Author’s response to reviews

Title: Quality comparison of electronic versus paper death certificates (France - 2010)

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Author’s response to reviews: see over
Answers to the reviewers

We are very grateful to the referees for their recommendations. The proposed modifications are shown below, and underlined in the manuscript.

Referee 1

Major compulsory revisions

1. Page 5; last paragraph. The use of the term ‘formal approach’ is unclear. In order to explain this issue, it is recommended that specific technical terms should be used for the two approaches. One solution would be through use of the following definitions:

   • A – comparison of UCD from DC with medical records – could be termed ‘content’ validity
   • B – comparison of ‘intrinsic’ characteristics of DCs for specific criteria at a population level – could be termed as ‘criterion’ validity.

Authors are recommended to look into this matter, and come up with proper standard terminology for such assessments. Further, the authors could refer to an overall framework for assessment of cause of death data quality, which makes similar points in regard to data validity (e.g Rao, C., et al. (2005). "Evaluating national cause of death statistics: Principles and application to the case of China." Bull World Health Organ 83(8): 618-625.

We are very grateful to the referee for this suggestion. In order to clarify the two approaches, the following sentences have been completed (page 5, line 19 and page 5, line 24):

   A. The first one consists in comparing the selected UCD with a gold standard; this approach is called "content validity" (ref Rao).
   B. The other approach is called "criterion validity".

2. Page 6: Methods. The authors mention 5 automated coding systems. Over here, please provided a table outlining the background / characteristics / current application of each system

The sentence:
"Iris is the only ACS that is language independent and this is one of the reasons why it is currently implemented in several countries, among which France."

has been replaced by (page 6, line 19):
"The US were the first country to develop an ACS. Sweden, France and Hungary followed. All these systems are compatible with the US system. They code the causes of death and select the underlying cause of death according to the ICD10 rules and guidelines. However, these systems are dependent of the language used for the causes of death reporting. This is why Iris was developed: it provides a system both compatible with the US system and usable whatever the language. Iris is now used by several countries such as: Sweden, France Germany, Canada, South Africa, Israel, Luxembourg...".
3. Page 8; Results. The manuscript should provide information on the characteristics of participating institutions, as there could be an element of selection bias here. If the institutions conducting electronic death certification are largely teaching hospitals or tertiary facilities, there could be a greater potential for higher data quality in terms of number of causes per death, and lower proportions of imprecise codes, as well as correct certification leading to application of the General Principle for coding. Any implications of characteristics of participating institutions should also be mentioned. In case possible, a stratified analysis comparing data quality across institutions with similar characteristics should be presented, which could clearly demonstrate the benefits of electronic vs paper death certification.

Institutions that have begun to certify electronically between 2007 and 2010 are known; all types of establishments are represented. However, this information is never known for paper certificates, so it is impossible to stratify the comparison analysis on it.

In order to clarify the possible selection bias, the following paragraph has been modified in the discussion (page 13, line 9) as follows:

"The study results are possibly affected by a confounding bias, because the medical establishments that adopt earlier than others electronic certification are likely to be more technophile and more interested in the purpose of certification. Therefore, a better quality of certification could be more attributable to the certifier than to the way of certification.

More specifically, quality of death certification could be associated to the type of institution (teaching hospital, local hospital, private clinic). Unfortunately, it is impossible to stratify or adjust the model on the type of institution, as this variable is not recorded for paper certificates. However, over the study period, electronic death certification was used by all types of Institutions, which suggest that the bias, if it exists, should not be strong."

4. Page 10; Discussion section, third paragraph. The authors mention ‘online guidelines’ for physicians in completing the electronic death certificate. Please elaborate on these guidelines in the methods section, as these could definitely have an important role in the differences in data quality observed from the study.

Following the reviewers remark, the following sentence has been modified in the introduction section (page 4, line 23): "The development of electronic certification has several aims: (1) to facilitate the physician’s certification process with online explanations (description of each part of the death certificate, and illustrative examples of the correct way to fulfill them)." To be consistent throughout the text, the term ‘guidelines’ has been replaced by ‘explanations’ in the discussion section (page 10, line 24).

Moreover, the following sentence has been added to the introduction section (page 5, line 3): "Moreover, in order to facilitate the use of electronic certification, a learning mode allows to practice before writing a real death certificate."

5. Page 10, Discussion. The authors should include a recommendation to conduct qualitative research into the knowledge, attitudes, practices and preferences of certifying physicians in regard to electronic vs paper based cause of death certification. The findings of such research would be
useful in designing broader interventions to augment the implementation of electronic death certification in France as well as in international settings.

The following sentence has been added at the end of the discussion (page 13, line 22): "This type of study could be completed by qualitative research on the knowledge, attitudes, practices and preferences of certifying physicians in relation with electronic versus paper death certification. The findings of such research would be useful in designing broader interventions to improve the implementation of electronic death certification in France as well as in international settings."

Minor essential revisions

1. Pg 6: replace ‘volunteer’ with ‘voluntary’

'Volunteer' has been replaced by 'voluntary'.

2. Pg 8: replace ‘affected frequently’ with ‘frequently affect’

'Affected frequently' has been replaced by 'frequently affect'.

3. Pg 10: last line of first paragraph of Discussion: .....paper DCs i.e replace 'ones' with 'DCs'

'Ones' has been replaced by 'death certificates'.

4. Pg 10; second paragraph; last line – the use of the term ‘generalise’ is unclear; please rephrase to clarify the intended meaning

'Generalize' has been replaced by 'be developed' in order to clarify the sentence, meaning that multiple causes analysis is becoming widespread and being more frequently used in several pathologies such as diabetes (but could reach other complex diseases in the future).

5. Pg 11; last paragraph – ‘….seem harder to code’. This phrase suggests that these deaths from external causes were coded manually, instead of being coded by the automated system. If this is so, this should be clarified in the Methods, since on pg 6 there is mention that IRIS codes all but 1% of deaths. Also, if possible, bring out the issue of the need for dual codes for injury deaths, (both external and internal causes), and whether IRIS has the facility to achieve such dual coding

Indeed, the sentence was unclear. The end of the sentence 'seem harder to code' has been modified into 'seem harder to certify well following WHO guidelines by physicians' in order to clarify the purpose (page 12, line 3).

We confirm that only 1% of deaths could not be coded automatically by Iris. Iris has the facility to deal with dual codes for injury deaths and this is not appearing as an issue in this context.

6. Table 1; examples. Replace ‘cardiovascular accident’ with ‘cerebrovascular accident’; and preferably replace ‘nose cancer’ with a more common condition e.g. lung cancer
'Cardiovascular accident' has been replaced with 'cerebrovascular accident' and 'nose cancer' was replaced with 'lung cancer'.

**Referee 2**

No comment was mentioned.

**Referee 3**

1. As a minor problem, they should remind in their limitation that “this method is usable when there are access to the electronic or non-electronic death certificate and it usually happen in developed countries”.

In order to respond to the first comment, the following sentence was added in the discussion section (page 13, line 7): "Furthermore, this method is available when an access to electronic or paper death certificates exist, which usually happens only in developed countries”.

2. Another minor problem that they should mention in limitation is “every certifier of electronic death certification knew that they are in evaluating study then they should be careful for selecting cause, sequence and other part of death certificate”.

It is a population-based study on routine death certificates. Certifiers were not warned of the present study, so they did not have reasons to be specifically careful. On the other hand, as mentioned in the discussion part, electronic death certification is a relatively new tool; it is possible that certifiers were more attentive when using it.

In order to clarify the purpose, the following sentence has been added (page 6, line 11): “The present study is a population-based study on routine death certificates.”

**Referee 4**

1. It would be helpful if the authors could specify more clearly how zero-truncated Poisson model was used to address which specific questions. I assumed it was used to compare the information quantity only, and the results presented in Table 2 were results from the zero-truncated Poisson model analysis? Please clarify.

The following sentence "As the death certificates analyzed contained at least one code and because number of causes by death certificate was a counting variable, zero-truncated Poisson models were fitted" was completed by "to model count data for which the value zero cannot occur" in order to clarify the purpose (page 8, line 13). In the table 2, title has been completed: 'Table 1 Number of causes by certificate (results from the zero-truncated Poisson model)'
2. Also regarding Table 2, it was unclear what variables were included in the models. Based on the description in the statistical analysis section, seemed like separate models were run for each type. However, if models were run for >65 (Paper vs. Electronic), how was the age variable being treated? Presumably it was excluded? But from the presentation of Table 2 it was not clear.

Variables included in models were: age, type of certificate, death place of occurrence, gender, initial cause of death and region of death (data not shown). Interaction result is given when it was statistically significant, maintaining death place of occurrence, gender, initial cause of death and region of death as adjustment variables. In order to clarify this sentence, it was modified into: 
"Model was adjusted on age, type of certificate, death place of occurrence, gender, initial cause of death and region of death (data not shown). Interaction result is given when it was statistically significant."

3. Considering that there was an analysis performed with “types for all age” and an age control variable was included in the model, why not use an interaction term to examine how the use of electronic vs. paper differ by age group <65 vs >65 rather than running separate regression models.

Yes, an interaction between age and type was performed and results of type x age are given in table 2. Model was performed initially without the interaction, and then with it.

4. Comments 2-3 apply to the log binomial model.

Answers 2-3 apply to the log binomial model.

5. Was the table for the results for the analysis regarding imprecision included somewhere in the paper?

No, results were just given in the text.

6. The authors mentioned that “A stepwise variables selection procedure was performed in order to determine the final model.” Was the “final model” referring to the one presented in the tables? What other variables were considered but dropped in the selection process?

Yes, the final model is the one presented in the tables. All variables were included in the selection process. Under each table, variables kept in the adjusted model are indicated and correspond to those described in the method section.