical analysis was not reported</p> <p>Was there a regression analysis? No</p> <p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? Not applicable</p>	<p>Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? Yes (specify). The authors point out that the law in Brazil changed during the period under analysis: PC, which had been introduced in 1998, was abolished in 2000</p> <p>Donor rates (summary of results): Donation rates for both hearts and lungs (and therefore for all thoracic organs) were 'significantly lower in the IC countries (Germany and the Netherlands) than in the PC countries (Austria and Belgium)'. The numbers of thoracic organs transplanted in the PC countries were twice as high as the numbers in the IC countries</p> <p>Organ donors pmp per year: Austria (PC) 23.4; Belgium (PC) 20.2; Germany (IC) 12.8; Netherlands (IC) 14.3; Eurotransplant average 14.4</p> <p>Hearts retrieved pmp per year (including those from heart–lung blocks): Austria (PC) 12.5; Belgium (PC) 11.8; Germany (IC) 6.0; Netherlands (IC) 4.3; Eurotransplant average 6.7</p> <p>Lungs retrieved pmp per year (including those from heart–lung blocks): Austria (PC) 5.8; Belgium (PC) 5.0; Germany (IC) 1.6; Netherlands (IC) 1.9; Eurotransplant average 2.2</p> <p>Total thoracic organs retrieved pmp per year: Austria (PC) 18.3; Belgium (PC) 16.8; Germany (IC) 7.6; Netherlands (IC) 6.2; Eurotransplant average 8.9</p> <p>Mean number of thoracic organs transplanted pmp per year: Austria (PC) 16.8; Belgium (PC) 14.8; Germany (IC) 6.8; Netherlands (IC) 4.2</p> <p>Which factors were statistically significant predictors of donor rates? Not applicable</p> <p>Family refusal rates: Not applicable</p> <p>Registration as non-donors: Not applicable</p>	<p>Were appropriate countries/cohorts and time periods chosen? Partial. The time period appears to have been chosen without a clear rationale. The principal members of Eurotransplant were included (Luxembourg appears to be commonly excluded from analyses, presumably because of the small number of donors/transplants)</p> <p>Were potential confounders sought and, if found, adjusted for in the analysis? No</p> <p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? Yes. The data were extracted from a reliable source (Eurotransplant's monthly and annual reports)</p> <p>Is it reasonably likely that the observed effects were attributable to PC effects alone? No</p> <p>Additional comments: No statistical analysis was presented and so the significance of the findings could not be substantiated. No factors other than PC were considered in the study</p>

Study methods	Results	Quality assessment
Which potential confounding/explanatory factors were explored in the analysis? None	Other outcomes: Not applicable Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? No	
Roels et al. 1991;⁴² Roels et al. 1990⁸⁴	Study design: Before and after (single country)	Were appropriate countries/cohorts and time periods chosen? Yes. First 3 years of data available
PC countries included in the analysis (time period of interest, details of PC system): Belgium: 1987–9 for organ retrieval, 1988 for transplants	Donor rates (summary of results): Kidney retrieval, <i>n</i> (number pmp/year): 1982–5 mean = 187/year (18.9 pmp/year); 1987 <i>n</i> = 371 (37.5); 1988 <i>n</i> = 377 (38.0); 1989 <i>n</i> = 409 (41.3)	Were potential confounders sought and, if found, adjusted for in the analysis? No
Comparator (time period of interest, details of comparator system): Same country: preimplementation 1982–5 for organ retrieval, 1984 for transplants	Heart retrieval, <i>n</i> (number pmp/year): 1982–5 mean = 9 (0.9 pmp/year); 1987 <i>n</i> = 77 (7.8); 1988 <i>n</i> = 89 (9); 1989 <i>n</i> = 118 (11.9)	Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? No
Was a rationale provided for the country/time period chosen? Yes (specify). Review of first 3 years of legislation in place	Liver retrieval, <i>n</i> (number pmp/year): 1982–5 mean = 7 (0.7 pmp/year); 1987 <i>n</i> = 42 (4.2); 1988 <i>n</i> = 66 (6.7); 1989 <i>n</i> = 106 (10.7)	Is it reasonably likely that the observed effects were attributable to PC effects alone? No
Outcomes: Deceased kidney transplants; deceased kidney, heart, liver transplants; deceased kidney, heart, liver retrieval	Kidney transplants: 1984 <i>n</i> = 220; 1988 <i>n</i> = 342 Kidney, heart, liver transplants: 1984 <i>n</i> = 234; 1988 <i>n</i> = 561	Additional comments: The data from these two studies have been extracted together as they overlap. Roels et al. ⁸³ compares kidney retrievals and kidney transplantations 1984–5 vs 1987 and 1988. Roels et al. ⁴² reports on kidney, hearts and liver retrievals 1982–5 vs 1987, 1988 and 1989. The majority of data were extracted from this paper – only the data on actual transplantations were extracted from the earlier paper. Both papers also report numbers for organ retrieval and transplantation from a small group of PC (Belgium Austria and France) and IC countries (UK, Germany, Netherlands). These data have not been extracted
Details of analysis: Number of organ retrievals and transplantations were reported. A statistical analysis was not conducted	Which factors were statistically significant predictors of donor rates? Not applicable	
Was there a regression analysis? No	Family refusal rates: Not applicable	
Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? Not applicable	Registration as non-donors: Not applicable	
Other outcomes: Not applicable	Other outcomes: Not applicable	<i>continued</i>

Study methods	Results	Quality assessment
<p>Which potential confounding/explanatory factors were explored in the analysis? None</p>	<p>Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? Yes (specify). The authors comment⁸³ that the Belgian law was consolidated by a nationwide campaign about the benefits of organ transplantation and ongoing efforts to inform health-care professionals about organ procurement procedures. The authors suggest⁸² that it is unlikely that the increase in donors was due to a high number of fatal RTAs as there has been a decrease from 1980 to 1988 in RTA victims dying in ICU within 30 days of admission</p>	<p>Were appropriate countries/cohorts and time periods chosen? No. The preimplementation time period was long and extended to before the adoption of the voluntary donation legislation in 1972. It is unclear how donation levels varied over the 20-year period</p>
<p>Soh and Lim 1992⁴³</p> <p>Study design: Before and after (single country)</p> <p>PC countries included in the analysis (time period of interest, details of PC system): Singapore (1988–90); HOTA 1987 presumes consent to kidney donation unless dissent has been registered for non-Muslim Singapore citizens aged 21–60 years and of sound mind; the IC/opting-in system also seems to have remained in place</p> <p>Comparator (time period of interest, details of comparator system): Same country preimplementation (1970–90); Medical Act 1972 provided for the voluntary donation of organs (this legislation continued 1988–90 alongside HOTA)</p> <p>Was a rationale provided for the country/time period chosen? Yes (specify). Reports first 3 years under new legislation</p> <p>Outcomes: Kidney procurement</p> <p>Details of analysis: Mean number of kidneys procured annually. A statistical comparison of the means was also conducted</p> <p>Was there a regression analysis? No</p> <p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? Not applicable</p>	<p>Donor rates (summary of results):</p> <p>Kidney procurement (procured in Singapore): 1970–87 $n = 85$ (mean 4.7 per year); 1988–90 $n = 94$ (mean 31.3 per year) ($p = 0.01$) (annual data reported only in graphs)</p> <p>Thirty-nine kidneys (41.5%) were obtained under the opting-in legislation and 55 kidneys (58.5%) were obtained under the PC system</p> <p>Number of kidneys procured through opting-in: before 1988: 4.7 per year; after 1988: 13 per year ($p = 0.01$)</p> <p>Which factors were statistically significant predictors of donor rates? Not applicable</p> <p>Family refusal rates: Not applicable</p> <p>Registration as non-donors: Not applicable</p> <p>Other outcomes: Not applicable</p> <p>Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? Yes (specify). They comment that the success of the law may be partly attributed to the intense public and professional discussions that took place before the introduction of the law. They point out that there was also an increase in voluntary opt-in donations</p>	<p>Were potential confounders sought and, if found, adjusted for in the analysis? No</p> <p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? No, not stated</p> <p>Is it reasonably likely that the observed effects were attributable to PC effects alone? No. Other factors not investigated</p> <p>Additional comments: It is unclear from this paper how the PC and IC systems for kidney donation operated in tandem</p>

Study methods	Results	Quality assessment
<p>Which potential confounding/explanatory factors were explored in the analysis? None</p> <p><i>Vanrenterghem et al. 1988⁴⁴</i></p> <p>Study design: Before and after (single country)</p> <p>PC countries included in the analysis (time period of interest, details of PC system): Leuven, an area of Belgium (1987 and first 9 months of 1988); PC law implemented February 1987</p> <p>Comparator (time period of interest, details of comparator system): Leuven, Belgium preimplementation (1978–86)</p> <p>Was a rationale provided for the country/time period chosen? Yes (specify). Leuven Collaborative group for Transplantation (LCGT), comprising 19 nephrology units in the Dutch-speaking area of Belgium, was formed in 1978. The study reports LCGT data from the years following this</p> <p>Outcomes: Number of kidneys procured per year; number of collaborating hospitals with donor procurement activities; number of deceased kidney transplantations performed by the LCGT</p> <p>Details of analysis: Narrative, graphical representation of data</p> <p>Was there a regression analysis? No</p> <p>Was there a rationale/theoretical model to choose potential explanatory/confounding factors for the regression analysis? Not applicable</p> <p>Which potential confounding/explanatory factors were explored in the analysis? None</p>	<p>Donor rates (summary of results): The authors state that in the years before the law change an average of 75 kidneys per year were procured (years used for this analysis were not stated), that this almost doubled to 150 in 1987, and that preliminary data for 1988 suggest a continuation of the trend (actual data are in graphs)</p> <p>Which factors were statistically significant predictors of donor rates? Not applicable</p> <p>Family refusal rates: Not applicable</p> <p>Registration as non-donors: Not applicable</p> <p>Other outcomes: Yes (specify). The number of collaborating hospitals with donor procurement activities increased from a mean of less than 5 hospitals before 1985 to 15 hospitals in 1987. The number of deceased kidney transplants performed increased from less than 75 in the preceding years (actual years not stated) to 135 in 1987. In 1987 the gap between new candidates registered per year and the number of transplants per year disappeared for the first time (annual data are in graphs)</p> <p>Do the authors refer to any other contextual factors that may have influenced the results that they were not able to take into account in the analysis? No</p>	<p>Were appropriate countries/cohorts and time periods chosen? Unclear. Although annual data are presented in graphs it is unclear which years have been used to provide the 'before' data used in the narrative</p> <p>Were potential confounders sought and, if found, adjusted for in the analysis? No</p> <p>Were the sources of data for outcome (and explanatory factors) specified and do they appear to be credible? Unclear. The data appear to have been obtained from hospital records but this is not explicitly stated</p> <p>Is it reasonably likely that the observed effects were attributable to PC effects alone? No</p> <p>Additional comments: The authors state that the national figures for Belgium also increased from 25 kidneys procured pmp to nearly 40 in 1987/8, and that within Eurotransplant this new figure is comparable to that in Austria, which also has PC law</p>
<p>CVA, cerebrovascular accident; ER, emergency room; GDP, gross domestic product; GLS, generalised least squares; HOTA, Human Organ Transplant Act; IC, informed consent; ICU, intensive care unit; MVA, motor vehicle accident; ns, not significant; OECD, Organization for Economic Cooperation and Development; OLS, ordinary least squares; PC, presumed consent; pmp, per million population; RTA, road traffic accident; SD, standard deviation; STC, shock trauma centre; WHO, World Health Organization.</p>		

Appendix 5

Quality assessment of surveys

Survey	Who was studied?	How was the sample obtained?	What was the response rate?	Design	Conduct	Analysis	Interpretation
Baines <i>et al.</i> 2002 ⁴⁸	Adult members of the Asian community in Glasgow and Asian patients in the west of Scotland awaiting a kidney transplant: 48.8% female; 17.5% 20–29 years, 23.8% 30–39 years, 22.5% 40–49 years, 16.2% 50–59 years, 20% 60+ years; 60% Muslim, 17.5% Hindu, 10% Christian, 2.5% Sikh, 7.5% atheist, 2.5% other religions; annual income £10,000–30,000 61.2%, £30,000–60,000 38.8%	Questionnaires were given to people attending the Ethnic Transplant Forum, the aim of which was to promote awareness of transplant issues affecting Asians	Of the 90 surveys distributed, 80 (89%) were returned fully completed	Were the aims clearly stated? Yes Is the design appropriate? Yes Was the sample size justified? No Are the measurements likely to be valid and reliable? Yes Are the statistical methods described? No Was a pilot conducted? Yes	Did untoward events occur during the study? No	Were the basic data adequately described? Yes Do the numbers add up? Yes Was the statistical significance assessed? No	How could selection bias arise? The sample was people who had chosen to attend the forum. The forum was conducted in English, therefore non-English speakers would not have attended Are important effects overlooked? The survey was conducted during/after the event and so it may have influenced attitudes Can the results be generalised? No
Conesa <i>et al.</i> 2003 ⁴⁹	People over 15 years from Murcia region, Spain: 51% female; mean age 41.2 years	Random sample stratified by age, sex and geographical location	Not reported; 2000 people were included	Were the aims clearly stated? Yes Is the design appropriate? Yes Was the sample size justified? Yes Are the measurements likely to be valid and reliable? Unclear Are the statistical methods described? Yes Was a pilot conducted? No	Did untoward events occur during the study? No	Were the basic data adequately described? Yes Do the numbers add up? Yes Was the statistical significance assessed? Yes, for comparison of subgroups (although only selected results for the question of interest were provided in the paper)	How could selection bias arise? It is not clear if there were non-respondents Are important effects overlooked? The wording of the question on presumed consent law may have negatively influenced respondents' opinions Can the results be generalised? The random sampling method means that results should be generalisable within the Murcia region of Spain

Survey	Who was studied?	How was the sample obtained?	What was the response rate?	Design	Conduct	Analysis	Interpretation
Haddow 2006 ⁵⁰	People 16 years and older in Scotland: 52% female; 35% 25–44 years; 20% socioeconomic grouping AB, 28% C1, 21% C2, 31% DE	Random sample weighted to match Scottish population	Not reported; 1009 people were included	Were the aims clearly stated? Yes Is the design appropriate? Yes Was the sample size justified? Yes Are the measurements likely to be valid and reliable? Yes Are the statistical methods described? No Was a pilot conducted? Yes	Did untoward events occur during the study? No	Were the basic data adequately described? Yes Do the numbers add up? No, there are some discrepancies Was the statistical significance assessed? Yes, for comparison of subgroups	How could selection bias arise? It is not clear if there were non-respondents. There was also a lack of a representative sample for inclusion of some demographic data, e.g. ethnicity, which may indicate selection bias Are important effects overlooked? No Can the results be generalised? The random sampling method means that results should be generalisable to the Scottish population although some demographic information was not included (e.g. ethnicity)
Klenow and Youngs 1995 ⁵¹	Residents of a midwestern metropolitan community: 55.9% female; 55% 25–44 years; over 80% had some post-high-school education; 41% professional/managerial; 64% Protestant, 27% Catholic; 99% white	Random sample based on telephone directory	Of the original sample of 824, 776 were contactable and 414 responded (50% of original sample, 53% of contactable sample)	Were the aims clearly stated? Yes Is the design appropriate? Yes Was the sample size justified? Yes Are the measurements likely to be valid and reliable? Yes Are the statistical methods described? Yes Was a pilot conducted? No	Did untoward events occur during the study? No	Were the basic data adequately described? Yes Do the numbers add up? Yes Was the statistical significance assessed? Yes	How could selection bias arise? The sampling method means that some sections of the community were excluded: those without a phone, with unlisted numbers or new to the community. Are important effects overlooked? No Can the results be generalised? Limitations in the sampling method and a response rate of only 50% mean that the results may not be generalisable to the whole community

continued

Survey	Who was studied?	How was the sample obtained?	What was the response rate?	Design	Conduct	Analysis	Interpretation
Moore et al. 1976 ⁵²	People from across Britain. Demographic details not provided	Non-random sample representative of age, sex and social class, using an interview schedule	Not reported; 548 interviews were conducted and 48 of these were discarded to make the final sample (n = 500) representative of age, sex and social class	Were the aims clearly stated? Yes Is the design appropriate? Yes Was the sample size justified? No Are the measurements likely to be valid and reliable? Yes Are the statistical methods described? No Was a pilot conducted? No	Did untoward events occur during the study? No	Were the basic data adequately described? Yes Do the numbers add up? Yes Was the statistical significance assessed? No	How could selection bias arise? Selection was performed by interviewers and was not random and it is not clear if there were non-respondents Are important effects overlooked? No Can the results be generalised? The demographics and location of the respondents is not provided and therefore it is not clear how generalisable the results are to the UK population
Oz et al. 2003 ⁴⁷	Members of the International Society for Heart and Lung Transplantation (ISHLT), representing individuals from more than 15 transplant-related professions in 15 different countries; 81.7% were from countries without presumed consent legislation	ISHLT members were emailed with an invitation to complete a questionnaire; 400 members without email or internet access and others that requested it were mailed a paper version	739/1821 members responded (33.5% response rate)	Were the aims clearly stated? Yes Is the design appropriate? Yes Was the sample size justified? Yes Are the measurements likely to be valid and reliable? Yes Are the statistical methods described? Yes Was a pilot conducted? No	Did untoward events occur during the study? No	Were the basic data adequately described? Yes Do the numbers add up? Yes Was the statistical significance assessed? No	How could selection bias arise? All members were approached, although the response rate was low; reasons for non-response are not known so this may not be random Are important effects overlooked? No Can the results be generalised? The low response rate means that the results may not be generalisable to all ISHLT members. The results would also only be generalisable to transplant-related medical professionals

Survey	Who was studied?	How was the sample obtained?	What was the response rate?	Design	Conduct	Analysis	Interpretation
Rodrigue et al. 2006 ⁵³	Adults who had recently been asked for consent to donate the organs of a family member: 77% female; mean age 47.6 years (range 18–85 years); 80% white, 16% black or African American; 76% post-high-school education	Non-random sample using telephone interview. Recruited from several sources	Interviews were completed by 285/456 (63%) people approached by investigators and 276/301 (92%) eligible people who responded to advertisements	Were the aims clearly stated? Yes Is the design appropriate? Yes Was the sample size justified? No Are the measurements likely to be valid and reliable? Yes Are the statistical methods described? Yes Was a pilot conducted? Yes	Did untoward events occur during the study? No	Were the basic data adequately described? Yes Do the numbers add up? Yes Was the statistical significance assessed? Yes	How could selection bias arise? The sample was not random Are important effects overlooked? Some of the sample was self-selected, i.e. those recruited through advertising campaigns Can the results be generalised? Non-random sample and demographic data showing participants to be predominantly female, white, employed and with college education mean that results may not be generalisable
Roels et al. 1997 ⁵⁴	Residents of Flanders, Belgium: young adults aged 18–29, parents aged 30–59 and grandparents 60+ years; 56% female; for the majority of the sample (60%) the highest educational level was secondary school	Non-random sample. Questionnaires were sent to young adults at the same time as their invitation for a mandatory routine medical check-up. They were asked to pass copies of the questionnaire to their parents and grandparents	466/500 (93%) young people completed the questionnaires. Surveys were also received from 595 parents and 245 grandparents	Were the aims clearly stated? Yes Is the design appropriate? Yes Was the sample size justified? No Are the measurements likely to be valid and reliable? Yes Are the statistical methods described? Yes Was a pilot conducted? Yes, although this study also appears to be part of a larger survey, presenting preliminary results	Did untoward events occur during the study? No	Were the basic data adequately described? Yes Do the numbers add up? Yes Was the statistical significance assessed? Yes	How could selection bias arise? It is unclear how the original sample was selected. The response rate for parents and grandparents is also not clear, there may be significant self-selection Are important effects overlooked? No Can the results be generalised? The results are probably generalisable to the young adults of Flanders, Belgium. As the response rate for the parents and grandparents is unclear the results may not be representative of these groups

continued

Survey	Who was studied?	How was the sample obtained?	What was the response rate?	Design	Conduct	Analysis	Interpretation
YouGov 2007 ⁵⁵	British adults: 55% female; 11% 18–24 years, 22% 25–34 years, 15% 35–44 years, 18% 45–54 years, 34% 55+ years; 49% socioeconomic grouping ABC I	Random sample from a base sample of 185,000 individuals who agreed to take part in surveys, weighted to provide a representative reporting sample. An email was sent with invitation to take part	Not reported; 2034 people were included	Insufficient detail to complete			
Additional survey data obtained from a secondary source⁵⁶ (original reports could not be obtained)							
BBC 2005 ³⁰	People over 16 years in the UK	Representative sample (further details not stated)	Not reported; 2067 people were included	Insufficient detail to complete			
Department of Health 1999 ³¹	People in the UK	Omnibus survey using face-to-face interviews (further details not stated)	Not reported; 1757 people were included	Insufficient detail to complete			
National Kidney Research Fund 2000 ³²	People aged 15+ years in the UK	Omnibus survey using face-to-face interviews (further details not stated)	Not reported; 1976 people were included	Insufficient detail to complete			
Watchdog Healthcheck 2001	People in the UK	Telephone poll (further details not stated)	Not reported; almost 52,000 people were included	Insufficient detail to complete			

Appendix 6

Protocol

Title of the project

A systematic review of presumed consent systems for deceased organ donation.

Authors

Amber Rithalia, Gill Norman, Catriona McDaid, Sara Suekarran, Lindsey Myers, Amanda Sowden.

Address

Centre for Reviews and Dissemination, University of York, UK.

The Centre for Reviews and Dissemination

The Centre for Reviews and Dissemination (CRD), based at the University of York, was established in January 1994 and is now the largest group in the world engaged exclusively in evidence synthesis in the health field. The centre undertakes high-quality systematic reviews that evaluate the effects of health and social care interventions and the delivery and organisation of health care. The centre has played a leading role in the development and promotion of evidence-informed decision-making in health policy and practice. The findings of CRD reviews are widely disseminated and have impacted on the quality of health care delivered.

Background

The UK-wide Organ Donation Taskforce was established in 2006 to recommend actions needed to increase organ donation and procurement within the current legal framework (covered under the Human Tissue Act 2004, which states that it is unlawful to remove, store or use human organs and other tissue for scheduled purposes without appropriate consent). Alongside this activity debate has been ongoing about different systems of consent for organ donation, and the Secretary of State for Health, Alan Johnson, asked the Organ Donation Taskforce to explore the potential impact of introducing a presumed consent system for postmortem organ donation in the UK. If implemented, all eligible parties would be viewed as potential donors unless they had registered an

objection or 'opted out' before death or, possibly, if a relative or relatives expressed an objection after death. The Taskforce will examine the complex ethical, medical, legal and societal issues around presumed consent. To inform the work of the Taskforce a systematic review of relevant literature was requested.

Objectives of the systematic review

The following terms of reference were initially provided:

- to examine the impact on organ donation rates of introducing an 'opt-out' or presumed consent system in countries where this has been adopted
- the review must take into account existing data on the factors influencing the positive or negative impacts of introducing a presumed consent or opt-out system, including the attitudes of the public, professionals and other stakeholders
- the review must take into account any comparative data on the relative impact of the legislative framework and systemic/organisational measures introduced in countries where opt-out systems have been adopted
- the review should include countries that have considered presumed consent and then rejected the concept for whatever reason.

After discussion with Policy Research Programme (PRP) and Taskforce members the following objectives were agreed:

- to examine the impact of presumed consent legislation on organ donation rates and attitudes of the public, professionals and any other stakeholders together with any adverse consequences
- to describe the context within which the system of presumed consent was introduced (where available).

An additional request was to assess the impact of different faith groups and the media on consent.

We agreed to extract any relevant information about influences on donation rates (including the media and individual characteristics such as faith) when it was available from the studies assessing the introduction of presumed consent. Time permitting we also agreed to provide information from surveys of attitudes towards presumed consent. The protocol was not amended to reflect this request but was agreed by email on 6 March 2008.

Systematic review methods

Search strategy

A range of databases will be searched, including:

- MEDLINE (medical)
- MEDLINE In-Process (rapid access to latest few weeks of medical literature)
- EMBASE (pharmacological, biomedical)
- CINAHL (nursing and allied health literature)
- PsycINFO (psychological)
- HMIC (health management)
- PAIS International (economic, political, social issues relevant to governments)
- OpenSIGLE (grey literature).

These databases index both journal articles and other forms of publication such as conference abstracts, dissertations and reports. In addition, we will undertake internet searches using the specialist search engine Intute: Health and Life Sciences – Medicine (www.intute.ac.uk/healthandlifesciences) and the meta-search engine Copernic (www.copernic.com).

A draft search strategy is presented in Appendix A. This strategy will be expanded to include other keywords and phrases following a fuller analysis of sample records and will be converted appropriately for use with each database. No language restrictions will be applied.

All records will be managed using ENDNOTE X1.

Inclusion criteria

Studies that meet the following criteria will be eligible for inclusion:

- Study design: comparative studies. A preliminary assessment of the available literature suggests that presumed consent legislation has been assessed through the use of (1) studies comparing donation rates in a single country before and after the introduction of a presumed consent law and (2) cross-sectional studies comparing donation rates in countries

with and without presumed consent systems. Both types of design will be included.

- Intervention: presumed consent systems for deceased organ donation introduced within a jurisdiction. A presumed consent system is defined as one in which a deceased person is considered to be an organ donor unless he/she has made known his/her opposition to this before death. Countries will be considered as presumed consent jurisdictions when such a law is in place, even if the system operated de facto requires consent of relatives. To be eligible for inclusion a system of presumed consent must have been compared with a non-presumed consent system (e.g. one in which individuals register as organ donors during their lifetime, one that requires relatives' consent or one that requires all citizens to register their willingness or not to be an organ donor in the event of their death). This may be within another jurisdiction or in the same jurisdiction before the introduction of a system of presumed consent.
- Population: any jurisdiction in which a system for deceased organ donation has been introduced.
- Outcomes: the primary outcome of interest is the impact on organ donation rates. Attitudes of the public, professionals and other stakeholders, and any adverse consequences, will also be assessed. Descriptive information about the context in which the system is introduced will be recorded, including reasons why a country chooses to introduce or reject a presumed consent system.

All papers will be screened for inclusion by two reviewers working independently. Disagreements will be resolved by consensus or by consultation with a third reviewer if necessary.

Data extraction

The following information will be extracted: bibliographic details, dates, country or countries studied, study design, method of analysis, factors considered in the analysis, other contextual factors, donation rates and other results of interest.

Data extraction will be performed by one reviewer and checked by a second. Data will be extracted into the review management software EPPI-REVIEWER (version 3.0).

Quality assessment

The methodological quality of the included studies will be assessed according to study design, using criteria from CRD's guidance for undertaking

systematic reviews.¹ Quality assessment will be performed by one reviewer and checked by a second.

Methods of analysis and synthesis

Given the anticipated diversity of the studies in terms of design, settings and focus of the legislation, we propose to undertake a narrative synthesis. The synthesis will describe, organise, explore and interpret the study findings, taking into account any contextual factors that might impact upon outcomes. The methodological strengths and weaknesses of the studies will also be taken into account. As part of this process we will investigate the similarities and differences between study findings.

Advisory group

Given the timescale for the review we propose to set up a small advisory group consisting of representatives from PRP (Clare Croft-White, Alan Glantz, Peter Jones) and the Organ Donation Taskforce (Professor Gurch Randhawa).

Timescales and reporting

The draft report will be delivered by 3 April 2008, consisting of a short report outlining the key findings, together with a more detailed report of the evidence.

References

NHS Centre for Reviews and Dissemination. *Undertaking systematic reviews of research on effectiveness: CRD's guidance for those carrying out or commissioning reviews*. 2nd edn. CRD Report no. 4. York: University of York, NHS Centre for Reviews and Dissemination; 2001.

Appendix A Draft MEDLINE search strategy

The following draft search strategy to identify articles on presumed consent and organ donation

was devised for MEDLINE in the Ovid interface. The strategy will be developed further and converted to run appropriately on other databases.

1. Presumed Consent/
2. Informed Consent/
3. (presum\$adj3 consent\$).ti,ab.
4. (assum\$adj3 consent\$).ti,ab.
5. (tacit adj3 consent\$).ti,ab.
6. opt out.ti,ab.
7. opting out.ti,ab.
8. or/1-8
9. Tissue Donors/
10. ((cadaver or cadaveric) adj2 donor\$).ti,ab.
11. ((postmortem or post mortem) adj2 donor\$).ti,ab.
12. ((deceased or dead) adj2 donor\$).ti,ab.
13. ((organ or organs) adj3 donor\$).ti,ab.
14. ((transplant or transplantation) adj2 donor\$).ti,ab.
15. (tissue adj3 donor\$).ti,ab.
16. "Tissue and Organ Procurement"/
17. "Tissue and Organ Harvesting"/
18. ((cadaver or cadaveric) adj2 (donat\$or harvest\$)).ti,ab.
19. ((postmortem or post mortem) adj2 (donat\$or harvest\$)).ti,ab.
20. ((deceased or dead) adj2 (donat\$or harvest\$)).ti,ab.
21. ((organ or organs) adj3 (donat\$or procure\$or harvest\$)).ti,ab.
22. (tissue adj3 (donat\$or procure\$or harvest\$)).ti,ab.
23. or/9-22
24. 8 and 23

Health Technology Assessment reports published to date

Volume 1, 1997

No. 1

Home parenteral nutrition: a systematic review.

By Richards DM, Deeks JJ, Sheldon TA, Shaffer JL.

No. 2

Diagnosis, management and screening of early localised prostate cancer.

A review by Selley S, Donovan J, Faulkner A, Coast J, Gillatt D.

No. 3

The diagnosis, management, treatment and costs of prostate cancer in England and Wales.

A review by Chamberlain J, Melia J, Moss S, Brown J.

No. 4

Screening for fragile X syndrome.

A review by Murray J, Cuckle H, Taylor G, Hewison J.

No. 5

A review of near patient testing in primary care.

By Hobbs FDR, Delaney BC, Fitzmaurice DA, Wilson S, Hyde CJ, Thorpe GH, *et al.*

No. 6

Systematic review of outpatient services for chronic pain control.

By McQuay HJ, Moore RA, Eccleston C, Morley S, de C Williams AC.

No. 7

Neonatal screening for inborn errors of metabolism: cost, yield and outcome.

A review by Pollitt RJ, Green A, McCabe CJ, Booth A, Cooper NJ, Leonard JV, *et al.*

No. 8

Preschool vision screening.

A review by Snowdon SK, Stewart-Brown SL.

No. 9

Implications of socio-cultural contexts for the ethics of clinical trials.

A review by Ashcroft RE, Chadwick DW, Clark SRL, Edwards RHT, Frith L, Hutton JL.

No. 10

A critical review of the role of neonatal hearing screening in the detection of congenital hearing impairment.

By Davis A, Bamford J, Wilson I, Ramkalawan T, Forshaw M, Wright S.

No. 11

Newborn screening for inborn errors of metabolism: a systematic review.

By Seymour CA, Thomason MJ, Chalmers RA, Addison GM, Bain MD, Cockburn F, *et al.*

No. 12

Routine preoperative testing: a systematic review of the evidence.

By Munro J, Booth A, Nicholl J.

No. 13

Systematic review of the effectiveness of laxatives in the elderly.

By Petticrew M, Watt I, Sheldon T.

No. 14

When and how to assess fast-changing technologies: a comparative study of medical applications of four generic technologies.

A review by Mowatt G, Bower DJ, Brebner JA, Cairns JA, Grant AM, McKee L.

Volume 2, 1998

No. 1

Antenatal screening for Down's syndrome.

A review by Wald NJ, Kennard A, Hackshaw A, McGuire A.

No. 2

Screening for ovarian cancer: a systematic review.

By Bell R, Petticrew M, Luengo S, Sheldon TA.

No. 3

Consensus development methods, and their use in clinical guideline development.

A review by Murphy MK, Black NA, Lamping DL, McKee CM, Sanderson CFB, Askham J, *et al.*

No. 4

A cost-utility analysis of interferon beta for multiple sclerosis.

By Parkin D, McNamee P, Jacoby A, Miller P, Thomas S, Bates D.

No. 5

Effectiveness and efficiency of methods of dialysis therapy for end-stage renal disease: systematic reviews.

By MacLeod A, Grant A, Donaldson C, Khan I, Campbell M, Daly C, *et al.*

No. 6

Effectiveness of hip prostheses in primary total hip replacement: a critical review of evidence and an economic model.

By Faulkner A, Kennedy LG, Baxter K, Donovan J, Wilkinson M, Bevan G.

No. 7

Antimicrobial prophylaxis in colorectal surgery: a systematic review of randomised controlled trials.

By Song F, Glenny AM.

No. 8

Bone marrow and peripheral blood stem cell transplantation for malignancy.

A review by Johnson PWM, Simnett SJ, Sweetenham JW, Morgan GJ, Stewart LA.

No. 9

Screening for speech and language delay: a systematic review of the literature.

By Law J, Boyle J, Harris F, Harkness A, Nye C.

No. 10

Resource allocation for chronic stable angina: a systematic review of effectiveness, costs and cost-effectiveness of alternative interventions.

By Sculpher MJ, Petticrew M, Kelland JL, Elliott RA, Holdright DR, Buxton MJ.

No. 11

Detection, adherence and control of hypertension for the prevention of stroke: a systematic review.

By Ebrahim S.

No. 12

Postoperative analgesia and vomiting, with special reference to day-case surgery: a systematic review.

By McQuay HJ, Moore RA.

No. 13

Choosing between randomised and nonrandomised studies: a systematic review.

By Britton A, McKee M, Black N, McPherson K, Sanderson C, Bain C.

No. 14

Evaluating patient-based outcome measures for use in clinical trials.

A review by Fitzpatrick R, Davey C, Buxton MJ, Jones DR.

No. 15

Ethical issues in the design and conduct of randomised controlled trials.

A review by Edwards SJL, Lilford RJ, Braunholtz DA, Jackson JC, Hewison J, Thornton J.

No. 16

Qualitative research methods in health technology assessment: a review of the literature.

By Murphy E, Dingwall R, Greatbatch D, Parker S, Watson P.

No. 17

The costs and benefits of paramedic skills in pre-hospital trauma care.

By Nicholl J, Hughes S, Dixon S, Turner J, Yates D.

No. 18

Systematic review of endoscopic ultrasound in gastro-oesophageal cancer.

By Harris KM, Kelly S, Berry E, Hutton J, Roderick P, Cullingworth J, *et al.*

No. 19

Systematic reviews of trials and other studies.

By Sutton AJ, Abrams KR, Jones DR, Sheldon TA, Song F.

No. 20

Primary total hip replacement surgery: a systematic review of outcomes and modelling of cost-effectiveness associated with different prostheses.

A review by Fitzpatrick R, Shortall E, Sculpher M, Murray D, Morris R, Lodge M, *et al.*

Volume 3, 1999

No. 1

Informed decision making: an annotated bibliography and systematic review.

By Bekker H, Thornton JG, Airey CM, Connelly JB, Hewison J, Robinson MB, *et al.*

No. 2

Handling uncertainty when performing economic evaluation of healthcare interventions.

A review by Briggs AH, Gray AM.

No. 3

The role of expectancies in the placebo effect and their use in the delivery of health care: a systematic review.

By Crow R, Gage H, Hampson S, Hart J, Kimber A, Thomas H.

No. 4

A randomised controlled trial of different approaches to universal antenatal HIV testing: uptake and acceptability. Annex: Antenatal HIV testing – assessment of a routine voluntary approach.

By Simpson WM, Johnstone FD, Boyd FM, Goldberg DJ, Hart GJ, Gormley SM, *et al.*

No. 5

Methods for evaluating area-wide and organisation-based interventions in health and health care: a systematic review.

By Ukoumunne OC, Gulliford MC, Chinn S, Sterne JAC, Burney PGJ.

No. 6

Assessing the costs of healthcare technologies in clinical trials.

A review by Johnston K, Buxton MJ, Jones DR, Fitzpatrick R.

No. 7

Cooperatives and their primary care emergency centres: organisation and impact.

By Hallam L, Henthorne K.

No. 8

Screening for cystic fibrosis.

A review by Murray J, Cuckle H, Taylor G, Littlewood J, Hewison J.

No. 9

A review of the use of health status measures in economic evaluation.

By Brazier J, Deverill M, Green C, Harper R, Booth A.

No. 10

Methods for the analysis of quality-of-life and survival data in health technology assessment.

A review by Billingham LJ, Abrams KR, Jones DR.

No. 11

Antenatal and neonatal haemoglobinopathy screening in the UK: review and economic analysis.

By Zeuner D, Ades AE, Karnon J, Brown J, Dezateux C, Anionwu EN.

No. 12

Assessing the quality of reports of randomised trials: implications for the conduct of meta-analyses.

A review by Moher D, Cook DJ, Jadad AR, Tugwell P, Moher M, Jones A, *et al.*

No. 13

'Early warning systems' for identifying new healthcare technologies.

By Robert G, Stevens A, Gabbay J.

No. 14

A systematic review of the role of human papillomavirus testing within a cervical screening programme.

By Cuzick J, Sasieni P, Davies P, Adams J, Normand C, Frater A, *et al.*

No. 15

Near patient testing in diabetes clinics: appraising the costs and outcomes.

By Grieve R, Beech R, Vincent J, Mazurkiewicz J.

No. 16

Positron emission tomography: establishing priorities for health technology assessment.

A review by Robert G, Milne R.

No. 17 (Pt 1)

The debridement of chronic wounds: a systematic review.

By Bradley M, Cullum N, Sheldon T.

No. 17 (Pt 2)

Systematic reviews of wound care management: (2) Dressings and topical agents used in the healing of chronic wounds.

By Bradley M, Cullum N, Nelson EA, Petticrew M, Sheldon T, Torgerson D.

No. 18

A systematic literature review of spiral and electron beam computed tomography: with particular reference to clinical applications in hepatic lesions, pulmonary embolus and coronary artery disease.

By Berry E, Kelly S, Hutton J, Harris KM, Roderick P, Boyce JC, *et al.*

No. 19

What role for statins? A review and economic model.

By Ebrahim S, Davey Smith G, McCabe C, Payne N, Pickin M, Sheldon TA, *et al.*

No. 20

Factors that limit the quality, number and progress of randomised controlled trials.

A review by Prescott RJ, Counsell CE, Gillespie WJ, Grant AM, Russell IT, Kiauka S, *et al.*

No. 21

Antimicrobial prophylaxis in total hip replacement: a systematic review.

By Glenny AM, Song F.

No. 22

Health promoting schools and health promotion in schools: two systematic reviews.

By Lister-Sharp D, Chapman S, Stewart-Brown S, Sowden A.

No. 23

Economic evaluation of a primary care-based education programme for patients with osteoarthritis of the knee.

A review by Lord J, Victor C, Littlejohns P, Ross FM, Axford JS.

Volume 4, 2000**No. 1**

The estimation of marginal time preference in a UK-wide sample (TEMPUS) project.

A review by Cairns JA, van der Pol MM.

No. 2

Geriatric rehabilitation following fractures in older people: a systematic review.

By Cameron I, Crotty M, Currie C, Finnegan T, Gillespie L, Gillespie W, *et al.*

No. 3

Screening for sickle cell disease and thalassaemia: a systematic review with supplementary research.

By Davies SC, Cronin E, Gill M, Greengross P, Hickman M, Normand C.

No. 4

Community provision of hearing aids and related audiology services.

A review by Reeves DJ, Alborz A, Hickson FS, Bamford JM.

No. 5

False-negative results in screening programmes: systematic review of impact and implications.

By Petticrew MP, Sowden AJ, Lister-Sharp D, Wright K.

No. 6

Costs and benefits of community postnatal support workers: a randomised controlled trial.

By Morrell CJ, Spiby H, Stewart P, Walters S, Morgan A.

No. 7

Implantable contraceptives (subdermal implants and hormonally impregnated intrauterine systems) versus other forms of reversible contraceptives: two systematic reviews to assess relative effectiveness, acceptability, tolerability and cost-effectiveness.

By French RS, Cowan FM, Mansour DJA, Morris S, Procter T, Hughes D, *et al.*

No. 8

An introduction to statistical methods for health technology assessment.

A review by White SJ, Ashby D, Brown PJ.

No. 9

Disease-modifying drugs for multiple sclerosis: a rapid and systematic review.

By Clegg A, Bryant J, Milne R.

No. 10

Publication and related biases.

A review by Song F, Eastwood AJ, Gilbody S, Duley L, Sutton AJ.

No. 11

Cost and outcome implications of the organisation of vascular services.

By Michaels J, Brazier J, Palfreyman S, Shackley P, Slack R.

No. 12

Monitoring blood glucose control in diabetes mellitus: a systematic review.

By Coster S, Gulliford MC, Seed PT, Powrie JK, Swaminathan R.

No. 13

The effectiveness of domiciliary health visiting: a systematic review of international studies and a selective review of the British literature.

By Elkan R, Kendrick D, Hewitt M, Robinson JJA, Tolley K, Blair M, *et al.*

No. 14

The determinants of screening uptake and interventions for increasing uptake: a systematic review.

By Jepson R, Clegg A, Forbes C, Lewis R, Sowden A, Kleijnen J.

No. 15

The effectiveness and cost-effectiveness of prophylactic removal of wisdom teeth.

A rapid review by Song F, O'Meara S, Wilson P, Golder S, Kleijnen J.

No. 16

Ultrasound screening in pregnancy: a systematic review of the clinical effectiveness, cost-effectiveness and women's views.

By Bricker L, Garcia J, Henderson J, Mugford M, Neilson J, Roberts T, *et al.*

No. 17

A rapid and systematic review of the effectiveness and cost-effectiveness of the taxanes used in the treatment of advanced breast and ovarian cancer.

By Lister-Sharp D, McDonagh MS, Khan KS, Kleijnen J.

No. 18

Liquid-based cytology in cervical screening: a rapid and systematic review.

By Payne N, Chilcott J, McGoogan E.

No. 19

Randomised controlled trial of non-directive counselling, cognitive-behaviour therapy and usual general practitioner care in the management of depression as well as mixed anxiety and depression in primary care.

By King M, Sibbald B, Ward E, Bower P, Lloyd M, Gabbay M, *et al.*

No. 20

Routine referral for radiography of patients presenting with low back pain: is patients' outcome influenced by GPs' referral for plain radiography?

By Kerry S, Hilton S, Patel S, Dundas D, Rink E, Lord J.

No. 21

Systematic reviews of wound care management: (3) antimicrobial agents for chronic wounds; (4) diabetic foot ulceration.

By O'Meara S, Cullum N, Majid M, Sheldon T.

No. 22

Using routine data to complement and enhance the results of randomised controlled trials.

By Lewsey JD, Leyland AH, Murray GD, Boddy FA.

No. 23

Coronary artery stents in the treatment of ischaemic heart disease: a rapid and systematic review.

By Meads C, Cummins C, Jolly K, Stevens A, Burls A, Hyde C.

No. 24

Outcome measures for adult critical care: a systematic review.

By Hayes JA, Black NA, Jenkinson C, Young JD, Rowan KM, Daly K, *et al.*

No. 25

A systematic review to evaluate the effectiveness of interventions to promote the initiation of breastfeeding.

By Fairbank L, O'Meara S, Renfrew MJ, Woolridge M, Sowden AJ, Lister-Sharp D.

No. 26

Implantable cardioverter defibrillators: arrhythmias. A rapid and systematic review.

By Parkes J, Bryant J, Milne R.

No. 27

Treatments for fatigue in multiple sclerosis: a rapid and systematic review.

By Brañas P, Jordan R, Fry-Smith A, Burls A, Hyde C.

No. 28

Early asthma prophylaxis, natural history, skeletal development and economy (EASE): a pilot randomised controlled trial.

By Baxter-Jones ADG, Helms PJ, Russell G, Grant A, Ross S, Cairns JA, *et al.*

No. 29

Screening for hypercholesterolaemia versus case finding for familial hypercholesterolaemia: a systematic review and cost-effectiveness analysis.

By Marks D, Wonderling D, Thorogood M, Lambert H, Humphries SE, Neil HAW.

No. 30

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of glycoprotein IIb/IIIa antagonists in the medical management of unstable angina.

By McDonagh MS, Bachmann LM, Golder S, Kleijnen J, ter Riet G.

No. 31

A randomised controlled trial of prehospital intravenous fluid replacement therapy in serious trauma.

By Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D.

No. 32

Intrathecal pumps for giving opioids in chronic pain: a systematic review.

By Williams JE, Louw G, Towler G.

No. 33

Combination therapy (interferon alfa and ribavirin) in the treatment of chronic hepatitis C: a rapid and systematic review.

By Shepherd J, Waugh N, Hewitson P.

No. 34

A systematic review of comparisons of effect sizes derived from randomised and non-randomised studies.

By MacLehose RR, Reeves BC, Harvey IM, Sheldon TA, Russell IT, Black AMS.

No. 35

Intravascular ultrasound-guided interventions in coronary artery disease: a systematic literature review, with decision-analytic modelling, of outcomes and cost-effectiveness.

By Berry E, Kelly S, Hutton J, Lindsay HSJ, Blaxill JM, Evans JA, *et al.*

No. 36

A randomised controlled trial to evaluate the effectiveness and cost-effectiveness of counselling patients with chronic depression.

By Simpson S, Corney R, Fitzgerald P, Beecham J.

No. 37

Systematic review of treatments for atopic eczema.

By Hoare C, Li Wan Po A, Williams H.

No. 38

Bayesian methods in health technology assessment: a review.

By Spiegelhalter DJ, Myles JP, Jones DR, Abrams KR.

No. 39

The management of dyspepsia: a systematic review.

By Delaney B, Moayyedi P, Deeks J, Innes M, Soo S, Barton P, *et al.*

No. 40

A systematic review of treatments for severe psoriasis.

By Griffiths CEM, Clark CM, Chalmers RJG, Li Wan Po A, Williams HC.

Volume 5, 2001

No. 1

Clinical and cost-effectiveness of donepezil, rivastigmine and galantamine for Alzheimer's disease: a rapid and systematic review.

By Clegg A, Bryant J, Nicholson T, McIntyre L, De Broe S, Gerard K, *et al.*

No. 2

The clinical effectiveness and cost-effectiveness of riluzole for motor neurone disease: a rapid and systematic review.

By Stewart A, Sandercock J, Bryan S, Hyde C, Barton PM, Fry-Smith A, *et al.*

No. 3

Equity and the economic evaluation of healthcare.

By Sassi F, Archard L, Le Grand J.

No. 4

Quality-of-life measures in chronic diseases of childhood.

By Eiser C, Morse R.

No. 5

Eliciting public preferences for healthcare: a systematic review of techniques.

By Ryan M, Scott DA, Reeves C, Bate A, van Teijlingen ER, Russell EM, *et al.*

No. 6

General health status measures for people with cognitive impairment: learning disability and acquired brain injury.

By Riemsma RP, Forbes CA, Glanville JM, Eastwood AJ, Kleijnen J.

No. 7

An assessment of screening strategies for fragile X syndrome in the UK.

By Pembrey ME, Barnicoat AJ, Carmichael B, Bobrow M, Turner G.

No. 8

Issues in methodological research: perspectives from researchers and commissioners.

By Lilford RJ, Richardson A, Stevens A, Fitzpatrick R, Edwards S, Rock F, *et al.*

No. 9

Systematic reviews of wound care management: (5) beds; (6) compression; (7) laser therapy, therapeutic ultrasound, electrotherapy and electromagnetic therapy.

By Cullum N, Nelson EA, Flemming K, Sheldon T.

No. 10

Effects of educational and psychosocial interventions for adolescents with diabetes mellitus: a systematic review.

By Hampson SE, Skinner TC, Hart J, Storey L, Gage H, Foxcroft D, *et al.*

No. 11

Effectiveness of autologous chondrocyte transplantation for hyaline cartilage defects in knees: a rapid and systematic review.

By Jobanputra P, Parry D, Fry-Smith A, Burls A.

No. 12

Statistical assessment of the learning curves of health technologies.

By Ramsay CR, Grant AM, Wallace SA, Garthwaite PH, Monk AF, Russell IT.

No. 13

The effectiveness and cost-effectiveness of temozolomide for the treatment of recurrent malignant glioma: a rapid and systematic review.

By Dinnes J, Cave C, Huang S, Major K, Milne R.

No. 14

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of debriding agents in treating surgical wounds healing by secondary intention.

By Lewis R, Whiting P, ter Riet G, O'Meara S, Glanville J.

No. 15

Home treatment for mental health problems: a systematic review.

By Burns T, Knapp M, Catty J, Healey A, Henderson J, Watt H, *et al.*

No. 16

How to develop cost-conscious guidelines.

By Eccles M, Mason J.

No. 17

The role of specialist nurses in multiple sclerosis: a rapid and systematic review.

By De Broe S, Christopher F, Waugh N.

No. 18

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of orlistat in the management of obesity.

By O'Meara S, Riemsma R, Shirran L, Mather L, ter Riet G.

No. 19

The clinical effectiveness and cost-effectiveness of pioglitazone for type 2 diabetes mellitus: a rapid and systematic review.

By Chilcott J, Wight J, Lloyd Jones M, Tappenden P.

No. 20

Extended scope of nursing practice: a multicentre randomised controlled trial of appropriately trained nurses and preregistration house officers in preoperative assessment in elective general surgery.

By Kinley H, Czoski-Murray C, George S, McCabe C, Primrose J, Reilly C, *et al.*

No. 21

Systematic reviews of the effectiveness of day care for people with severe mental disorders: (1) Acute day hospital versus admission; (2) Vocational rehabilitation; (3) Day hospital versus outpatient care.

By Marshall M, Crowther R, Almaraz-Serrano A, Creed F, Sledge W, Kluiters H, *et al.*

No. 22

The measurement and monitoring of surgical adverse events.

By Bruce J, Russell EM, Mollison J, Krukowski ZH.

No. 23

Action research: a systematic review and guidance for assessment.

By Waterman H, Tillen D, Dickson R, de Koning K.

No. 24

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of gemcitabine for the treatment of pancreatic cancer.

By Ward S, Morris E, Bansback N, Calvert N, Crellin A, Forman D, *et al.*

No. 25

A rapid and systematic review of the evidence for the clinical effectiveness and cost-effectiveness of irinotecan, oxaliplatin and raltitrexed for the treatment of advanced colorectal cancer.

By Lloyd Jones M, Hummel S, Bansback N, Orr B, Seymour M.

No. 26

Comparison of the effectiveness of inhaler devices in asthma and chronic obstructive airways disease: a systematic review of the literature.

By Brocklebank D, Ram F, Wright J, Barry P, Cates C, Davies L, *et al.*

No. 27

The cost-effectiveness of magnetic resonance imaging for investigation of the knee joint.

By Bryan S, Weatherburn G, Bungay H, Hatrick C, Salas C, Parry D, *et al.*

No. 28

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of topotecan for ovarian cancer.

By Forbes C, Shirran L, Bagnall A-M, Duffy S, ter Riet G.

No. 29

Superseded by a report published in a later volume.

No. 30

The role of radiography in primary care patients with low back pain of at least 6 weeks duration: a randomised (unblinded) controlled trial.

By Kendrick D, Fielding K, Bentley E, Miller P, Kerslake R, Pringle M.

No. 31

Design and use of questionnaires: a review of best practice applicable to surveys of health service staff and patients.

By McColl E, Jacoby A, Thomas L, Soutter J, Bamford C, Steen N, *et al.*

No. 32

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of paclitaxel, docetaxel, gemcitabine and vinorelbine in non-small-cell lung cancer.

By Clegg A, Scott DA, Sidhu M, Hewitson P, Waugh N.

No. 33

Subgroup analyses in randomised controlled trials: quantifying the risks of false-positives and false-negatives.

By Brookes ST, Whitley E, Peters TJ, Mulheran PA, Egger M, Davey Smith G.

No. 34

Depot antipsychotic medication in the treatment of patients with schizophrenia: (1) Meta-review; (2) Patient and nurse attitudes.

By David AS, Adams C.

No. 35

A systematic review of controlled trials of the effectiveness and cost-effectiveness of brief psychological treatments for depression.

By Churchill R, Hunot V, Corney R, Knapp M, McGuire H, Tylee A, *et al.*

No. 36

Cost analysis of child health surveillance.

By Sanderson D, Wright D, Acton C, Duree D.

Volume 6, 2002**No. 1**

A study of the methods used to select review criteria for clinical audit.

By Hearnshaw H, Harker R, Cheater F, Baker R, Grimshaw G.

No. 2

Fludarabine as second-line therapy for B cell chronic lymphocytic leukaemia: a technology assessment.

By Hyde C, Wake B, Bryan S, Barton P, Fry-Smith A, Davenport C, *et al.*

No. 3

Rituximab as third-line treatment for refractory or recurrent Stage III or IV follicular non-Hodgkin's lymphoma: a systematic review and economic evaluation.

By Wake B, Hyde C, Bryan S, Barton P, Song F, Fry-Smith A, *et al.*

No. 4

A systematic review of discharge arrangements for older people.

By Parker SG, Peet SM, McPherson A, Cannaby AM, Baker R, Wilson A, *et al.*

No. 5

The clinical effectiveness and cost-effectiveness of inhaler devices used in the routine management of chronic asthma in older children: a systematic review and economic evaluation.

By Peters J, Stevenson M, Beverley C, Lim J, Smith S.

No. 6

The clinical effectiveness and cost-effectiveness of sibutramine in the management of obesity: a technology assessment.

By O'Meara S, Riemsma R, Shirran L, Mather L, ter Riet G.

No. 7

The cost-effectiveness of magnetic resonance angiography for carotid artery stenosis and peripheral vascular disease: a systematic review.

By Berry E, Kelly S, Westwood ME, Davies LM, Gough MJ, Bamford JM, *et al.*

No. 8

Promoting physical activity in South Asian Muslim women through 'exercise on prescription'.

By Carroll B, Ali N, Azam N.

No. 9

Zanamivir for the treatment of influenza in adults: a systematic review and economic evaluation.

By Burls A, Clark W, Stewart T, Preston C, Bryan S, Jefferson T, *et al.*

No. 10

A review of the natural history and epidemiology of multiple sclerosis: implications for resource allocation and health economic models.

By Richards RG, Sampson FC, Beard SM, Tappenden P.

No. 11

Screening for gestational diabetes: a systematic review and economic evaluation.

By Scott DA, Loveman E, McIntyre L, Waugh N.

No. 12

The clinical effectiveness and cost-effectiveness of surgery for people with morbid obesity: a systematic review and economic evaluation.

By Clegg AJ, Colquitt J, Sidhu MK, Royle P, Loveman E, Walker A.

No. 13

The clinical effectiveness of trastuzumab for breast cancer: a systematic review.

By Lewis R, Bagnall A-M, Forbes C, Shirran E, Duffy S, Kleijnen J, *et al.*

No. 14

The clinical effectiveness and cost-effectiveness of vinorelbine for breast cancer: a systematic review and economic evaluation.

By Lewis R, Bagnall A-M, King S, Woolcott N, Forbes C, Shirran L, *et al.*

No. 15

A systematic review of the effectiveness and cost-effectiveness of metal-on-metal hip resurfacing arthroplasty for treatment of hip disease.

By Vale L, Wyness L, McCormack K, McKenzie L, Brazzelli M, Stearns SC.

No. 16

The clinical effectiveness and cost-effectiveness of bupropion and nicotine replacement therapy for smoking cessation: a systematic review and economic evaluation.

By Woolcott NF, Jones L, Forbes CA, Mather LC, Sowden AJ, Song FJ, *et al.*

No. 17

A systematic review of effectiveness and economic evaluation of new drug treatments for juvenile idiopathic arthritis: etanercept.

By Cummins C, Connock M, Fry-Smith A, Burls A.

No. 18

Clinical effectiveness and cost-effectiveness of growth hormone in children: a systematic review and economic evaluation.

By Bryant J, Cave C, Mihaylova B, Chase D, McIntyre L, Gerard K, *et al.*

No. 19

Clinical effectiveness and cost-effectiveness of growth hormone in adults in relation to impact on quality of life: a systematic review and economic evaluation.

By Bryant J, Loveman E, Chase D, Mihaylova B, Cave C, Gerard K, *et al.*

No. 20

Clinical medication review by a pharmacist of patients on repeat prescriptions in general practice: a randomised controlled trial.

By Zermansky AG, Petty DR, Raynor DK, Lowe CJ, Freemantle N, Vail A.

No. 21

The effectiveness of infliximab and etanercept for the treatment of rheumatoid arthritis: a systematic review and economic evaluation.

By Jobanputra P, Barton P, Bryan S, Burls A.

No. 22

A systematic review and economic evaluation of computerised cognitive behaviour therapy for depression and anxiety.

By Kaltenthaler E, Shackley P, Stevens K, Beverley C, Parry G, Chilcott J.

No. 23

A systematic review and economic evaluation of pegylated liposomal doxorubicin hydrochloride for ovarian cancer.

By Forbes C, Wilby J, Richardson G, Sculpher M, Mather L, Reimsma R.

No. 24

A systematic review of the effectiveness of interventions based on a stages-of-change approach to promote individual behaviour change.

By Riemsma RP, Pattenden J, Bridle C, Sowden AJ, Mather L, Watt IS, *et al.*

No. 25

A systematic review update of the clinical effectiveness and cost-effectiveness of glycoprotein IIb/IIIa antagonists.

By Robinson M, Ginnelly L, Sculpher M, Jones L, Riemsma R, Palmer S, *et al.*

No. 26

A systematic review of the effectiveness, cost-effectiveness and barriers to implementation of thrombolytic and neuroprotective therapy for acute ischaemic stroke in the NHS.

By Sandercock P, Berge E, Dennis M, Forbes J, Hand P, Kwan J, *et al.*

No. 27

A randomised controlled crossover trial of nurse practitioner versus doctor-led outpatient care in a bronchiectasis clinic.

By Caine N, Sharples LD, Hollingworth W, French J, Keogan M, Exley A, *et al.*

No. 28

Clinical effectiveness and cost – consequences of selective serotonin reuptake inhibitors in the treatment of sex offenders.

By Adi Y, Ashcroft D, Browne K, Beech A, Fry-Smith A, Hyde C.

No. 29

Treatment of established osteoporosis: a systematic review and cost-utility analysis.

By Kanis JA, Brazier JE, Stevenson M, Calvert NW, Lloyd Jones M.

No. 30

Which anaesthetic agents are cost-effective in day surgery? Literature review, national survey of practice and randomised controlled trial.

By Elliott RA Payne K, Moore JK, Davies LM, Harper NJN, St Leger AS, *et al.*

No. 31

Screening for hepatitis C among injecting drug users and in genitourinary medicine clinics: systematic reviews of effectiveness, modelling study and national survey of current practice.

By Stein K, Dalziel K, Walker A, McIntyre L, Jenkins B, Horne J, *et al.*

No. 32

The measurement of satisfaction with healthcare: implications for practice from a systematic review of the literature.

By Crow R, Gage H, Hampson S, Hart J, Kimber A, Storey L, *et al.*

No. 33

The effectiveness and cost-effectiveness of imatinib in chronic myeloid leukaemia: a systematic review.

By Garside R, Round A, Dalziel K, Stein K, Royle R.

No. 34

A comparative study of hypertonic saline, daily and alternate-day rhDNase in children with cystic fibrosis.

By Suri R, Wallis C, Bush A, Thompson S, Normand C, Flather M, *et al.*

No. 35

A systematic review of the costs and effectiveness of different models of paediatric home care.

By Parker G, Bhakta P, Lovett CA, Paisley S, Olsen R, Turner D, *et al.*

Volume 7, 2003

No. 1

How important are comprehensive literature searches and the assessment of trial quality in systematic reviews? Empirical study.

By Egger M, Jüni P, Bartlett C, Hohenstein F, Sterne J.

No. 2

Systematic review of the effectiveness and cost-effectiveness, and economic evaluation, of home versus hospital or satellite unit haemodialysis for people with end-stage renal failure.

By Mowatt G, Vale L, Perez J, Wyness L, Fraser C, MacLeod A, *et al.*

No. 3

Systematic review and economic evaluation of the effectiveness of infliximab for the treatment of Crohn's disease.

By Clark W, Raftery J, Barton P, Song F, Fry-Smith A, Burls A.

No. 4

A review of the clinical effectiveness and cost-effectiveness of routine anti-D prophylaxis for pregnant women who are rhesus negative.

By Chilcott J, Lloyd Jones M, Wight J, Forman K, Wray J, Beverley C, *et al.*

No. 5

Systematic review and evaluation of the use of tumour markers in paediatric oncology: Ewing's sarcoma and neuroblastoma.

By Riley RD, Burchill SA, Abrams KR, Heney D, Lambert PC, Jones DR, *et al.*

No. 6

The cost-effectiveness of screening for *Helicobacter pylori* to reduce mortality and morbidity from gastric cancer and peptic ulcer disease: a discrete-event simulation model.

By Roderick P, Davies R, Raftery J, Crabbe D, Pearce R, Bhandari P, *et al.*

No. 7

The clinical effectiveness and cost-effectiveness of routine dental checks: a systematic review and economic evaluation.

By Davenport C, Elley K, Salas C, Taylor-Weetman CL, Fry-Smith A, Bryan S, *et al.*

No. 8

A multicentre randomised controlled trial assessing the costs and benefits of using structured information and analysis of women's preferences in the management of menorrhagia.

By Kennedy ADM, Sculpher MJ, Coulter A, Dwyer N, Rees M, Horsley S, *et al.*

No. 9

Clinical effectiveness and cost-utility of photodynamic therapy for wet age-related macular degeneration: a systematic review and economic evaluation.

By Meads C, Salas C, Roberts T, Moore D, Fry-Smith A, Hyde C.

No. 10

Evaluation of molecular tests for prenatal diagnosis of chromosome abnormalities.

By Grimshaw GM, Szczepura A, Hultén M, MacDonald F, Nevin NC, Sutton F, *et al.*

No. 11

First and second trimester antenatal screening for Down's syndrome: the results of the Serum, Urine and Ultrasound Screening Study (SURUSS).

By Wald NJ, Rodeck C, Hackshaw AK, Walters J, Chitty L, Mackinson AM.

No. 12

The effectiveness and cost-effectiveness of ultrasound locating devices for central venous access: a systematic review and economic evaluation.

By Calvert N, Hind D, McWilliams RG, Thomas SM, Beverley C, Davidson A.

No. 13

A systematic review of atypical antipsychotics in schizophrenia.

By Bagnall A-M, Jones L, Lewis R, Ginnelly L, Glanville J, Torgerson D, *et al.*

No. 14

Prostate Testing for Cancer and Treatment (ProtecT) feasibility study.

By Donovan J, Hamdy F, Neal D, Peters T, Oliver S, Brindle L, *et al.*

No. 15

Early thrombolysis for the treatment of acute myocardial infarction: a systematic review and economic evaluation.

By Boland A, Dundar Y, Bagust A, Haycox A, Hill R, Mujica Mota R, *et al.*

No. 16

Screening for fragile X syndrome: a literature review and modelling.

By Song FJ, Barton P, Sleightholme V, Yao GL, Fry-Smith A.

No. 17

Systematic review of endoscopic sinus surgery for nasal polyps.

By Dalziel K, Stein K, Round A, Garside R, Royle P.

No. 18

Towards efficient guidelines: how to monitor guideline use in primary care.

By Hutchinson A, McIntosh A, Cox S, Gilbert C.

No. 19

Effectiveness and cost-effectiveness of acute hospital-based spinal cord injuries services: systematic review.

By Bagnall A-M, Jones L, Richardson G, Duffy S, Riemsma R.

No. 20

Prioritisation of health technology assessment. The PATHS model: methods and case studies.

By Townsend J, Buxton M, Harper G.

No. 21

Systematic review of the clinical effectiveness and cost-effectiveness of tension-free vaginal tape for treatment of urinary stress incontinence.

By Cody J, Wyness L, Wallace S, Glazener C, Kilonzo M, Stearns S, *et al.*

No. 22

The clinical and cost-effectiveness of patient education models for diabetes: a systematic review and economic evaluation.

By Loveman E, Cave C, Green C, Royle P, Dunn N, Waugh N.

No. 23

The role of modelling in prioritising and planning clinical trials.

By Chilcott J, Brennan A, Booth A, Karnon J, Tappenden P.

No. 24

Cost-benefit evaluation of routine influenza immunisation in people 65-74 years of age.

By Allsup S, Gosney M, Haycox A, Regan M.

No. 25

The clinical and cost-effectiveness of pulsatile machine perfusion versus cold storage of kidneys for transplantation retrieved from heart-beating and non-heart-beating donors.

By Wight J, Chilcott J, Holmes M, Brewer N.

No. 26

Can randomised trials rely on existing electronic data? A feasibility study to explore the value of routine data in health technology assessment.

By Williams JG, Cheung WY, Cohen DR, Hutchings HA, Longo MF, Russell IT.

No. 27

Evaluating non-randomised intervention studies.

By Deeks JJ, Dinnes J, D'Amico R, Sowden AJ, Sakarovich C, Song F, *et al.*

No. 28

A randomised controlled trial to assess the impact of a package comprising a patient-orientated, evidence-based self-help guidebook and patient-centred consultations on disease management and satisfaction in inflammatory bowel disease.

By Kennedy A, Nelson E, Reeves D, Richardson G, Roberts C, Robinson A, *et al.*

No. 29

The effectiveness of diagnostic tests for the assessment of shoulder pain due to soft tissue disorders: a systematic review.

By Dinnes J, Loveman E, McIntyre L, Waugh N.

No. 30

The value of digital imaging in diabetic retinopathy.

By Sharp PF, Olson J, Strachan F, Hipwell J, Ludbrook A, O'Donnell M, *et al.*

No. 31

Lowering blood pressure to prevent myocardial infarction and stroke: a new preventive strategy.

By Law M, Wald N, Morris J.

No. 32

Clinical and cost-effectiveness of capecitabine and tegafur with uracil for the treatment of metastatic colorectal cancer: systematic review and economic evaluation.

By Ward S, Kaltenthaler E, Cowan J, Brewer N.

No. 33

Clinical and cost-effectiveness of new and emerging technologies for early localised prostate cancer: a systematic review.

By Hummel S, Paisley S, Morgan A, Currie E, Brewer N.

No. 34

Literature searching for clinical and cost-effectiveness studies used in health technology assessment reports carried out for the National Institute for Clinical Excellence appraisal system.

By Royle P, Waugh N.

No. 35

Systematic review and economic decision modelling for the prevention and treatment of influenza A and B.

By Turner D, Wailoo A, Nicholson K, Cooper N, Sutton A, Abrams K.

No. 36

A randomised controlled trial to evaluate the clinical and cost-effectiveness of Hickman line insertions in adult cancer patients by nurses.

By Boland A, Haycox A, Bagust A, Fitzsimmons L.

No. 37

Redesigning postnatal care: a randomised controlled trial of protocol-based midwifery-led care focused on individual women's physical and psychological health needs.

By MacArthur C, Winter HR, Bick DE, Lilford RJ, Lancashire RJ, Knowles H, *et al.*

No. 38

Estimating implied rates of discount in healthcare decision-making.

By West RR, McNabb R, Thompson AGH, Sheldon TA, Grimley Evans J.

No. 39

Systematic review of isolation policies in the hospital management of methicillin-resistant *Staphylococcus aureus*: a review of the literature with epidemiological and economic modelling.

By Cooper BS, Stone SP, Kibbler CC, Cookson BD, Roberts JA, Medley GF, *et al.*

No. 40

Treatments for spasticity and pain in multiple sclerosis: a systematic review.

By Beard S, Hunn A, Wight J.

No. 41

The inclusion of reports of randomised trials published in languages other than English in systematic reviews.

By Moher D, Pham B, Lawson ML, Klassen TP.

No. 42

The impact of screening on future health-promoting behaviours and health beliefs: a systematic review.

By Bankhead CR, Brett J, Bukach C, Webster P, Stewart-Brown S, Munafo M, *et al.*

Volume 8, 2004

No. 1

What is the best imaging strategy for acute stroke?

By Wardlaw JM, Keir SL, Seymour J, Lewis S, Sandercock PAG, Dennis MS, *et al.*

No. 2

Systematic review and modelling of the investigation of acute and chronic chest pain presenting in primary care.

By Mant J, McManus RJ, Oakes RAL, Delaney BC, Barton PM, Deeks JJ, *et al.*

No. 3

The effectiveness and cost-effectiveness of microwave and thermal balloon endometrial ablation for heavy menstrual bleeding: a systematic review and economic modelling.

By Garside R, Stein K, Wyatt K, Round A, Price A.

No. 4

A systematic review of the role of bisphosphonates in metastatic disease.

By Ross JR, Saunders Y, Edmonds PM, Patel S, Wonderling D, Normand C, *et al.*

No. 5

Systematic review of the clinical effectiveness and cost-effectiveness of capecitabine (Xeloda®) for locally advanced and/or metastatic breast cancer.

By Jones L, Hawkins N, Westwood M, Wright K, Richardson G, Riemsma R.

No. 6

Effectiveness and efficiency of guideline dissemination and implementation strategies.

By Grimshaw JM, Thomas RE, MacLennan G, Fraser C, Ramsay CR, Vale L, *et al.*

No. 7

Clinical effectiveness and costs of the Sugarbaker procedure for the treatment of pseudomyxoma peritonei.

By Bryant J, Clegg AJ, Sidhu MK, Brodin H, Royle P, Davidson P.

No. 8

Psychological treatment for insomnia in the regulation of long-term hypnotic drug use.

By Morgan K, Dixon S, Mathers N, Thompson J, Tomeny M.

No. 9

Improving the evaluation of therapeutic interventions in multiple sclerosis: development of a patient-based measure of outcome.

By Hobart JC, Riazi A, Lamping DL, Fitzpatrick R, Thompson AJ.

No. 10

A systematic review and economic evaluation of magnetic resonance cholangiopancreatography compared with diagnostic endoscopic retrograde cholangiopancreatography.

By Kaltenthaler E, Bravo Vergel Y, Chilcott J, Thomas S, Blakeborough T, Walters SJ, *et al.*

No. 11

The use of modelling to evaluate new drugs for patients with a chronic condition: the case of antibodies against tumour necrosis factor in rheumatoid arthritis.

By Barton P, Jobanputra P, Wilson J, Bryan S, Burls A.

No. 12

Clinical effectiveness and cost-effectiveness of neonatal screening for inborn errors of metabolism using tandem mass spectrometry: a systematic review.

By Pandor A, Eastham J, Beverley C, Chilcott J, Paisley S.

No. 13

Clinical effectiveness and cost-effectiveness of pioglitazone and rosiglitazone in the treatment of type 2 diabetes: a systematic review and economic evaluation.

By Czoski-Murray C, Warren E, Chilcott J, Beverley C, Psyllaki MA, Cowan J.

No. 14

Routine examination of the newborn: the EMREN study. Evaluation of an extension of the midwife role including a randomised controlled trial of appropriately trained midwives and paediatric senior house officers.

By Townsend J, Wolke D, Hayes J, Davé S, Rogers C, Bloomfield L, *et al.*

No. 15

Involving consumers in research and development agenda setting for the NHS: developing an evidence-based approach.

By Oliver S, Clarke-Jones L, Rees R, Milne R, Buchanan P, Gabbay J, *et al.*

No. 16

A multi-centre randomised controlled trial of minimally invasive direct coronary bypass grafting versus percutaneous transluminal coronary angioplasty with stenting for proximal stenosis of the left anterior descending coronary artery.

By Reeves BC, Angelini GD, Bryan AJ, Taylor FC, Cripps T, Spyt TJ, *et al.*

No. 17

Does early magnetic resonance imaging influence management or improve outcome in patients referred to secondary care with low back pain? A pragmatic randomised controlled trial.

By Gilbert FJ, Grant AM, Gillan MGC, Vale L, Scott NW, Campbell MK, *et al.*

No. 18

The clinical and cost-effectiveness of anakinra for the treatment of rheumatoid arthritis in adults: a systematic review and economic analysis.

By Clark W, Jobanputra P, Barton P, Burls A.

No. 19

A rapid and systematic review and economic evaluation of the clinical and cost-effectiveness of newer drugs for treatment of mania associated with bipolar affective disorder.

By Bridle C, Palmer S, Bagnall A-M, Darba J, Duffy S, Sculpher M, *et al.*

No. 20

Liquid-based cytology in cervical screening: an updated rapid and systematic review and economic analysis.

By Karnon J, Peters J, Platt J, Chilcott J, McGoogan E, Brewer N.

No. 21

Systematic review of the long-term effects and economic consequences of treatments for obesity and implications for health improvement.

By Avenell A, Broom J, Brown TJ, Poobalan A, Aucott L, Stearns SC, *et al.*

No. 22

Autoantibody testing in children with newly diagnosed type 1 diabetes mellitus.

By Dretzke J, Cummins C, Sandercock J, Fry-Smith A, Barrett T, Burls A.

No. 23

Clinical effectiveness and cost-effectiveness of prehospital intravenous fluids in trauma patients.

By Dretzke J, Sandercock J, Bayliss S, Burls A.

No. 24

Newer hypnotic drugs for the short-term management of insomnia: a systematic review and economic evaluation.

By Dündar Y, Boland A, Strobl J, Dodd S, Haycox A, Bagust A, *et al.*

No. 25

Development and validation of methods for assessing the quality of diagnostic accuracy studies.

By Whiting P, Rutjes AWS, Dinnes J, Reitsma JB, Bossuyt PMM, Kleijnen J.

No. 26

EVALUATE hysterectomy trial: a multicentre randomised trial comparing abdominal, vaginal and laparoscopic methods of hysterectomy.

By Garry R, Fountain J, Brown J, Manca A, Mason S, Sculpher M, *et al.*

No. 27

Methods for expected value of information analysis in complex health economic models: developments on the health economics of interferon- β and glatiramer acetate for multiple sclerosis.

By Tappenden P, Chilcott JB, Eggington S, Oakley J, McCabe C.

No. 28

Effectiveness and cost-effectiveness of imatinib for first-line treatment of chronic myeloid leukaemia in chronic phase: a systematic review and economic analysis.

By Dalziel K, Round A, Stein K, Garside R, Price A.

No. 29

VenUS I: a randomised controlled trial of two types of bandage for treating venous leg ulcers.

By Iglesias C, Nelson EA, Cullum NA, Torgerson DJ, on behalf of the VenUS Team.

No. 30

Systematic review of the effectiveness and cost-effectiveness, and economic evaluation, of myocardial perfusion scintigraphy for the diagnosis and management of angina and myocardial infarction.

By Mowatt G, Vale L, Brazzelli M, Hernandez R, Murray A, Scott N, *et al.*

No. 31

A pilot study on the use of decision theory and value of information analysis as part of the NHS Health Technology Assessment programme.

By Claxton K, Ginnelly L, Sculpher M, Philips Z, Palmer S.

No. 32

The Social Support and Family Health Study: a randomised controlled trial and economic evaluation of two alternative forms of postnatal support for mothers living in disadvantaged inner-city areas.

By Wiggins M, Oakley A, Roberts I, Turner H, Rajan L, Austerberry H, *et al.*

No. 33

Psychosocial aspects of genetic screening of pregnant women and newborns: a systematic review.

By Green JM, Hewison J, Bekker HL, Bryant, Cuckle HS.

No. 34

Evaluation of abnormal uterine bleeding: comparison of three outpatient procedures within cohorts defined by age and menopausal status.

By Critchley HOD, Warner P, Lee AJ, Brechin S, Guise J, Graham B.

No. 35

Coronary artery stents: a rapid systematic review and economic evaluation.

By Hill R, Bagust A, Bakhai A, Dickson R, Dündar Y, Haycox A, *et al.*

No. 36

Review of guidelines for good practice in decision-analytic modelling in health technology assessment.

By Philips Z, Ginnelly L, Sculpher M, Claxton K, Golder S, Riemsma R, *et al.*

No. 37

Rituximab (MabThera®) for aggressive non-Hodgkin's lymphoma: systematic review and economic evaluation.

By Knight C, Hind D, Brewer N, Abbott V.

No. 38

Clinical effectiveness and cost-effectiveness of clopidogrel and modified-release dipyridamole in the secondary prevention of occlusive vascular events: a systematic review and economic evaluation.

By Jones L, Griffin S, Palmer S, Main C, Orton V, Sculpher M, *et al.*

No. 39

Pegylated interferon α -2a and -2b in combination with ribavirin in the treatment of chronic hepatitis C: a systematic review and economic evaluation.

By Shepherd J, Brodin H, Cave C, Waugh N, Price A, Gabbay J.

No. 40

Clopidogrel used in combination with aspirin compared with aspirin alone in the treatment of non-ST-segment-elevation acute coronary syndromes: a systematic review and economic evaluation.

By Main C, Palmer S, Griffin S, Jones L, Orton V, Sculpher M, *et al.*

No. 41

Provision, uptake and cost of cardiac rehabilitation programmes: improving services to under-represented groups.

By Beswick AD, Rees K, Griebisch I, Taylor FC, Burke M, West RR, *et al.*

No. 42

Involving South Asian patients in clinical trials.

By Hussain-Gambles M, Leese B, Atkin K, Brown J, Mason S, Tovey P.

No. 43

Clinical and cost-effectiveness of continuous subcutaneous insulin infusion for diabetes.

By Colquitt JL, Green C, Sidhu MK, Hartwell D, Waugh N.

No. 44

Identification and assessment of ongoing trials in health technology assessment reviews.

By Song FJ, Fry-Smith A, Davenport C, Bayliss S, Adi Y, Wilson JS, *et al.*

No. 45

Systematic review and economic evaluation of a long-acting insulin analogue, insulin glargine

By Warren E, Weatherley-Jones E, Chilcott J, Beverley C.

No. 46

Supplementation of a home-based exercise programme with a class-based programme for people with osteoarthritis of the knees: a randomised controlled trial and health economic analysis.

By McCarthy CJ, Mills PM, Pullen R, Richardson G, Hawkins N, Roberts CR, *et al.*

No. 47

Clinical and cost-effectiveness of once-daily versus more frequent use of same potency topical corticosteroids for atopic eczema: a systematic review and economic evaluation.

By Green C, Colquitt JL, Kirby J, Davidson P, Payne E.

No. 48

Acupuncture of chronic headache disorders in primary care: randomised controlled trial and economic analysis.

By Vickers AJ, Rees RW, Zollman CE, McCarney R, Smith CM, Ellis N, *et al.*

No. 49

Generalisability in economic evaluation studies in healthcare: a review and case studies.

By Sculpher MJ, Pang FS, Manca A, Drummond MF, Golder S, Urdahl H, *et al.*

No. 50

Virtual outreach: a randomised controlled trial and economic evaluation of joint teleconferenced medical consultations.

By Wallace P, Barber J, Clayton W, Currell R, Fleming K, Garner P, *et al.*

Volume 9, 2005

No. 1

Randomised controlled multiple treatment comparison to provide a cost-effectiveness rationale for the selection of antimicrobial therapy in acne.

By Ozolins M, Eady EA, Avery A, Cunliffe WJ, O'Neill C, Simpson NB, *et al.*

No. 2

Do the findings of case series studies vary significantly according to methodological characteristics?

By Dalziel K, Round A, Stein K, Garside R, Castelnovo E, Payne L.

No. 3

Improving the referral process for familial breast cancer genetic counselling: findings of three randomised controlled trials of two interventions.

By Wilson BJ, Torrance N, Mollison J, Wordsworth S, Gray JR, Haites NE, *et al.*

No. 4

Randomised evaluation of alternative electrosurgical modalities to treat bladder outflow obstruction in men with benign prostatic hyperplasia.

By Fowler C, McAllister W, Plail R, Karim O, Yang Q.

No. 5

A pragmatic randomised controlled trial of the cost-effectiveness of palliative therapies for patients with inoperable oesophageal cancer.

By Shenfine J, McNamee P, Steen N, Bond J, Griffin SM.

No. 6

Impact of computer-aided detection prompts on the sensitivity and specificity of screening mammography.

By Taylor P, Champness J, Given-Wilson R, Johnston K, Potts H.

No. 7

Issues in data monitoring and interim analysis of trials.

By Grant AM, Altman DG, Babiker AB, Campbell MK, Clemens FJ, Darbyshire JH, *et al.*

No. 8

Lay public's understanding of equipoise and randomisation in randomised controlled trials.

By Robinson EJ, Kerr CEP, Stevens AJ, Lilford RJ, Braunholtz DA, Edwards SJ, *et al.*

No. 9

Clinical and cost-effectiveness of electroconvulsive therapy for depressive illness, schizophrenia, catatonia and mania: systematic reviews and economic modelling studies.

By Greenhalgh J, Knight C, Hind D, Beverley C, Walters S.

No. 10

Measurement of health-related quality of life for people with dementia: development of a new instrument (DEM-QOL) and an evaluation of current methodology.

By Smith SC, Lamping DL, Banerjee S, Harwood R, Foley B, Smith P, *et al.*

No. 11

Clinical effectiveness and cost-effectiveness of drotrecogin alfa (activated) (Xigris®) for the treatment of severe sepsis in adults: a systematic review and economic evaluation.

By Green C, Dinnes J, Takeda A, Shepherd J, Hartwell D, Cave C, *et al.*

No. 12

A methodological review of how heterogeneity has been examined in systematic reviews of diagnostic test accuracy.

By Dinnes J, Deeks J, Kirby J, Roderick P.

No. 13

Cervical screening programmes: can automation help? Evidence from systematic reviews, an economic analysis and a simulation modelling exercise applied to the UK.

By Willis BH, Barton P, Pearmain P, Bryan S, Hyde C.

No. 14

Laparoscopic surgery for inguinal hernia repair: systematic review of effectiveness and economic evaluation.

By McCormack K, Wake B, Perez J, Fraser C, Cook J, McIntosh E, *et al.*

No. 15

Clinical effectiveness, tolerability and cost-effectiveness of newer drugs for epilepsy in adults: a systematic review and economic evaluation.

By Wilby J, Kainth A, Hawkins N, Epstein D, McIntosh H, McDaid C, *et al.*

No. 16

A randomised controlled trial to compare the cost-effectiveness of tricyclic antidepressants, selective serotonin reuptake inhibitors and lofepramine.

By Peveler R, Kendrick T, Buxton M, Longworth L, Baldwin D, Moore M, *et al.*

No. 17

Clinical effectiveness and cost-effectiveness of immediate angioplasty for acute myocardial infarction: systematic review and economic evaluation.

By Hartwell D, Colquitt J, Loveman E, Clegg AJ, Brodin H, Waugh N, *et al.*

No. 18

A randomised controlled comparison of alternative strategies in stroke care.

By Kalra L, Evans A, Perez I, Knapp M, Swift C, Donaldson N.

No. 19

The investigation and analysis of critical incidents and adverse events in healthcare.

By Woloshynowych M, Rogers S, Taylor-Adams S, Vincent C.

No. 20

Potential use of routine databases in health technology assessment.

By Raftery J, Roderick P, Stevens A.

No. 21

Clinical and cost-effectiveness of newer immunosuppressive regimens in renal transplantation: a systematic review and modelling study.

By Woodroffe R, Yao GL, Meads C, Bayliss S, Ready A, Raftery J, *et al.*

No. 22

A systematic review and economic evaluation of alendronate, etidronate, risedronate, raloxifene and teriparatide for the prevention and treatment of postmenopausal osteoporosis.

By Stevenson M, Lloyd Jones M, De Nigris E, Brewer N, Davis S, Oakley J.

No. 23

A systematic review to examine the impact of psycho-educational interventions on health outcomes and costs in adults and children with difficult asthma.

By Smith JR, Muggford M, Holland R, Candy B, Noble MJ, Harrison BDW, *et al.*

No. 24

An evaluation of the costs, effectiveness and quality of renal replacement therapy provision in renal satellite units in England and Wales.

By Roderick P, Nicholson T, Armitage A, Mehta R, Mullee M, Gerard K, *et al.*

No. 25

Imatinib for the treatment of patients with unresectable and/or metastatic gastrointestinal stromal tumours: systematic review and economic evaluation.

By Wilson J, Connock M, Song F, Yao G, Fry-Smith A, Raftery J, *et al.*

No. 26

Indirect comparisons of competing interventions.

By Glenny AM, Altman DG, Song F, Sakarovich C, Deeks JJ, D'Amico R, *et al.*

No. 27

Cost-effectiveness of alternative strategies for the initial medical management of non-ST elevation acute coronary syndrome: systematic review and decision-analytical modelling.

By Robinson M, Palmer S, Sculpher M, Philips Z, Ginnelly L, Bowens A, *et al.*

No. 28

Outcomes of electrically stimulated gracilis neosphincter surgery.

By Tillin T, Chambers M, Feldman R.

No. 29

The effectiveness and cost-effectiveness of pimecrolimus and tacrolimus for atopic eczema: a systematic review and economic evaluation.

By Garside R, Stein K, Castelnovo E, Pitt M, Ashcroft D, Dimmock P, *et al.*

No. 30

Systematic review on urine albumin testing for early detection of diabetic complications.

By Newman DJ, Mattock MB, Dawnay ABS, Kerry S, McGuire A, Yaqoob M, *et al.*

No. 31

Randomised controlled trial of the cost-effectiveness of water-based therapy for lower limb osteoarthritis.

By Cochrane T, Davey RC, Matthes Edwards SM.

No. 32

Longer term clinical and economic benefits of offering acupuncture care to patients with chronic low back pain.

By Thomas KJ, MacPherson H, Ratcliffe J, Thorpe L, Brazier J, Campbell M, *et al.*

No. 33

Cost-effectiveness and safety of epidural steroids in the management of sciatica.

By Price C, Arden N, Cogan L, Rogers P.

No. 34

The British Rheumatoid Outcome Study Group (BROSG) randomised controlled trial to compare the effectiveness and cost-effectiveness of aggressive versus symptomatic therapy in established rheumatoid arthritis.

By Symmons D, Tricker K, Roberts C, Davies L, Dawes P, Scott DL.

No. 35

Conceptual framework and systematic review of the effects of participants' and professionals' preferences in randomised controlled trials.

By King M, Nazareth I, Lampe F, Bower P, Chandler M, Morou M, *et al.*

No. 36

The clinical and cost-effectiveness of implantable cardioverter defibrillators: a systematic review.

By Bryant J, Brodin H, Loveman E, Payne E, Clegg A.

No. 37

A trial of problem-solving by community mental health nurses for anxiety, depression and life difficulties among general practice patients. The CPN-GP study.

By Kendrick T, Simons L, Mynors-Wallis L, Gray A, Lathlean J, Pickering R, *et al.*

No. 38

The causes and effects of socio-demographic exclusions from clinical trials.

By Bartlett C, Doyal L, Ebrahim S, Davey P, Bachmann M, Egger M, *et al.*

No. 39

Is hydrotherapy cost-effective? A randomised controlled trial of combined hydrotherapy programmes compared with physiotherapy land techniques in children with juvenile idiopathic arthritis.

By Epps H, Ginnelly L, Utley M, Southwood T, Gallivan S, Sculpher M, *et al.*

No. 40

A randomised controlled trial and cost-effectiveness study of systematic screening (targeted and total population screening) versus routine practice for the detection of atrial fibrillation in people aged 65 and over. The SAFE study.

By Hobbs FDR, Fitzmaurice DA, Mant J, Murray E, Jowett S, Bryan S, *et al.*

No. 41

Displaced intracapsular hip fractures in fit, older people: a randomised comparison of reduction and fixation, bipolar hemiarthroplasty and total hip arthroplasty.

By Keating JF, Grant A, Masson M, Scott NW, Forbes JF.

No. 42

Long-term outcome of cognitive behaviour therapy clinical trials in central Scotland.

By Durham RC, Chambers JA, Power KG, Sharp DM, Macdonald RR, Major KA, *et al.*

No. 43

The effectiveness and cost-effectiveness of dual-chamber pacemakers compared with single-chamber pacemakers for bradycardia due to atrioventricular block or sick sinus syndrome: systematic review and economic evaluation.

By Castelnovo E, Stein K, Pitt M, Garside R, Payne E.

No. 44

Newborn screening for congenital heart defects: a systematic review and cost-effectiveness analysis.

By Knowles R, Griebisch I, Dezateux C, Brown J, Bull C, Wren C.

No. 45

The clinical and cost-effectiveness of left ventricular assist devices for end-stage heart failure: a systematic review and economic evaluation.

By Clegg AJ, Scott DA, Loveman E, Colquitt J, Hutchinson J, Royle P, *et al.*

No. 46

The effectiveness of the Heidelberg Retina Tomograph and laser diagnostic glaucoma scanning system (GDx) in detecting and monitoring glaucoma.

By Kwartz AJ, Henson DB, Harper RA, Spencer AF, McLeod D.

No. 47

Clinical and cost-effectiveness of autologous chondrocyte implantation for cartilage defects in knee joints: systematic review and economic evaluation.

By Clar C, Cummins E, McIntyre L, Thomas S, Lamb J, Bain L, *et al.*

No. 48

Systematic review of effectiveness of different treatments for childhood retinoblastoma.

By McDaid C, Hartley S, Bagnall A-M, Ritchie G, Light K, Riemsma R.

No. 49

Towards evidence-based guidelines for the prevention of venous thromboembolism: systematic reviews of mechanical methods, oral anticoagulation, dextran and regional anaesthesia as thromboprophylaxis.

By Roderick P, Ferris G, Wilson K, Halls H, Jackson D, Collins R, *et al.*

No. 50

The effectiveness and cost-effectiveness of parent training/education programmes for the treatment of conduct disorder, including oppositional defiant disorder, in children.

By Dretzke J, Frew E, Davenport C, Barlow J, Stewart-Brown S, Sandercock J, *et al.*

Volume 10, 2006

No. 1

The clinical and cost-effectiveness of donepezil, rivastigmine, galantamine and memantine for Alzheimer's disease.

By Loveman E, Green C, Kirby J, Takeda A, Picot J, Payne E, *et al.*

No. 2

FOOD: a multicentre randomised trial evaluating feeding policies in patients admitted to hospital with a recent stroke.

By Dennis M, Lewis S, Cranswick G, Forbes J.

No. 3

The clinical effectiveness and cost-effectiveness of computed tomography screening for lung cancer: systematic reviews.

By Black C, Bagust A, Boland A, Walker S, McLeod C, De Verteuil R, *et al.*

No. 4

A systematic review of the effectiveness and cost-effectiveness of neuroimaging assessments used to visualise the seizure focus in people with refractory epilepsy being considered for surgery.

By Whiting P, Gupta R, Burch J, Mujica Mota RE, Wright K, Marson A, *et al.*

No. 5

Comparison of conference abstracts and presentations with full-text articles in the health technology assessments of rapidly evolving technologies.

By Dundar Y, Dodd S, Dickson R, Walley T, Haycox A, Williamson PR.

No. 6

Systematic review and evaluation of methods of assessing urinary incontinence.

By Martin JL, Williams KS, Abrams KR, Turner DA, Sutton AJ, Chapple C, *et al.*

No. 7

The clinical effectiveness and cost-effectiveness of newer drugs for children with epilepsy. A systematic review.

By Connock M, Frew E, Evans B-W, Bryan S, Cummins C, Fry-Smith A, *et al.*

No. 8

Surveillance of Barrett's oesophagus: exploring the uncertainty through systematic review, expert workshop and economic modelling.

By Garside R, Pitt M, Somerville M, Stein K, Price A, Gilbert N.

No. 9

Topotecan, pegylated liposomal doxorubicin hydrochloride and paclitaxel for second-line or subsequent treatment of advanced ovarian cancer: a systematic review and economic evaluation.

By Main C, Bojke L, Griffin S, Norman G, Barbieri M, Mather L, *et al.*

No. 10

Evaluation of molecular techniques in prediction and diagnosis of cytomegalovirus disease in immunocompromised patients.

By Szczepura A, Westmoreland D, Vinogradova Y, Fox J, Clark M.

No. 11

Screening for thrombophilia in high-risk situations: systematic review and cost-effectiveness analysis. The Thrombosis: Risk and Economic Assessment of Thrombophilia Screening (TREATS) study.

By Wu O, Robertson L, Twaddle S, Lowe GDO, Clark P, Greaves M, *et al.*

No. 12

A series of systematic reviews to inform a decision analysis for sampling and treating infected diabetic foot ulcers.

By Nelson EA, O'Meara S, Craig D, Iglesias C, Golder S, Dalton J, *et al.*

No. 13

Randomised clinical trial, observational study and assessment of cost-effectiveness of the treatment of varicose veins (REACTIV trial).

By Michaels JA, Campbell WB, Brazier JE, MacIntyre JB, Palfreyman SJ, Ratcliffe J, *et al.*

No. 14

The cost-effectiveness of screening for oral cancer in primary care.

By Speight PM, Palmer S, Moles DR, Downer MC, Smith DH, Henriksson M, *et al.*

No. 15

Measurement of the clinical and cost-effectiveness of non-invasive diagnostic testing strategies for deep vein thrombosis.

By Goodacre S, Sampson F, Stevenson M, Wailoo A, Sutton A, Thomas S, *et al.*

No. 16

Systematic review of the effectiveness and cost-effectiveness of HealOzone® for the treatment of occlusal pit/fissure caries and root caries.

By Brazzelli M, McKenzie L, Fielding S, Fraser C, Clarkson J, Kilonzo M, *et al.*

No. 17

Randomised controlled trials of conventional antipsychotic versus new atypical drugs, and new atypical drugs versus clozapine, in people with schizophrenia responding poorly to, or intolerant of, current drug treatment.

By Lewis SW, Davies L, Jones PB, Barnes TRE, Murray RM, Kerwin R, *et al.*

No. 18

Diagnostic tests and algorithms used in the investigation of haematuria: systematic reviews and economic evaluation.

By Rodgers M, Nixon J, Hempel S, Aho T, Kelly J, Neal D, *et al.*

No. 19

Cognitive behavioural therapy in addition to antispasmodic therapy for irritable bowel syndrome in primary care: randomised controlled trial.

By Kennedy TM, Chalder T, McCrone P, Darnley S, Knapp M, Jones RH, *et al.*

No. 20

A systematic review of the clinical effectiveness and cost-effectiveness of enzyme replacement therapies for Fabry's disease and mucopolysaccharidosis type 1.

By Connock M, Juarez-Garcia A, Frew E, Mans A, Dretzke J, Fry-Smith A, *et al.*

No. 21

Health benefits of antiviral therapy for mild chronic hepatitis C: randomised controlled trial and economic evaluation.

By Wright M, Grieve R, Roberts J, Main J, Thomas HC, on behalf of the UK Mild Hepatitis C Trial Investigators.

No. 22

Pressure relieving support surfaces: a randomised evaluation.

By Nixon J, Nelson EA, Cranny G, Iglesias CP, Hawkins K, Cullum NA, *et al.*

No. 23

A systematic review and economic model of the effectiveness and cost-effectiveness of methylphenidate, dexamfetamine and atomoxetine for the treatment of attention deficit hyperactivity disorder in children and adolescents.

By King S, Griffin S, Hodges Z, Weatherly H, Asseburg C, Richardson G, *et al.*

No. 24

The clinical effectiveness and cost-effectiveness of enzyme replacement therapy for Gaucher's disease: a systematic review.

By Connock M, Burls A, Frew E, Fry-Smith A, Juarez-Garcia A, McCabe C, *et al.*

No. 25

Effectiveness and cost-effectiveness of salicylic acid and cryotherapy for cutaneous warts. An economic decision model.

By Thomas KS, Keogh-Brown MR, Chalmers JR, Fordham RJ, Holland RC, Armstrong SJ, *et al.*

No. 26

A systematic literature review of the effectiveness of non-pharmacological interventions to prevent wandering in dementia and evaluation of the ethical implications and acceptability of their use.

By Robinson L, Hutchings D, Corner L, Beyer F, Dickinson H, Vanoli A, *et al.*

No. 27

A review of the evidence on the effects and costs of implantable cardioverter defibrillator therapy in different patient groups, and modelling of cost-effectiveness and cost-utility for these groups in a UK context.

By Buxton M, Caine N, Chase D, Connelly D, Grace A, Jackson C, *et al.*

No. 28

Adefovir dipivoxil and pegylated interferon alfa-2a for the treatment of chronic hepatitis B: a systematic review and economic evaluation.

By Shepherd J, Jones J, Takeda A, Davidson P, Price A.

No. 29

An evaluation of the clinical and cost-effectiveness of pulmonary artery catheters in patient management in intensive care: a systematic review and a randomised controlled trial.

By Harvey S, Stevens K, Harrison D, Young D, Brampton W, McCabe C, *et al.*

No. 30

Accurate, practical and cost-effective assessment of carotid stenosis in the UK.

By Wardlaw JM, Chappell FM, Stevenson M, De Nigris E, Thomas S, Gillard J, *et al.*

No. 31

Etanercept and infliximab for the treatment of psoriatic arthritis: a systematic review and economic evaluation.

By Woolacott N, Bravo Vergel Y, Hawkins N, Kainth A, Khadjesari Z, Misso K, *et al.*

No. 32

The cost-effectiveness of testing for hepatitis C in former injecting drug users.

By Castelnovo E, Thompson-Coon J, Pitt M, Cramp M, Siebert U, Price A, *et al.*

No. 33

Computerised cognitive behaviour therapy for depression and anxiety update: a systematic review and economic evaluation.

By Kaltenthaler E, Brazier J, De Nigris E, Tumor I, Ferriter M, Beverley C, *et al.*

No. 34

Cost-effectiveness of using prognostic information to select women with breast cancer for adjuvant systemic therapy.

By Williams C, Brunskill S, Altman D, Briggs A, Campbell H, Clarke M, *et al.*

No. 35

Psychological therapies including dialectical behaviour therapy for borderline personality disorder: a systematic review and preliminary economic evaluation.

By Brazier J, Tumor I, Holmes M, Ferriter M, Parry G, Dent-Brown K, *et al.*

No. 36

Clinical effectiveness and cost-effectiveness of tests for the diagnosis and investigation of urinary tract infection in children: a systematic review and economic model.

By Whiting P, Westwood M, Bojke L, Palmer S, Richardson G, Cooper J, *et al.*

No. 37

Cognitive behavioural therapy in chronic fatigue syndrome: a randomised controlled trial of an outpatient group programme.

By O'Dowd H, Gladwell P, Rogers CA, Hollinghurst S, Gregory A.

No. 38

A comparison of the cost-effectiveness of five strategies for the prevention of nonsteroidal anti-inflammatory drug-induced gastrointestinal toxicity: a systematic review with economic modelling.

By Brown TJ, Hooper L, Elliott RA, Payne K, Webb R, Roberts C, *et al.*

No. 39

The effectiveness and cost-effectiveness of computed tomography screening for coronary artery disease: systematic review.

By Waugh N, Black C, Walker S, McIntyre L, Cummins E, Hillis G.

No. 40

What are the clinical outcome and cost-effectiveness of endoscopy undertaken by nurses when compared with doctors? A Multi-Institution Nurse Endoscopy Trial (MINuET).

By Williams J, Russell I, Durai D, Cheung W-Y, Farrin A, Bloor K, *et al.*

No. 41

The clinical and cost-effectiveness of oxaliplatin and capecitabine for the adjuvant treatment of colon cancer: systematic review and economic evaluation.

By Pandor A, Eggington S, Paisley S, Tappenden P, Sutcliffe P.

No. 42

A systematic review of the effectiveness of adalimumab, etanercept and infliximab for the treatment of rheumatoid arthritis in adults and an economic evaluation of their cost-effectiveness.

By Chen Y-F, Jobanputra P, Barton P, Jowett S, Bryan S, Clark W, *et al.*

No. 43

Telemedicine in dermatology: a randomised controlled trial.

By Bowns IR, Collins K, Walters SJ, McDonagh AJG.

No. 44

Cost-effectiveness of cell salvage and alternative methods of minimising perioperative allogeneic blood transfusion: a systematic review and economic model.

By Davies L, Brown TJ, Haynes S, Payne K, Elliott RA, McCollum C.

No. 45

Clinical effectiveness and cost-effectiveness of laparoscopic surgery for colorectal cancer: systematic reviews and economic evaluation.

By Murray A, Lourenco T, de Verteuil R, Hernandez R, Fraser C, McKinley A, *et al.*

No. 46

Etanercept and efalizumab for the treatment of psoriasis: a systematic review.

By Woolacott N, Hawkins N, Mason A, Kainth A, Khadjesari Z, Bravo Vergel Y, *et al.*

No. 47

Systematic reviews of clinical decision tools for acute abdominal pain.

By Liu JLY, Wyatt JC, Deeks JJ, Clamp S, Keen J, Verde P, *et al.*

No. 48

Evaluation of the ventricular assist device programme in the UK.

By Sharples L, Buxton M, Caine N, Cafferty F, Demiris N, Dyer M, *et al.*

No. 49

A systematic review and economic model of the clinical and cost-effectiveness of immunosuppressive therapy for renal transplantation in children.

By Yao G, Albon E, Adi Y, Milford D, Bayliss S, Ready A, *et al.*

No. 50

Amniocentesis results: investigation of anxiety. The ARIA trial.

By Hewison J, Nixon J, Fountain J, Cocks K, Jones C, Mason G, *et al.*

Volume 11, 2007

No. 1

Pemetrexed disodium for the treatment of malignant pleural mesothelioma: a systematic review and economic evaluation.

By Dundar Y, Bagust A, Dickson R, Dodd S, Green J, Haycox A, *et al.*

No. 2

A systematic review and economic model of the clinical effectiveness and cost-effectiveness of docetaxel in combination with prednisone or prednisolone for the treatment of hormone-refractory metastatic prostate cancer.

By Collins R, Fenwick E, Trowman R, Perard R, Norman G, Light K, *et al.*

No. 3

A systematic review of rapid diagnostic tests for the detection of tuberculosis infection.

By Dinnes J, Deeks J, Kunst H, Gibson A, Cummins E, Waugh N, *et al.*

No. 4

The clinical effectiveness and cost-effectiveness of strontium ranelate for the prevention of osteoporotic fragility fractures in postmenopausal women.

By Stevenson M, Davis S, Lloyd-Jones M, Beverley C.

No. 5

A systematic review of quantitative and qualitative research on the role and effectiveness of written information available to patients about individual medicines.

By Raynor DK, Blenkinsopp A, Knapp P, Grime J, Nicolson DJ, Pollock K, *et al.*

No. 6

Oral naltrexone as a treatment for relapse prevention in formerly opioid-dependent drug users: a systematic review and economic evaluation.

By Adi Y, Juarez-Garcia A, Wang D, Jowett S, Frew E, Day E, *et al.*

No. 7

Glucocorticoid-induced osteoporosis: a systematic review and cost-utility analysis.

By Kanis JA, Stevenson M, McCloskey EV, Davis S, Lloyd-Jones M.

No. 8

Epidemiological, social, diagnostic and economic evaluation of population screening for genital chlamydial infection.

By Low N, McCarthy A, Macleod J, Salisbury C, Campbell R, Roberts TE, *et al.*

No. 9

Methadone and buprenorphine for the management of opioid dependence: a systematic review and economic evaluation.

By Connock M, Juarez-Garcia A, Jowett S, Frew E, Liu Z, Taylor RJ, *et al.*

No. 10

Exercise Evaluation Randomised Trial (EXERT): a randomised trial comparing GP referral for leisure centre-based exercise, community-based walking and advice only.

By Isaacs AJ, Critchley JA, See Tai S, Buckingham K, Westley D, Harridge SDR, *et al.*

No. 11

Interferon alfa (pegylated and non-pegylated) and ribavirin for the treatment of mild chronic hepatitis C: a systematic review and economic evaluation.

By Shepherd J, Jones J, Hartwell D, Davidson P, Price A, Waugh N.

No. 12

Systematic review and economic evaluation of bevacizumab and cetuximab for the treatment of metastatic colorectal cancer.

By Tappenden P, Jones R, Paisley S, Carroll C.

No. 13

A systematic review and economic evaluation of epoetin alfa, epoetin beta and darbepoetin alfa in anaemia associated with cancer, especially that attributable to cancer treatment.

By Wilson J, Yao GL, Raftery J, Bohlius J, Brunskill S, Sandercock J, *et al.*

No. 14

A systematic review and economic evaluation of statins for the prevention of coronary events.

By Ward S, Lloyd Jones M, Pandor A, Holmes M, Ara R, Ryan A, *et al.*

No. 15

A systematic review of the effectiveness and cost-effectiveness of different models of community-based respite care for frail older people and their carers.

By Mason A, Weatherly H, Spilsbury K, Arksey H, Golder S, Adamson J, *et al.*

No. 16

Additional therapy for young children with spastic cerebral palsy: a randomised controlled trial.

By Weindling AM, Cunningham CC, Glenn SM, Edwards RT, Reeves DJ.

No. 17

Screening for type 2 diabetes: literature review and economic modelling.

By Waugh N, Scotland G, McNamee P, Gillett M, Brennan A, Goyder E, *et al.*

No. 18

The effectiveness and cost-effectiveness of cinacalcet for secondary hyperparathyroidism in end-stage renal disease patients on dialysis: a systematic review and economic evaluation.

By Garside R, Pitt M, Anderson R, Mealing S, Roome C, Snaith A, *et al.*

No. 19

The clinical effectiveness and cost-effectiveness of gemcitabine for metastatic breast cancer: a systematic review and economic evaluation.

By Takeda AL, Jones J, Loveman E, Tan SC, Clegg AJ.

No. 20

A systematic review of duplex ultrasound, magnetic resonance angiography and computed tomography angiography for the diagnosis and assessment of symptomatic, lower limb peripheral arterial disease.

By Collins R, Cranny G, Burch J, Aguiar-Ibáñez R, Craig D, Wright K, *et al.*

No. 21

The clinical effectiveness and cost-effectiveness of treatments for children with idiopathic steroid-resistant nephrotic syndrome: a systematic review.

By Colquitt JL, Kirby J, Green C, Cooper K, Trompeter RS.

No. 22

A systematic review of the routine monitoring of growth in children of primary school age to identify growth-related conditions.

By Fayer D, Nixon J, Hartley S, Rithalia A, Butler G, Rudolf M, *et al.*

No. 23

Systematic review of the effectiveness of preventing and treating *Staphylococcus aureus* carriage in reducing peritoneal catheter-related infections.

By McCormack K, Rabindranath K, Kilonzo M, Vale L, Fraser C, McIntyre L, *et al.*

No. 24

The clinical effectiveness and cost of repetitive transcranial magnetic stimulation versus electroconvulsive therapy in severe depression: a multicentre pragmatic randomised controlled trial and economic analysis.

By McLoughlin DM, Mogg A, Eranti S, Pluck G, Purvis R, Edwards D, *et al.*

No. 25

A randomised controlled trial and economic evaluation of direct versus indirect and individual versus group modes of speech and language therapy for children with primary language impairment.

By Boyle J, McCartney E, Forbes J, O'Hare A.

No. 26

Hormonal therapies for early breast cancer: systematic review and economic evaluation.

By Hind D, Ward S, De Nigris E, Simpson E, Carroll C, Wyld L.

No. 27

Cardioprotection against the toxic effects of anthracyclines given to children with cancer: a systematic review.

By Bryant J, Picot J, Levitt G, Sullivan I, Baxter L, Clegg A.

No. 28

Adalimumab, etanercept and infliximab for the treatment of ankylosing spondylitis: a systematic review and economic evaluation.

By McLeod C, Bagust A, Boland A, Dagenais P, Dickson R, Dundar Y, *et al.*

No. 29

Prenatal screening and treatment strategies to prevent group B streptococcal and other bacterial infections in early infancy: cost-effectiveness and expected value of information analyses.

By Colbourn T, Asseburg C, Bojke L, Phillips Z, Claxton K, Ades AE, *et al.*

No. 30

Clinical effectiveness and cost-effectiveness of bone morphogenetic proteins in the non-healing of fractures and spinal fusion: a systematic review.

By Garrison KR, Donell S, Ryder J, Shemilt I, Mugford M, Harvey I, *et al.*

No. 31

A randomised controlled trial of postoperative radiotherapy following breast-conserving surgery in a minimum-risk older population. The PRIME trial.

By Prescott RJ, Kunkler IH, Williams LJ, King CC, Jack W, van der Pol M, *et al.*

No. 32

Current practice, accuracy, effectiveness and cost-effectiveness of the school entry hearing screen.

By Bamford J, Fortnum H, Bristow K, Smith J, Vamvakas G, Davies L, *et al.*

No. 33

The clinical effectiveness and cost-effectiveness of inhaled insulin in diabetes mellitus: a systematic review and economic evaluation.

By Black C, Cummins E, Royle P, Philip S, Waugh N.

No. 34

Surveillance of cirrhosis for hepatocellular carcinoma: systematic review and economic analysis.

By Thompson Coon J, Rogers G, Hewson P, Wright D, Anderson R, Cramp M, *et al.*

No. 35

The Birmingham Rehabilitation Uptake Maximisation Study (BRUM). Homebased compared with hospital-based cardiac rehabilitation in a multi-ethnic population: cost-effectiveness and patient adherence.

By Jolly K, Taylor R, Lip GYH, Greenfield S, Raftery J, Mant J, *et al.*

No. 36

A systematic review of the clinical, public health and cost-effectiveness of rapid diagnostic tests for the detection and identification of bacterial intestinal pathogens in faeces and food.

By Abubakar I, Irvine L, Aldus CF, Wyatt GM, Fordham R, Schelenz S, *et al.*

No. 37

A randomised controlled trial examining the longer-term outcomes of standard versus new antiepileptic drugs. The SANAD trial.

By Marson AG, Appleton R, Baker GA, Chadwick DW, Doughty J, Eaton B, *et al.*

No. 38

Clinical effectiveness and cost-effectiveness of different models of managing long-term oral anti-coagulation therapy: a systematic review and economic modelling.

By Connock M, Stevens C, Fry-Smith A, Jowett S, Fitzmaurice D, Moore D, *et al.*

No. 39

A systematic review and economic model of the clinical effectiveness and cost-effectiveness of interventions for preventing relapse in people with bipolar disorder.

By Soares-Weiser K, Bravo Vergel Y, Beynon S, Dunn G, Barbieri M, Duffy S, *et al.*

No. 40

Taxanes for the adjuvant treatment of early breast cancer: systematic review and economic evaluation.

By Ward S, Simpson E, Davis S, Hind D, Rees A, Wilkinson A.

No. 41

The clinical effectiveness and cost-effectiveness of screening for open angle glaucoma: a systematic review and economic evaluation.

By Burr JM, Mowatt G, Hernández R, Siddiqui MAR, Cook J, Lourenco T, *et al.*

No. 42

Acceptability, benefit and costs of early screening for hearing disability: a study of potential screening tests and models.

By Davis A, Smith P, Ferguson M, Stephens D, Gianopoulos I.

No. 43

Contamination in trials of educational interventions.

By Keogh-Brown MR, Bachmann MO, Shepstone L, Hewitt C, Howe A, Ramsay CR, *et al.*

No. 44

Overview of the clinical effectiveness of positron emission tomography imaging in selected cancers.

By Facey K, Bradbury I, Laking G, Payne E.

No. 45

The effectiveness and cost-effectiveness of carmustine implants and temozolomide for the treatment of newly diagnosed high-grade glioma: a systematic review and economic evaluation.

By Garside R, Pitt M, Anderson R, Rogers G, Dyer M, Mealing S, *et al.*

No. 46

Drug-eluting stents: a systematic review and economic evaluation.

By Hill RA, Boland A, Dickson R, Dünder Y, Haycox A, McLeod C, *et al.*

No. 47

The clinical effectiveness and cost-effectiveness of cardiac resynchronisation (biventricular pacing) for heart failure: systematic review and economic model.

By Fox M, Mealing S, Anderson R, Dean J, Stein K, Price A, *et al.*

No. 48

Recruitment to randomised trials: strategies for trial enrolment and participation study. The STEPS study.

By Campbell MK, Snowdon C, Francis D, Elbourne D, McDonald AM, Knight R, *et al.*

No. 49

Cost-effectiveness of functional cardiac testing in the diagnosis and management of coronary artery disease: a randomised controlled trial. The CECaT trial.

By Sharples L, Hughes V, Crean A, Dyer M, Buxton M, Goldsmith K, *et al.*

No. 50

Evaluation of diagnostic tests when there is no gold standard. A review of methods.

By Rutjes AWS, Reitsma JB, Coomarasamy A, Khan KS, Bossuyt PMM.

No. 51

Systematic reviews of the clinical effectiveness and cost-effectiveness of proton pump inhibitors in acute upper gastrointestinal bleeding.

By Leontiadis GI, Sreedharan A, Dorward S, Barton P, Delaney B, Howden CW, *et al.*

No. 52

A review and critique of modelling in prioritising and designing screening programmes.

By Karnon J, Goyder E, Tappenden P, McPhie S, Towers I, Brazier J, *et al.*

No. 53

An assessment of the impact of the NHS Health Technology Assessment Programme.

By Hanney S, Buxton M, Green C, Coulson D, Raftery J.

Volume 12, 2008

No. 1

A systematic review and economic model of switching from nonglycopeptide to glycopeptide antibiotic prophylaxis for surgery.

By Cranny G, Elliott R, Weatherly H, Chambers D, Hawkins N, Myers L, *et al.*

No. 2

'Cut down to quit' with nicotine replacement therapies in smoking cessation: a systematic review of effectiveness and economic analysis.

By Wang D, Connock M, Barton P, Fry-Smith A, Aveyard P, Moore D.

No. 3

A systematic review of the effectiveness of strategies for reducing fracture risk in children with juvenile idiopathic arthritis with additional data on long-term risk of fracture and cost of disease management.

By Thornton J, Ashcroft D, O'Neill T, Elliott R, Adams J, Roberts C, *et al.*

No. 4

Does befriending by trained lay workers improve psychological well-being and quality of life for carers of people with dementia, and at what cost? A randomised controlled trial.

By Charlesworth G, Shepstone L, Wilson E, Thalany M, Mugford M, Poland F.

No. 5

A multi-centre retrospective cohort study comparing the efficacy, safety and cost-effectiveness of hysterectomy and uterine artery embolisation for the treatment of symptomatic uterine fibroids. The HOPEFUL study.

By Hirst A, Dutton S, Wu O, Briggs A, Edwards C, Waldenmaier L, *et al.*

No. 6

Methods of prediction and prevention of pre-eclampsia: systematic reviews of accuracy and effectiveness literature with economic modelling.

By Meads CA, Cnossen JS, Meher S, Juarez-Garcia A, ter Riet G, Duley L, *et al.*

No. 7

The use of economic evaluations in NHS decision-making: a review and empirical investigation.

By Williams I, McIver S, Moore D, Bryan S.

No. 8

Stapled haemorrhoidectomy (haemorrhoidopexy) for the treatment of haemorrhoids: a systematic review and economic evaluation.

By Burch J, Epstein D, Baba-Akbari A, Weatherly H, Fox D, Golder S, *et al.*

No. 9

The clinical effectiveness of diabetes education models for Type 2 diabetes: a systematic review.

By Loveman E, Frampton GK, Clegg AJ.

No. 10

Payment to healthcare professionals for patient recruitment to trials: systematic review and qualitative study.

By Raftery J, Bryant J, Powell J, Kerr C, Hawker S.

No. 11

Cyclooxygenase-2 selective non-steroidal anti-inflammatory drugs (etodolac, meloxicam, celecoxib, rofecoxib, etoricoxib, valdecoxib and lumiracoxib) for osteoarthritis and rheumatoid arthritis: a systematic review and economic evaluation.

By Chen Y-F, Jobanputra P, Barton P, Bryan S, Fry-Smith A, Harris G, *et al.*

No. 12

The clinical effectiveness and cost-effectiveness of central venous catheters treated with anti-infective agents in preventing bloodstream infections: a systematic review and economic evaluation.

By Hockenhull JC, Dwan K, Boland A, Smith G, Bagust A, Dundar Y, *et al.*

No. 13

Stepped treatment of older adults on laxatives. The STOOL trial.

By Mihaylov S, Stark C, McColl E, Steen N, Vanoli A, Rubin G, *et al.*

No. 14

A randomised controlled trial of cognitive behaviour therapy in adolescents with major depression treated by selective serotonin reuptake inhibitors. The ADAPT trial.

By Goodyer IM, Dubicka B, Wilkinson P, Kelvin R, Roberts C, Byford S, *et al.*

No. 15

The use of irinotecan, oxaliplatin and raltitrexed for the treatment of advanced colorectal cancer: systematic review and economic evaluation.

By Hind D, Tappenden P, Tumor I, Eggington E, Sutcliffe P, Ryan A.

No. 16

Ranibizumab and pegaptanib for the treatment of age-related macular degeneration: a systematic review and economic evaluation.

By Colquitt JL, Jones J, Tan SC, Takeda A, Clegg AJ, Price A.

No. 17

Systematic review of the clinical effectiveness and cost-effectiveness of 64-slice or higher computed tomography angiography as an alternative to invasive coronary angiography in the investigation of coronary artery disease.

By Mowatt G, Cummins E, Waugh N, Walker S, Cook J, Jia X, *et al.*

No. 18

Structural neuroimaging in psychosis: a systematic review and economic evaluation.

By Albon E, Tsourapas A, Frew E, Davenport C, Oyebo F, Bayliss S, *et al.*

No. 19

Systematic review and economic analysis of the comparative effectiveness of different inhaled corticosteroids and their usage with long-acting beta₂ agonists for the treatment of chronic asthma in adults and children aged 12 years and over.

By Shepherd J, Rogers G, Anderson R, Main C, Thompson-Coon J, Hartwell D, *et al.*

No. 20

Systematic review and economic analysis of the comparative effectiveness of different inhaled corticosteroids and their usage with long-acting beta₂ agonists for the treatment of chronic asthma in children under the age of 12 years.

By Main C, Shepherd J, Anderson R, Rogers G, Thompson-Coon J, Liu Z, *et al.*

No. 21

Ezetimibe for the treatment of hypercholesterolaemia: a systematic review and economic evaluation.

By Ara R, Tumur I, Pandor A, Duenas A, Williams R, Wilkinson A, *et al.*

No. 22

Topical or oral ibuprofen for chronic knee pain in older people. The TOIB study.

By Underwood M, Ashby D, Carnes D, Castelnovo E, Cross P, Harding G, *et al.*

No. 23

A prospective randomised comparison of minor surgery in primary and secondary care. The MiSTIC trial.

By George S, Pockney P, Primrose J, Smith H, Little P, Kinley H, *et al.*

No. 24

A review and critical appraisal of measures of therapist-patient interactions in mental health settings.

By Cahill J, Barkham M, Hardy G, Gilbody S, Richards D, Bower P, *et al.*

No. 25

The clinical effectiveness and cost-effectiveness of screening programmes for amblyopia and strabismus in children up to the age of 4-5 years: a systematic review and economic evaluation.

By Carlton J, Karnon J, Czoski-Murray C, Smith KJ, Marr J.

No. 26

A systematic review of the clinical effectiveness and cost-effectiveness and economic modelling of minimal incision total hip replacement approaches in the management of arthritic disease of the hip.

By de Verteuil R, Imamura M, Zhu S, Glazener C, Fraser C, Munro N, *et al.*

No. 27

A preliminary model-based assessment of the cost-utility of a screening programme for early age-related macular degeneration.

By Karnon J, Czoski-Murray C, Smith K, Brand C, Chakravarthy U, Davis S, *et al.*

No. 28

Intravenous magnesium sulphate and sotalol for prevention of atrial fibrillation after coronary artery bypass surgery: a systematic review and economic evaluation.

By Shepherd J, Jones J, Frampton GK, Tanajewski L, Turner D, Price A.

No. 29

Absorbent products for urinary/faecal incontinence: a comparative evaluation of key product categories.

By Fader M, Cottenden A, Getliffe K, Gage H, Clarke-O'Neill S, Jamieson K, *et al.*

No. 30

A systematic review of repetitive functional task practice with modelling of resource use, costs and effectiveness.

By French B, Leathley M, Sutton C, McAdam J, Thomas L, Forster A, *et al.*

No. 31

The effectiveness and cost-effectiveness of minimal access surgery amongst people with gastro-oesophageal reflux disease – a UK collaborative study. The REFLUX trial.

By Grant A, Wileman S, Ramsay C, Bojke L, Epstein D, Sculpher M, *et al.*

No. 32

Time to full publication of studies of anti-cancer medicines for breast cancer and the potential for publication bias: a short systematic review.

By Takeda A, Loveman E, Harris P, Hartwell D, Welch K.

No. 33

Performance of screening tests for child physical abuse in accident and emergency departments.

By Woodman J, Pitt M, Wentz R, Taylor B, Hodes D, Gilbert RE.

No. 34

Curative catheter ablation in atrial fibrillation and typical atrial flutter: systematic review and economic evaluation.

By Rodgers M, McKenna C, Palmer S, Chambers D, Van Hout S, Golder S, *et al.*

No. 35

Systematic review and economic modelling of effectiveness and cost utility of surgical treatments for men with benign prostatic enlargement.

By Lourenco T, Armstrong N, N'Dow J, Nabi G, Deverill M, Pickard R, *et al.*

No. 36

Immunoprophylaxis against respiratory syncytial virus (RSV) with palivizumab in children: a systematic review and economic evaluation.

By Wang D, Cummins C, Bayliss S, Sandercock J, Burls A.

Volume 13, 2009**No. 1**

Deferasirox for the treatment of iron overload associated with regular blood transfusions (transfusional haemosiderosis) in patients suffering with chronic anaemia: a systematic review and economic evaluation.

By McLeod C, Fleeman N, Kirkham J, Bagust A, Boland A, Chu P, *et al.*

No. 2

Thrombophilia testing in people with venous thromboembolism: systematic review and cost-effectiveness analysis.

By Simpson EL, Stevenson MD, Rawdin A, Papaioannou D.

No. 3

Surgical procedures and non-surgical devices for the management of non-apnoeic snoring: a systematic review of clinical effects and associated treatment costs.

By Main C, Liu Z, Welch K, Weiner G, Quentin Jones S, Stein K.

No. 4

Continuous positive airway pressure devices for the treatment of obstructive sleep apnoea-hypopnoea syndrome: a systematic review and economic analysis.

By McDaid C, Griffin S, Weatherly H, Durée K, van der Burgt M, van Hout S, Akers J, *et al.*

No. 5

Use of classical and novel biomarkers as prognostic risk factors for localised prostate cancer: a systematic review.

By Sutcliffe P, Hummel S, Simpson E, Young T, Rees A, Wilkinson A, *et al.*

No. 6

The harmful health effects of recreational ecstasy: a systematic review of observational evidence.

By Rogers G, Elston J, Garside R, Roome C, Taylor R, Younger P, *et al.*

No. 7

Systematic review of the clinical effectiveness and cost-effectiveness of oesophageal Doppler monitoring in critically ill and high-risk surgical patients.

By Mowatt G, Houston G, Hernández R, de Verteuil R, Fraser C, Cuthbertson B, *et al.*

No. 8

The use of surrogate outcomes in model-based cost-effectiveness analyses: a survey of UK Health Technology Assessment reports.

By Taylor RS, Elston J.

No. 9

Controlling Hypertension and Hypotension Immediately Post Stroke (CHHIPS) – a randomised controlled trial.

By Potter J, Mistri A, Brodie F, Chernova J, Wilson E, Jagger C, *et al.*

No. 10

Routine antenatal anti-D prophylaxis for RhD-negative women: a systematic review and economic evaluation.

By Pilgrim H, Lloyd-Jones M, Rees A.

No. 11

Amantadine, oseltamivir and zanamivir for the prophylaxis of influenza (including a review of existing guidance no. 67): a systematic review and economic evaluation.

By Tappenden P, Jackson R, Cooper K, Rees A, Simpson E, Read R, *et al.*

No. 12

Improving the evaluation of therapeutic interventions in multiple sclerosis: the role of new psychometric methods.

By Hobart J, Cano S.

No. 13

Treatment of severe ankle sprain: a pragmatic randomised controlled trial comparing the clinical effectiveness and cost-effectiveness of three types of mechanical ankle support with tubular bandage. The CAST trial.

By Cooke MW, Marsh JL, Clark M, Nakash R, Jarvis RM, Hutton JL, *et al.*, on behalf of the CAST trial group.

No. 14

Non-occupational postexposure prophylaxis for HIV: a systematic review.

By Bryant J, Baxter L, Hird S.

No. 15

Blood glucose self-monitoring in type 2 diabetes: a randomised controlled trial.

By Farmer AJ, Wade AN, French DP, Simon J, Yudkin P, Gray A, *et al.*

No. 16

How far does screening women for domestic (partner) violence in different health-care settings meet criteria for a screening programme? Systematic reviews of nine UK National Screening Committee criteria.

By Feder G, Ramsay J, Dunne D, Rose M, Arsene C, Norman R, *et al.*

No. 17

Spinal cord stimulation for chronic pain of neuropathic or ischaemic origin: systematic review and economic evaluation.

By Simpson, EL, Duenas A, Holmes MW, Papaioannou D, Chilcott J.

No. 18

The role of magnetic resonance imaging in the identification of suspected acoustic neuroma: a systematic review of clinical and cost-effectiveness and natural history.

By Fortnum H, O'Neill C, Taylor R, Lenthall R, Nikolopoulos T, Lightfoot G, *et al.*

No. 19

Dipsticks and diagnostic algorithms in urinary tract infection: development and validation, randomised trial, economic analysis, observational cohort and qualitative study.

By Little P, Turner S, Rumsby K, Warner G, Moore M, Lowes JA, *et al.*

No. 20

Systematic review of respite care in the frail elderly.

By Shaw C, McNamara R, Abrams K, Cannings-John R, Hood K, Longo M, *et al.*

No. 21

Neuroleptics in the treatment of aggressive challenging behaviour for people with intellectual disabilities: a randomised controlled trial (NACHBID).

By Tyrer P, Oliver-Africano P, Romeo R, Knapp M, Dickens S, Bouras N, *et al.*

No. 22

Randomised controlled trial to determine the clinical effectiveness and cost-effectiveness of selective serotonin reuptake inhibitors plus supportive care, versus supportive care alone, for mild to moderate depression with somatic symptoms in primary care: the THREAD (THREshold for AntiDepressant response) study.

By Kendrick T, Chatwin J, Dowrick C, Tylee A, Morriss R, Peveler R, *et al.*

No. 23

Diagnostic strategies using DNA testing for hereditary haemochromatosis in at-risk populations: a systematic review and economic evaluation.

By Bryant J, Cooper K, Picot J, Clegg A, Roderick P, Rosenberg W, *et al.*

No. 24

Enhanced external counterpulsation for the treatment of stable angina and heart failure: a systematic review and economic analysis.

By McKenna C, McDaid C, Suekarran S, Hawkins N, Claxton K, Light K, *et al.*

No. 25

Development of a decision support tool for primary care management of patients with abnormal liver function tests without clinically apparent liver disease: a record-linkage population cohort study and decision analysis (ALFIE).

By Donnan PT, McLernon D, Dillon JF, Ryder S, Roderick P, Sullivan F, *et al.*



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We look forward to hearing from you.