

# Quality of Death Certificates in Valencia, Spain

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**Abstract:** Certificates of 1,454 deaths occurring over 11 months were retrieved from the Civil Register in Valencia, Spain. Relevant medical information was systematically gathered from hospital records, questionnaires, and Coroner reports. We compared the underlying cause of death (UCD) from the original death certificate,

and a reference cause of death (RCD) determined by a panel of experts based on all available information. Overall, 80.2 percent of the certificates were concordant for disease category, but there was a great disparity among some specific disease categories. (*Am J Public Health* 1989; 79:1352-1354.)

## Introduction

The quality of mortality statistics has been studied frequently.<sup>1-6</sup>

While mortality statistics are commonly used both for research and administrative purposes in Spain, their reliability has not yet been studied in full detail. This is an important omission; the first studies in this field were carried out in other countries as early as the 1940s.<sup>7-9</sup>

To date, studies of the quality of the registered causes of death have been based on death certificates selected either because stated causes were specific diseases or because of the availability of information required to test the concordance of the death certificate.<sup>10-14</sup> In order to minimize such selection biases, the present investigation was population-based.

## Methods

All death certificates for the 255,866 residents in the catchment area of the Teaching Hospital in the region of Valencia, Spain from February-December 1984 were obtained from the Civil Register. For the resulting 1,454 certifications, we systematically reviewed autopsy findings, questionnaires addressed to the certifiers, and hospital records.

The monthly search for this information started in the Teaching Hospital. If hospital records corresponding to each death were available in the first week of the search, and the last inpatient summary had been completed within the three months prior to death, the search for clinical information was concluded.

When results of first step were negative, a questionnaire (based on work by Moriyama, *et al.*<sup>15</sup>) requesting clinical information about the death was sent to the certifier in the first week of the month following the death, and a list of all such deaths was sent to the Hospital Records departments of all the other hospitals in the city.

Finally, records were obtained from the Coroner's Office for those deaths which had been certified by a Coroner.

All the available information was reviewed separately by two specialists in Internal Medicine, who were not conver-

sant with the information recorded in the original death certificate. Kappa index of agreement between the two reviewers was 0.78 (confidence intervals 0.76, 0.81). When internists opinions did not coincide, a third specialist was called in to review the information and thus provide a conclusive decision. All three specialists had been trained previously in certifying procedures by experienced physicians from the Office of Mortality Statistics.

Applying the rules of the ICD-9th revision,<sup>16</sup> professional coders selected the underlying cause of death (UCD) from each original certificate and the reference cause of death (RCD) from each standard certificate produced by the internists.

Using two by two tables for each cause and for each group of causes, the Detection Rate (DR),\* and the Confirmation Rate (CR),\*\* were computed working at a three-digit level of ICD-9th codes.

From the initial 1,454 certificates, clinical information was obtained for 1,176 deaths; in the remaining 278 deaths neither clinical records were available nor were questionnaires answered. Out of the 1,176 deaths, 108 (9.2 percent) were not included in the study because the medical reviewers considered the clinical information inadequate to test the concordance. Therefore, the final number of deaths studied was 1,068 (73.5 percent of the initial sample).

## Results

In 50.9 percent of the 1,068 deaths, clinical information was obtained only from hospital records, in 27.7 percent only from questionnaires, and in 11.9 percent from both sources. Coroners' reports provided the remaining 9.4 percent of the information, of which 1.9 percent had also hospital records. The total number of deaths with hospital records amounted to 692. In 40 cases, autopsies were carried out by hospital pathologists. Of the 692 deaths with information obtained through hospital records, 562 (81.2 percent) took place in hospitals.

According to the completed questionnaires, the duration of the professional relationship between the certifier and the deceased had lasted less than 24 hours in 29.2 percent of the cases. When deaths occurred in hospitals, this percentage increased to 53.7 percent; when deaths occurred at home, it decreased to 17.9 percent.

Agreement between Detection and Confirmation Rates did not vary by duration of professional relationship, by place

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**Editor's Note:** See also related editorial p 1349 this issue.

\*Detection Rate equals the number of concordant deaths according to a particular disease category divided by the number of standard death certificates from the same disease category.

\*\*Confirmation Rate equals the number of concordant deaths according to a particular disease category divided by the number of original death certificates from the same disease category.

**TABLE 1—Percentage Agreement (with 95% Confidence Intervals) of Detection and Confirmation Rates by Place of Death, Duration of Professional Relationship and Sources of Information**

Place of death	N	Agreement Indexes (%)	95% CI
Home	426	80.5	76.7, 84.2
Hospital	642	80.1	77.0, 83.1
Duration of professional relationship			
>3 months	215	81.8	76.7, 86.9
<3 months	85	82.4	74.3, 95.5
<24 hours	124	81.5	74.6, 88.3
Sources of information			
Clinical records	692	79.1	76.1, 82.1
Questionnaires (only)	296	82.1	77.7, 86.5

of death, and by sources of information (Table 1).

The agreement indexes for all causes were 80.2 percent both for the detection and confirmation rates, as shown in Table 2.

The agreement indexes, DR and CR, for the major categories of causes of death can also be found in Table 2. They are highest for tumors (DR = 89.9 percent and CR = 95.3 percent) and circulatory diseases (DR = 87.6 percent and CR = 80.5 percent).

Agreement indexes for the rest of groups of causes were questionable, due to the small number of deaths on which they were based. Table 3 displays the matrix plotting underlying cause against reference cause.

As regards specific tumor sites, the highest indexes of agreement were those for lung cancer (DR = 84.6 percent and CR = 91.7 percent) and breast cancer (DR = 88 percent and CR = 95.7 percent). Conversely, liver cancer showed very low rates of agreement (DR = 53.8 percent and CR = 37.9 percent), and colon cancer showed indexes below 80 percent but of a very similar nature (DR = 75 percent and CR = 71.4 percent).\*

\*Data available on request to author.

**TABLE 2—Agreement Indexes for the Underlying Causes of Death, ICD-9A Main Category**

Disease Category	UCD(*) N	RCD(**) N	Agreements N	Detection Rate		Confirmation Rate	
				%	SD	%	SD
Infectious/parasitic	6	7	2	28.6	17.1	33.3	19.2
Neoplasm	279	296	266	89.9	1.8	95.3	1.3
Endocrine/metabolic	43	51	30	58.8	6.9	68.8	7.0
Blood organs	4	1	1	100.0	0.0	25.0	21.7
Mental disorders	7	3	2	66.7	27.2	28.6	17.1
Nervous system	13	8	6	75.0	15.3	46.2	13.8
Circulatory	430	395	346	87.6	1.7	80.5	1.9
Respiratory	78	85	47	55.3	5.4	60.3	5.5
Digestive	83	99	73	73.7	4.4	87.5	3.6
Genitourinary	29	28	14	50.0	9.5	48.3	9.3
Pregnancy	1	1	1	100.0	0.0	100.0	0.0
Skin	0	2	0	0.0	0.0	0.0	0.0
Musculoskeletal	1	2	1	50.0	35.4	100.0	0.0
Congenital anomalies	7	6	6	100.0	0.0	85.7	13.2
Perinatal	3	4	3	75.0	21.7	100.0	0.0
Ill-defined	14	1	0	0.0	0.0	0.0	0.0
External causes	70	79	59	74.7	4.9	84.3	4.4
Total	1068	1068	857	80.2	1.2	80.2	1.2

(\*)UCD: Underlying Cause of Death  
(\*\*)RCD: Reference Cause of death.

Agreement indexes for circulatory diseases varied greatly. Hypertensive disease produced low indexes of agreement. Arteriosclerosis gave quite similar results, with even lower indexes (DR = 19.2 percent and CR = 21.7 percent). Acute myocardial infarction showed a DR of 75.5 percent and a CR of 53.7 percent and the intra cranial haemorrhage a DR of 84.2 percent and a CR of 55.2 percent. However, the overall agreement in this group was over 80 percent.\*

*Discussion*

In these data, mortality statistics as a whole appear to be reasonably reliable: 80.2 percent of the certificates showed good concordance. This figure lies somewhere within the range of results obtained by Alderson<sup>4</sup> in the Oxford Record Linkage Study Area (61 percent of agreement) and by Faire<sup>5</sup> among Swedish twins born in 1901–25 (DR = 94.9 percent and CR = 95.6 percent) (our estimate from their figures).

When comparing our population based results with those of Kircher in Connecticut,<sup>14</sup> based on autopsies, we found his confirmation rates to be lower than ours for neoplasms, circulatory diseases, and respiratory diseases (85 percent versus 95.3 percent; 75 percent versus 85.5 percent and 31 percent versus 60.3 percent, respectively). These differences might be explained, at least to some extent, by the fact that when only autopsies are used to validate death certificates, a higher level of disagreement is to be expected as autopsies are carried out mainly on diagnoses that appear uncertain.

It is interesting to note that in our study 13 deaths initially certified as due to cancer were reclassified after reviewing the available clinical information, and 30 deaths initially assigned to groups other than tumors were then reclassified as due to cancer. This finding suggests that mortality from cancer was underreported by 6.1 percent, a figure that lies between the value of 5 percent found by Griffith in England and Wales<sup>17</sup> and the value of 10 percent observed by Engel in Georgia.<sup>18</sup>

Percy, *et al.*,<sup>6</sup> estimate a DR and CR of 82.7 percent for tumors in the USA, a value close to ours as regards DR but lower in respect to CR. Our results are relatively close to those obtained by Faire<sup>5</sup> in Sweden with a DR of 98.2 percent and a CR of 99.5 percent.

TABLE 3—Agreement Matrix between Underlying Cause of Death and Reference Cause of Death (RCD)

Underlying Cause of Death ICD-9 <sup>a</sup>	Reference Cause of Death																	Total U.C.D.
	001 -139	140 -239	240 -279	280 -289	290 -319	320 -389	390 -459	460 -519	520 -579	580 -629	630 -676	680 -709	710 -739	740 -759	760 -779	780 -799	E800 -E999	
Infectious/parasitic (001-139)	2	2							2									6
Neoplasm (140-239)	1	266	1				3		5	2			1					279
Endocrine-metabolic (240-279)		2	30				8		3									43
Blood organs (280-289)		1		1			1		1									4
Mental disorders (290-319)					2		4			1								7
Nervous system (320-389)						6	4			1							1	13
Circulatory (390-459)	1	14	15		1	1	346	26	9	7					1		9	430
Respiratory (460-519)	1	4				1	12	47	4	1			1				6	78
Digestive (520-579)		4	2					3	73				1					83
Genitourinary (580-629)		3	2				8			14							2	29
Pregnancy (630-676)											1							1
Skin (680-709)													1					0
Musculoskeletal (710-739)														1				1
Congenital anomalies (740-759)							1							6				7
Perinatal (760-779)															3			3
Ill-defined (780-799)								4	7	1								14
External causes (E800-E999)	2						4	2	2	1							2	14
Total RCD	7	296	51	1	3	8	395	85	99	28	1	2	2	6	4	1	79	1068

With respect to mortality due to cardiovascular diseases, our indexes lie between those obtained by Engel<sup>18</sup> (DR = 69.0; CR = 75.6) and those found by Faire<sup>5</sup> in Sweden (DR = 92.4; CR = 88.8).

It has been argued that concordance indexes might depend on the precision and completeness of the information used by the reviewers to establish the standard cause of death. In our case, the influence of what has been called reviewer bias does not seem to play an important role, as additional information obtained after the death usually comes from autopsies and the number of these in our area was dramatically low.

It has also been argued that reviewers might have access to clinical records to which medical certifiers did not have access. But this does not accord with the fact that in our study 81.2 percent of the deaths with clinical records available took place and were certified in hospitals. However, even if this were the case, it would lead to a real discrepancy since the reviewers would have been able to establish the cause of death more accurately.

On the contrary, if the medical certifiers had access, the discrepancies would be spurious. Nevertheless, 72.3 percent of the information used to test the degree of concordance came from hospital records and forensic reports and thus was equally available for both certifiers and reviewers.

Some information was obtained only from questionnaires. This presented the problem of the reviewing doctors not having access to any more information than that which was transcribed. However for 70.5 percent of the completed questionnaires, corresponding to deaths at home, there was presumably no more information than that which appeared on the questionnaires, as the systematic search for the clinical records of these cases was negative. However, the possibility that a crucial piece of information which might have been known to the medical certifier did not appear in the records, although remote, cannot be ruled out in this sort of study.

#### ACKNOWLEDGMENTS

We thank Dr. S. Guiral and E. Gonzalez for their help with data collection; Drs. V. Arraez, L. Jimenez and P. Bordes for their work in the panel of

specialists; and A. Nolasco for computer programming. This work was partially supported by the Spanish Medical Research Fund (FIS) (Grant 84/1933).

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