PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Geographical variation in blindness and sight impairment rates in England, 2008-09: Analysis of national certification data
AUTHORS	Malik, Aeesha; Bunce, Catey; Wormald, Richard; Suleman, Mehrunisha; Stratton, Irene; Gray, Muir

VERSION 1 - REVIEW

REVIEWER	Jennifer Evans Lecturer London School of Hygiene and Tropical Medicine I have worked with some of the authors of this paper, in particular Richard Wormald and Catey Bunce, over many years.
REVIEW RETURNED	06-Jul-2012

THE STUDY	Under limitations, I felt that the question of standardisation and control of confounding by age might be one limitation of the analysis. The authors have controlled for age differences between PCTs using direct standardisation. They acknowledge one of the limitations of direct standardisation is that, if the number of events in each age band is low, then it can be subject to sampling error. As a result they have used rather wide age-bands. There may be residual confounding by age, particularly in the older age-groups. This might explain some of the variation. One option would be to repeat the analyses using indirect standardisation and smaller age-bands. If indirect standardisation is not a valid analysis with these data (for example, if the proportionality assumption does not hold) then the possible limitation of residual confounding needs to be more clearly stated and and explanation given as to why indirect standardisation not used.
RESULTS & CONCLUSIONS	In general the results were well presented but Table 1 and Figure 1 could be made a bit clearer. Table 1 could benefit from reporting the units i.e. rates per 100,000, spend per head of population (in pounds sterling?). Presumably IMD does not have units but it would be good to put the score in context - perhaps by noting the range of possible scores in a footnote to the table. In Figure 1 the term "severely sight impaired" is introduced. Is this the same as "blindness" as used elsewhere in the paper? Figure 3 "Cases as a percentage of population" is that the same as what is called elsewhere the "crude rate"? Would it be better to plot the directly standardised rate here? Presumably population is population of the PCT. It would be good to show the units here if possible. Perhaps be a bit clearer in the text as to what "outside the limits" means exactly.

	The discussion is quite wide-ranging and could be improved by being a bit more focussed on the results of the study. Before discussing the limitations of CVI data it may be helpful to discuss the limitations of the analysis, including control of confounding by age. The implications of the variation are discussed in terms of equitable access to services for visually impaired people and use of these data in the Public Health Outcome Framework, but it would be helpful to have more specific suggestions for future research.
GENERAL COMMENTS	The terminology is quite confusing in this area and it would help to use consistent terminology throughout. The "certificate of vision impairment" uses the terms sight impairment and severe sight impairment (replacing the terms previously used which were "partially sighted" and "blind"). The paper mostly uses the terms sight impairment and blindness, which does not correspond to the current CVI terminology. However, the analyses are not done separately for these two categories and it may be simpler just to refer to the incidence of certification (as vision impaired). The terms registration and certification appear to be used interchangeably in the paper. For example, what this paper adds " There is a large geographical variation in the registration of blindness and sight impairment..." They are not strictly the same thing as registration occurs after certification. Sometimes the "incidence of blindness and sight impairment" is discussed. In the context of this paper, this needs to be qualiified that this is vision impairment eligible for registration, which is not the same thing as incidence of vision impairment per se. Under the terms of the National Assistance Act registration should be offered to people who are permanently visually impaired, and so conditions that are amenable to treatment are not usually counted by this routine data collection system. This is one of the reasons this dataset is so valuable, in my opinion, is that it counts people who have lost their vision and will not benefit from any more treatment. Particularly important to count this for conditions where sight impairment is potentially preventable (such as diabetic retinopathy).

REVIEWER	Tiarnan Keenan, MRCOphth Clinical Research Fellow University of Manchester and Manchester Royal Eye Hospital UK Competing interests - none
REVIEW RETURNED	11-Jul-2012

THE STUDY	This manuscript presents important and novel research findings, but requires some redrafting to improve the clarity and presentation. The methodology used was appropriate and well described in the Methods section. However the Results section needs to be expanded to 'tell the story' of the research findings, and the Introduction and Discussion sections need to be more concise and precise. Some particular points: Key messages – presumably the first message should be the finding of wide geographical variation; these three messages could be more

concise

Strengths and limitations – these should stand alone, rather than refer to the manuscript

Abstract – generally clear but the conclusion needs to be more concise (some of what is written includes introductory statements rather than genuine conclusions drawn from the results); results section – needs more actual data – no rates of blindness are given, e.g. consider giving lowest and highest rates (trimmed rates) and 95% confidence intervals; also 'rate' can be ambiguous and needs descriptors for the time period (e.g. annual rate) and the population

Introduction – in general, this is too long and needs to be more concise and focused.

Not all references written at the bottom of the article are actually cited in the manuscript.

Methods section – very clear; the methodology used is appropriate and well explained.

CVI data collection – could the authors include a quick indication of what is meant by 'good rate of compliance' as this is very important for data validity? (i.e. what percentage, so that readers do not have to look up the reference cited)

Converting data to maps – the discussion of quantiles and quintiles and ranges could be shorter and clearer. Is it necessary to discuss quantiles?

Results section – as mentioned above, this is extremely short and should be lengthened to 'tell the story' of the research in a logical and interesting manner.

Table 1 legend – 'CVI rates' is unclear (e.g. per 100,000 population per year?). Also the Methods section says that 95% confidence intervals were calculated, but these are not given in Table 1 (or elsewhere). Would the authors consider adding an extra figure? – a plot of each PCT's mean annual DSR of CVI blind certifications (y axis) arranged highest to lowest (x axis), i.e. each PCT as a point with its 95% confidence intervals. This would help give a visual representation of what 11-fold variation looks like, before moving on to the two following figures.

Figure 1 – 'directly'?

Figure 2 – 'The figures illustrate little evidence of any association between the rates and IMD 2010 (correlation coefficients 0.11, p=0.15).' I would say that there is weakly positive correlation.

Figure 4 – no legend is given, and the explanation is not very clear. Also the key to the figure does not correspond to the lines used.

Discussion – in generaly this needs to be more concise and specific. The paragraphs are extremely long and need to be shortened and refined. There is not a great deal of critical analysis, e.g. what factors may affect patients being referred to and attending the hospital eye service; is there a literature on this? In general, very few references are given; the findings need to be put in the context of existing reports in the literature on UK geographical variation in eye disease. I know from my own group's research that there are wide variations in (standardised) rates of patients receiving various ophthalmology services by geographical area across the UK (including cataract surgery, corneal grafts, trabeculectomy and

intravitreal therapy, and particularly wide for intravitreal therapy).
Are there international comparisons?
Also it may be worth discussing the distinction bewteen incident blindness which is considered preventable versus not preventable. This is alluded to in the article but is an important distinction.
In addition, a formal discussion of the limitations of the research methodology is required (e.g. use of wide age bands for standardisation).
'There have been, to our knowledge, no other studies on geographical variation in sight loss conducted' – do the authors mean in the UK? If so, this must be stated. If not, RAAB studies have now been conducted in many countries, and some of these have reported very significant differences in the prevalence of blindness within countries (e.g. Gaza versus West Bank of the Palestinian Territories).

What this paper adds – section 1: 'The number of certifications for blindness and sight impairment have been falling' – no data have been presented on this.

Large variation - 'This implies both a need to improve consistency in access to certification across the country and investigate further the causes of this variation' – little discussion is presented in the manuscript as to how we might distinguish between genuine regional differences in incident blindness versus artefactual differences in CVI take-up.

In summary, this is an important and novel piece of research, and the methodology used is appropriate to answer the research question. However the clarity of discussion and analysis should be improved for the message to be communicated effectively.

VERSION 1 – AUTHOR RESPONSE

Reviewer: Jennifer Evans
Lecturer
London School of Hygiene and Tropical Medicine

I have worked with some of the authors of this paper, in particular Richard Wormald and Catey Bunce, over many years.

Under limitations, I felt that the question of standardisation and control of confounding by age might be one limitation of the analysis. The authors have controlled for age differences between PCTs using direct standardisation. They acknowledge one of the limitations of direct standardisation is that, if the number of events in each age band is low, then it can be subject to sampling error. As a result they have used rather wide age-bands. There may be residual confounding by age, particularly in the older age-groups. This might explain some of the variation. One option would be to repeat the analyses using indirect standardisation and smaller age-bands. If indirect standardisation is not a valid analysis with these data (for example, if the proportionality assumption does not hold) then the possible limitation of residual confounding needs to be more clearly stated and and explanation given as to why indirect standardisation not used.

We chose direct rather than indirect standardisation because we wished to compare PCTs with each other. Indirect standardisation would not allow this.
(http://www.avon.nhs.uk/phnet/PHinfo/understanding.htm#Indirect) reference added
LImatation expanded and clearly stated in discussion

In general the results were well presented but Table 1 and Figure 1 could be made a bit clearer.

Table 1 could benefit from reporting the units i.e. rates per 100,000, spend per head of population (in pounds sterling?). Presumably IMD does not have units but it would be good to put the score in context - perhaps by noting the range of possible scores in a footnote to the table.

Changes to table made in the paper, as suggested.
Footnote and reference added with regard the IMD

In Figure 1 the term "severely sight impaired" is introduced. Is this the same as "blindness" as used elsewhere in the paper?

Yes the 'official' term is severely sight impaired which replaces the word blindness (but has the same definition). Blindness was previously used but since this is a relatively new change to terminology and 'severely sight impaired' is less intuitive to understand as a comparison to sight impairment we have kept the word blindness throughout the text for the sake of clarity for readers, who will mainly not be ophthalmology professionals.

Figure 3 "Cases as a percentage of population" is that the same as what is called elsewhere the "crude rate"? Would it be better to plot the directly standardised rate here? Presumably population is population of the PCT. It would be good to show the units here if possible. Perhaps be a bit clearer in the text as to what "outside the limits" means exactly.

This comments refers to figure 4, not figure3. New funnel plot using directly standardised rate and units added. Comment clarified in paper after figure 4

The discussion is quite wide-ranging and could be improved by being a bit more focussed on the results of the study. Before discussing the limitations of CVI data it may be helpful to discuss the limitations of the analysis, including control of confounding by age. The implications of the variation are discussed in terms of equitable access to services for visually impaired people and use of these data in the Public Health Outcome Framework, but it would be helpful to have more specific suggestions for future research.

Discussion expanded on limitations of study and moved to the first paragraph in the discussion section of the paper. Specific suggestions on future research expanded on lines 348 in last paragraph, although the main point of the paper is the data needs to be improved so that it can be used for further research and analysis. Therefore we have deliberately not put in many further suggestions for research.

The terminology is quite confusing in this area and it would help to use consistent terminology throughout.

The "certificate of vision impairment" uses the terms sight impairment and severe sight impairment (replacing the terms previously used which were "partially sighted" and "blind"). The paper mostly uses the terms sight impairment and blindness, which does not correspond to the current CVI terminology. However, the analyses are not done separately for these two categories and it may be simpler just to refer to the incidence of certification (as vision impaired).

We agree the terminology in this area is very confusing, compounded by the fact that it has recently changed, and we have tried to keep as clear as possible for non specialist readers. We feel it is very important to keep the word 'blindness' in the title as this gives a very clear picture of what is being discussed. Replacing the two terms with either 'certification' or 'vision impaired' (which would also be a new term) and removing 'blindness' altogether may mislead readers into thinking it is not significant visual loss, as most people will not understand what constitutes vision impaired and its implications for the individual. We have not currently changed the terminology as requested but we could change it in the paper if requested by the editor but feel strongly the title should not be changed.

The terms registration and certification appear to be used interchangeably in the paper. For example, what this paper adds " There is a large geographical variation in the registration of blindness and sight impairment..." They are not strictly the same thing as registration occurs after certification.

Again we take this point and our reasons are above. However in this case we have changed the terminology in the paper to 'certification' for consistency and removed 'registration', as requested.

Sometimes the "incidence of blindness and sight impairment" is discussed. In the context of this paper, this needs to be qualiified that this is vision impairment eligible for registration, which is not the same thing as incidence of vision impairment per se. Under the terms of the National Assistance Act registration should be offered to people who are permanently visually impaired, and so conditions that are amenable to treatment are not usually counted by this routine data collection system. This is one of the reasons this dataset is so valuable, in my opinion, is that it counts people who have lost their vision and will not benefit from any more treatment. Particularly important to count this for conditions where sight impairment is potentially preventable (such as diabetic retinopathy).

We have added the word 'certified' in front of any references made to incidence of blindness and sight impairment. We have already put in detailed explanations as to what the definitions are of certified sight impairment as discussed in the paper in both the methods (first paragraph) and the discussion (2nd and 3rd paragraphs). This should make it very clear to the reader what we are referring to throughout the paper.

Reviewer: Tiarnan Keenan, MRCOphth
Clinical Research Fellow
University of Manchester and Manchester Royal Eye Hospital
UK
Competing interests - none

This manuscript presents important and novel research findings, but requires some redrafting to improve the clarity and presentation. The methodology used was appropriate and well described in the Methods section. However the Results section needs to be expanded to 'tell the story' of the research findings, and the Introduction and Discussion sections need to be more concise and precise.

Some particular points:
Key messages – presumably the first message should be the finding of wide geographical variation; these three messages could be more concise
Strengths and limitations – these should stand alone, rather than refer to the manuscript
Abstract – generally clear but the conclusion needs to be more concise (some of what is written includes introductory statements rather than genuine conclusions drawn from the results); results section – needs more actual data – no rates of blindness are given, e.g. consider giving lowest and highest rates (trimmed rates) and 95% confidence intervals; also 'rate' can be ambiguous and needs descriptors for the time period (e.g. annual rate) and the population

Changes made to the text of the paper as suggested above.

Introduction – in general, this is too long and needs to be more concise and focused.
Not all references written at the bottom of the article are actually cited in the manuscript.

This has been shortened and references double checked.

Methods section – very clear; the methodology used is appropriate and well explained.
CVI data collection – could the authors include a quick indication of what is meant by 'good rate of compliance' as this is very important for data validity? (i.e. what percentage, so that readers do not have to look up the reference cited)
Converting data to maps – the discussion of quantiles and quintiles and ranges could be shorter and clearer. Is it necessary to discuss quantiles?

Have amended as suggested but kept in some information about quantiles as may be unfamiliar to readers

Results section – as mentioned above, this is extremely short and should be lengthened to 'tell the story' of the research in a logical and interesting manner.

Have added further explanation in results section

Table 1 legend – 'CVI rates' is unclear (e.g. per 100,000 population per year?). Also the Methods section says that 95% confidence intervals were calculated, but these are not given in Table 1 (or elsewhere). Would the authors consider adding an extra figure? – a plot of each PCT's mean annual DSR of CVI blind certifications (y axis) arranged highest to lowest (x axis), i.e. each PCT as a point with its 95% confidence intervals. This would help give a visual representation of what 11-fold variation looks like, before moving on to the two following figures.

Table amended and extra figure which should be included within figure 1 added (attached as seperate file called figure 1a)

Figure 1 – 'directly'? yes, states this on the map

Figure 2 – 'The figures illustrate little evidence of any association between the rates and IMD 2010 (correlation coefficients 0.11, p=0.15).' I would say that there is weakly positive correlation. Amended

Figure 4 – no legend is given, and the explanation is not very clear. Also the key to the figure does not correspond to the lines used. Adjusted as per other reviewers comments and clarified

Discussion – in generaly this needs to be more concise and specific. The paragraphs are extremely long and need to be shortened and refined. There is not a great deal of critical analysis, e.g. what factors may affect patients being referred to and attending the hospital eye service; is there a literature on this? In general, very few references are given; the findings need to be put in the context of existing reports in the literature on UK geographical variation in eye disease. I know from my own group's research that there are wide variations in (standardised) rates of patients receiving various ophthalmology services by geographical area across the UK (including cataract surgery, corneal grafts, trabeculectomy and intravitreal therapy, and particularly wide for intravitreal therapy). Are there international comparisons?
The discussion has been shortened and amended to take in the comments above. We have included some of the reviewers own papers now, as he has mentioned. They were left out before as they were quite different, mainly relying on hospital data and on specific surgical procedures. We wanted to concentrate in the discussion on issues of blindness and sight impairment and the wider public health issue that this has and its implications. There are no international comparisions, as mentioned in the discussion.

Also it may be worth discussing the distinction bewteen incident blindness which is considered preventable versus not preventable. This is alluded to in the article but is an important distinction. Added

In addition, a formal discussion of the limitations of the research methodology is required (e.g. use of wide age bands for standardisation). Done

'There have been, to our knowledge, no other studies on geographical variation in sight loss conducted' – do the authors mean in the UK? If so, this must be stated. If not, RAAB studies have now been conducted in many countries, and some of these have reported very significant differences in the prevalence of blindness within countries (e.g. Gaza versus West Bank of the Palestinian Territories).

We do mean in the UK-clarified in the discussion. We are aware of RAAB studies but these have a very different methodology and are not directly comparable to ours but we have however added them into the discussion now.

What this paper adds – section 1: 'The number of certifications for blindness and sight impairment have been falling' – no data have been presented on this.
this is what is now reference 16

Large variation - 'This implies both a need to improve consistency in access to certification across the country and investigate further the causes of this variation' – little discussion is presented in the manuscript as to how we might distinguish between genuine regional differences in incident blindness

versus artefactual differences in CVI take-up.

We would not describe differences in CVI take up as artefactual differences. Higher CVI figures may not necessary reflect higher rates of blindness but they do nevertheless reflect higher numbers of people being put in touch with social services in those areas because of their visual problems. The discussion already includes and analyses the reasons for inconsistencies in offering CVI and possibly uptake and this is one of the issues the paper and discussion highlights.

In summary, this is an important and novel piece of research, and the methodology used is appropriate to answer the research question. However the clarity of discussion and analysis should be improved for the message to be communicated effectively.

VERSION 2 – REVIEW

REVIEWER	Jennifer Evans Lecturer London School of Hygiene and Tropical Medicine I have worked with some of the authors of this paper, in particular Richard Wormald and Catey Bunce, over many years.
REVIEW RETURNED	27-Sep-2012

| GENERAL COMMENTS | 1. Page 5 line 176/177: I think this point is debatable and so a better reference is needed to support this view. I think most epidemiologists would agree that SMRs can be compared if the ratio of rates in the study/standard population is fairly constant (even if they disagree as to whether this assumption is generally likely to hold). As age-specific rates for study and standard populations are available presumably this assumption could be tested.
2. Page 8 line 284: it would be good to give a reference for this statement and clarify a little how this relates to the legal requirements that people should be "permanently handicapped" to be eligible for registration.
3. Page 30 Figure 4: The note to this figure needs to be amended. The directly standardised rate is the rate that would apply in the PCT if it had the same age structure as the standard population (England presumably). The PCT populations will not have been adjusted.
4. Page 32 line 15: : I agree with you that the term "blindness" should not be removed altogether but at the moment the title, abstract and key message are potentially misleading as they imply that the paper reports "geographical variation in blindness". A little rewording of these sections could put the emphasis on what is reported - variation in CVI rates - but keep the context, i.e. eligibility for registration as blind or sight impaired.

Minor points
5. Page 2 line 56: typo "interprete"
6. Page 2 line 57: the certificate is called the certificate of "vision impairment" not visual impairment
7. Page 2 line 62: certified rates does not sound quite right as it implies that the rates are certified. Perhaps rates of certification would be better.
8. Page 2 line 81: as for point 5
9. Page 2 line 82: as for point 6
10. Page 2 line 104: please include units for the rate, presumably per 100,000.
11. Page 2 line 104: is it weak evidence of an association or |

	evidence of a weak association?
	12. Page 4 line 163: please clarify what this correlation coefficient refers to. What has been correlated?
	13. Page 5 line 169: please state what the standard population used was, please spell out ONS at first use, and give a reference for Byar's method.
	14. Page 6 table 1: please indicate that programme spend is per head of population
	15. Page 6 line 229: second use of the word "directly" is not necessary
	16. Page 6 line 234: typo: word "as" missing
	17. Page 8 line 303: please spell out EPRs at first use
	18. Page 8 line 315: "However this." should be deleted.
	19. Page 26 Figure 1: it would be good if the legend could indicate the ranges of rates for each of the five categories.
	20. Page 32 line 29: the title still refers to "Analysis of national register data"

REVIEWER	Tiarnan Keenan, MRCOphth Clinical Research Fellow University of Manchester and Manchester Royal Eye Hospital, UK Competing interests - none
REVIEW RETURNED	17-Sep-2012

GENERAL COMMENTS	Most of the points raised in my previous review have been answered satisfactorily.
	A couple of points remain, for example I still find that the introduction and the discussion sections could be more focused, but perhaps that it a matter for personal preference and could be settled by the editor. Also I am unable to find 95% confidence intervals in the paper; maybe remove from the methods section if choosing not to report them.
	As before, I feel that this is an important and novel piece of research, and that the methodology used was appropriate to answer the research question.

VERSION 2 – AUTHOR RESPONSE

Reviewer: Tiarnan Keenan, MRCOphth
Clinical Research Fellow
University of Manchester and Manchester Royal Eye Hospital, UK
Competing interests - none

Most of the points raised in my previous review have been answered satisfactorily.

A couple of points remain, for example I still find that the introduction and the discussion sections could be more focused, but perhaps that it a matter for personal preference and could be settled by the editor. Also I am unable to find 95% confidence intervals in the paper; maybe remove from the methods section if choosing not to report them.

The CIs have been removed.

As before, I feel that this is an important and novel piece of research, and that the methodology used

was appropriate to answer the research question.

Reviewer: Jennifer Evans

1. Page 5 line 176/177: I think this point is debatable and so a better reference is needed to support this view. I think most epidemiologists would agree that SMRs can be compared if the ratio of rates in the study/standard population is fairly constant (even if they disagree as to whether this assumption is generally likely to hold). As age-specific rates for study and standard populations are available presumably this assumption could be tested.

We are sorry that our reference did not meet with the reviewer's approval. We wanted to use something that was readily accessible to all. We are aware that there is disagreement amongst epidemiologists regarding the most appropriate form of standardisation but this document is more directed to the public health audience and we feel that direct standardisation is more intuitive that indirect. Would the reviewer be happy with the following reference:

Technical Briefing 3 Commonly used public health statistics and their confidence intervals Eayres D Association of Public Health Observatories, 2008.

This has been changed in the references section.

2. Page 8 line 284: it would be good to give a reference for this statement and clarify a little how this relates to the legal requirements that people should be "permanently handicapped" to be eligible for registration.

It is our understanding that the legal requirements do not demand permanent handicap.

3. Page 30 Figure 4: The note to this figure needs to be amended. The directly standardised rate is the rate that would apply in the PCT if it had the same age structure as the standard population (England presumably). The PCT populations will not have been adjusted.

The reviewer is quite correct and we thank her for pointing this out. We have corrected the note to the figure accordingly

4. Page 32 line 15: : I agree with you that the term "blindness" should not be removed altogether but at the moment the title, abstract and key message are potentially misleading as they imply that the paper reports "geographical variation in blindness". A little rewording of these sections could put the emphasis on what is reported - variation in CVI rates - but keep the context, i.e. eligibility for registration as blind or sight impaired.

Thank you for this point and we agree with the reviewer. We have amended the title. As fas as we can see the key message, abstract and rest of the text make it clear this is certification rates we are reporting.

Minor points
5. Page 2 line 56: typo "interprete"
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