Death in Town and Country
An Analysis of Urban–Rural
Differences in Mortality

Luis A. Camarero Rioja, Rosa Gómez Redondo
Ricardo Jiménez Aboitiz

It is often said that death is a great leveller but while it is true that we all die, we die in different ways. Differences in causes of death may express different living conditions and, in a broad sense, can be considered as indicating social differences. This is the premise of this article. It continues the debate on differences between urban and rural environments, using differences in mortality to point to the differences that exist in Spain at the end of the twentieth century. From another point of view, it also introduces the habitat variable in the analysis of mortality because, although often omitted, it may provide information on the epidemiological transition. However, in view of the lack of literature on this subject,[1] readers should bear in mind that this reflection is inevitably exploratory.

In Spain, the reason for this omission is essentially the difficulty of obtaining data broken down by size of place of residence. Tables of mortality rates in the rural environment have not yet been published, which means that there are no specific indicators for life expectancy.[2] This lack of information is even more marked in the area of causes of death, which is a key factor for any preventive health policy and even for economic, town or environmental planning. All this means that population projections are based on urban rates and that preventive health policies follow essentially urban criteria. The specific health risks for inhabitants of rural areas are, in fact, unknown.

This lack of information leads to clichés being considered as truths. Readers of this article may even assume implicitly that rural mortality is higher than urban mortality. Such an affirmation would be based on the assumption that the standard of living in rural areas is lower than in urban areas, partly due to the fact that health care was implemented later in rural areas than in urban areas, and possibly that greater distance from the main health centres leads to poorer care. From a more anthropological point of view, it might also be assumed that in the rural environment there is greater resistance to official medicine because of the survival of primitive cultural systems involving folk healing, etc.

It is certainly true to say that the differences between rural and urban mortality have not been studied sufficiently.[3] The above-mentioned assumption may be true if the rural environment is considered to be in the early stages of the epidemiologi-

cal transition, which would confirm a situation of serious economic and cultural backwardness. But it is also possible, even if it is just taken as a hypothesis for this article, that the opposite is true for the Spain of today. This would be based on two facts. Firstly, the health care system in Spain is now practically universal. The endemic diseases that shocked King Alfonso xiii when he visited the western region of Las Hurdes in the 1920s and the malaria that was endemic in southern Andalusia are now very much things of the past. And, secondly, although the economy has perhaps developed more slowly in rural areas than in urban areas, in many respects the rural environment offers a better quality of life than the noisy, contaminated, urban and industrial centres.

If life expectancy were greater in rural areas than in towns, this would put an end to many false myths. It would mean that there are no differences in health care – which seems reasonable at the end of the twentieth century – and that the Spanish rural environment is at an advanced stage of the epidemiological transition, possibly due to the better environmental quality of rural areas.

Methodology

The analysis is based on official records of vital statistics (*Movimiento Natural de la Población*) supplied by the National Institute of Statistics in the form of anonymous data. To prevent interference from any particular year, an average was taken over a three-year period, namely from 1990 to 1992, taking the total population to be that given in the 1991 Census.

This study considered districts having less than 10,000 inhabitants as being rural and those larger than this as urban. This definition was made necessary by the data used. The procedure for making records anonymous only allows identification of districts when they have a population in excess of 10,000. When they are smaller than this, all the records appear with the same district code number. It is therefore impossible to break down the figuress more specifically according to size of habitat. However, this threshold allows a clear distinction between urban and rural Spain[4] (Camarero 1992).

In order to study causes of death, the 9th icd series b classification was used. Subsequently, in order to facilitate interpretation of the approximately 900 subheadings it comprises, these were grouped into 27 main categories. The specific meaning of these causes can be seen in the annex to this article.

The analysis began with the preparation of tables for life expectancy for five-year age groups for two populations (rural and urban, or men and women, as appropriate). After obtaining the figure for life expectancy (e_x) for each of the populations, the differences between the two were calculated for each age group. These differences expressed in hundredths of a year were then broken down according to the cause of death. This made it possible to determine the crossed contribution of age and cause (and, where appropriate, sex) to differences in life expectancy between the two populations.[5]

The method used (Pollard 1988) has the advantage of comparability as it is not affected by the age and sex structure of each population. In our case, this precaution is very important because the urban and rural demographic structures are very different. The rural environment is much older and has more men than urban

areas.[6] Moreover, the method of analysis for differences in life expectancy can be extended to the causes of death, allowing consideration of the type of differences between the two habitats.

Urban–rural differences

Sorokin and Zimmerman, in Chapter 8 of their classic treatise on rural sociology written in 1929, dealt very carefully with the matter of the differences between urban and rural mortality. Firstly, they noted that life expectancy was greater in the country than in towns,[7] and that this was so for all age groups, even babies, and for both men and women. They studied both innate and environmental factors. Concerning the former, they concluded that there was no evidence for any natural order leading to better rural health or vice versa.[8] With respect to environmental factors, they rejected the influence of economic factors and of differences in health care and hygiene.[9] They ended up basing the greater life expectancy of the rural population on the lower demographic density, the greater integration of rural families, better care of children by their mothers, the open-air nature of agricultural work, better air quality, the more healthy nature of agricultural work, the greater peace and quiet of the rural world and, essentially, the poor adaptation of human beings to urban environments.

Seventy years later, the explanations given by Sorokin and Zimmerman bring a smile to readers' lips. Their study shows clearly that rural inhabitants had a better mortality rate but the weight they placed on nature as man's ideal, original habitat did not explain the differences they observed.

It is true that during the early stages of the epidemiological transition, when epidemic mortality was particularly high, high population density showed a strong, positive correlation with mortality.[10] However, after this stage of epidemic mortality and during subsequent stages of the epidemiological transition, improved hygiene and nutrition played a part in the increase in life expectancy (Bernabeu-Mestre 1994), and these came first to the urban environment.

More recent studies, such as that carried out by Clifford and Brannon (1985), point to the closing of the gap between urban and rural life expectancy.[11] These authors do not attempt to give any explanation for the differences but they consider that the change in lifestyles and in values of rural inhabitants could be of importance in the closing of the gap in mortality patterns. They attribute this convergence to slower growth in rural life expectancy.

Myers and Hastings (1995), however, found that in the State of Tennessee in 1990 rural mortality was slightly higher than urban mortality, although they note that the differences were increasingly small. They consider that urbanization, technological advances in communications and transport and the extension of urban lifestyles and values have erased urban-rural differences.

In Spain, Bielza de Ory (1989) analyzed crude mortality rates and found that the traditional higher urban mortality had decreased throughout the century, becoming lower than rural mortality at the end of the 1970s. The explanation he gives for this changing trend is improved health care: "the multiplication of old people's homes in the rural environment and the widespread use of social security health centres in cities" (p. 31).

However, our article shows that the excessive aging of the population in the rural environment means that crude rates are clearly insufficient for evaluating the differences in habitat for mortality. The work by Ferrer and Calvo (1994) is also based on crude rates. These authors found a parabolic relationship between habitat and mortality with higher mortality in the most urban and rural strata and lower mortality in the central strata. But it must be remembered that city centres and very rural areas have older populations than dormitory towns and regional capitals, so this parabolic relationship could be just the effect of the youth or old age of the populations.

López Zumel (1978) found in his 'unusual'[12] consideration of urban and rural differences that in 1970 men aged under 70 and very young women living in the rural environment had greater life expectancy than those living in the urban environment, whereas for old men and for practically all women the situation is the opposite.

So, basically, all the authors observe differences between urban and rural mortality but the meaning and explanations they give for these differences are contradictory. The recent changes in the Spanish rural environment – marked abandonment of agricultural activities, increasing installation of new residents – make any attempt at giving an explanation even more complex.

The epidemiological transition: Trends in urban and rural mortality

The fact that the rural environment changes and that rural and urban relationships change even more made it necessary to carry out a diachronic analysis of the advances and contributions made by the two habitats to the increase in life expectancy. Of special relevance is the diagram proposed by the theory of epidemiological transition (Omran 1972) to explain trends in mortality. This theory points to three periods – epidemics and famine; the fight against pandemics; degenerative diseases and man-made diseases.

During the first phase, which is characterized by catastrophic mortality and is the result of poor harvests and epidemics (in the Spanish environment these are mostly cholera and yellow fever), it is not unreasonable to assume that the effects of these were less dramatic in the rural environment than in small towns because the lower population density and the greater isolation of country societies helped to stop the spread of epidemics, which were much more common in towns.[13] With reference to poor harvests and famine, towns are especially sensitive to these because they are totally dependent for food whereas farm-workers are in a better position to face up to such calamities because of their subsistence farming.[14] This is expressed by De Miguel when he points to the low growth in population in the nineteenth century as being due to the fact that "towns at the end of the nineteenth century were even more harmful than the country, at least in times of epidemics" (De Miguel, 1987, p. 138).

The second phase, dated by Omran in the second half of the nineteenth century, but which we should date during the first half of the 20th century for Spain, was when urban and industrial development began. Hygiene improved with sewage treatment and urban sanitation, and the conditions of urban living and diet improved. It was precisely during this stage that the gap between the rural and urban environments widened. Rural life no longer offered advantages over city life because the phenomenon of urbanization excluded the rural world from the process of modernization. With improved urban living conditions, especially with

respect to hygiene and diet, the high rates of infant mortality[15] in towns fell, giving rise to a sharp increase in life expectancy. This process did not take place to the same extent in the rural environment.

This was especially clear in Spain. Arbeló (1962) noted that, during the first two decades of the twentieth century, infant mortality was markedly higher in provincial capitals than in the rest of Spain.[16] Insalubrity, crowded housing and a weak health care structure promoted the propagation of infectious diseases. The exhausting working days of the working masses also affected child nutrition, painting a dismal picture for child survival in industrial areas.

This situation was to turn around in the mid-1920s. The high urban infant mortality was to give way to high rural infant mortality (Gómez Redondo 1992). It was in towns that most attention was paid to children, and the appearance and proliferation in some towns of institutions such as *La Gota de Leche* (the drop of milk) which aimed to improve child nutrition significantly took place alongside the reduction in urban infant mortality.

In spite of this changing trend during the twenties, life expectancy in towns only started to increase in the forties (Villar Salinas 1942). This difference in the rates of decrease of urban mortality by age can be explained, as pointed out by Reher (1996), by the fact that urban mortality was much higher in adults than in children.

Paradoxically, as also noted by Reher, the reduction in mortality began in those places in which the starting situation was worse, that is, in the large urban areas. Sanz Gimeno and Ramiro Fariñas (1995), after analyzing the geographical differences in decreasing rural and urban mortality, reached the conclusion that the decrease in urban mortality depended largely on the level of socio-economic development and on the extent that industrial development fostered improved health and hygiene.

This leads us to the start of the third stage of the epidemiological transition in which medical and health care improvements were behind improvements in life expectancy, especially because these improvements were being deliberately extended through the health care systems. While health care was becoming consolidated in urban areas, programmes to improve living conditions in rural environments were being implemented.[17] The subsequent extension of health services throughout Spain and improvements in communications were to contribute to the standardization of health conditions for both rural and urban inhabitants.

During the last stage, there has been an increase in the number of deaths resulting from degenerative diseases and alterations to the environment as well as from diseases of social origin. With respect to morbidity caused by environmental changes, the rural environment clearly has the upper hand while for the group of social illnesses, mortality depends on living conditions so there are increasingly fewer differences between urban and rural areas.

In summary, it seems clear that differences over time between rural and urban mortality have varied both in intensity and in direction. Firstly, when mortality was higher, environmental differences led to better figures for rural areas, mitigating catastrophic mortality to some extent. But the drop in mortality is the result of the specifically urban process of modernization, which has turned the tables, leading to a fast decrease in urban mortality but not in rural areas. Life expectancy in urban areas increased while rural areas maintained their high mortality pattern. The recent extension of the process of modernization throughout Spain is levelling out the marked differences.

Today, large differences between the two habitats cannot be expected because the main factors contributing to such differences, such as endemic diseases, malnutrition and especially differences in health care, are no longer relevant. Other possible factors, such as socio-economic differences, should be minimized by the universalization of health care. This leaves living conditions as the main explanation for any possible differences noted.

So, in what follows, research into the different causes of death between rural and urban inhabitants has serious repercussions for the debate on the existence of different living conditions in the rural and urban environments. Clearly, if such differences are found, this would provide a firm argument confirming the existence of different societies in the rural and urban worlds. But if there are small differences, then the rural and urban worlds can be considered as merely different locations forming part of a single society.

The current structure of mortality in Spain

Several authors[18] have suggested that a fourth stage should be introduced into the traditional epidemiological stages devised by Omran. This new period would be characterized by slower increases in life expectancy because of the persistence of or even the increase in mortality at younger ages, as a result of social practices and risk activities. While improvements in living conditions put an end to epidemic mortality and reduced endemic disease, and medical advances and extension of the health system transferred the causes of death to degenerative diseases, increasingly separating illness from mortality, the arrival of the post-industrial society has generated a new type of restriction on the increase of life expectancy, namely social risk practices.

Recent studies (Gómez Redondo 1995) place Spain somewhere between the third and fourth stages of the epidemiological transition, although it is showing clear signs of having entered the fourth stage. As a characteristic feature of the least twenty years it is stated that, during the slow increase in life expectancy, especially since the eighties, there has been a marked increase in mortality amongst young people, especially because of certain risk behaviour such as drug addiction, accidents and violent death: "If our average life increases, this is because of a positive force – the prolongation of old age – from which a negative force has to be deducted – the loss of young people" (Gómez Redondo 1995, p. 105). Although this mortality is not large in absolute numbers, the fact that it is concentrated at early ages has a worrying effect in that it holds back the increase in life expectancy.

Other data, such as the growing divergence in life expectancy between men and women, show that in Spain today certain habits and behaviours related to environmental or biological factors are becoming increasingly important in mortality trends.

Table 1 shows the specific death rates by cause for each of the groups of causes of death considered in this study (see Annex). It confirms the huge proportion of degenerative causes of death in both urban and rural mortality. Circulatory and cerebro-vascular diseases account for no less than 28.3% of urban deaths and 33.4% of rural deaths. This table also shows that the crude death rate is about 8 per thousand in the urban environment and 10.5 per thousand in the rural environment. However, it is misleading to use these results to evaluate differences in urban and rural

Table 1: *Specific death rates by cause (1990–1992)*

Causes of death	Urban	Rural
Diseases of the circulatory system	129.97	199.30
Cerebro-vascular diseases	95.82	155.20
Myocardial infarction and other ischaemic heart diseases	83.84	106 67
Cancer of the digestive system	69.87	84.84
Neoplasms	59.75	68.18
Diseases of the respiratory system	47.36	68.18
Cancer of the respiratory system	42.78	45.09
Diseases of the blood, mental disorders and disorders of the sense organs	30.78	35.26
Diseases of the digestive system	26.15	34.89
Diabetes	21.74	26.31
Cirrhosis of the liver	20.40	17.95
Violent death	19.60	22.11
Motor vehicle accidents	18.55	21.15
Diseases of the genitourinary system	17.11	21.94
Pneumonia	16.66	19.97
Ill-defined conditions	14.97	27.97
Breast cancer	14.32	13.53
Endocrine, nutritional, metabolic diseases and immune disorders	11.46	6.88
Prostate cancer	9.95	15.70
Chronic bronchitis, emphysema and asthma	9.38	12.43
Infectious and parasitic diseases	8.11	8.28
Diseases of the skin and subcutaneous tissue	7.33	11.97
Congenital anomalies and perinatal death	7.22	5.87
Suicide	6.85	9.12
Cervical and uterine cancer	4.63	4.67
Tuberculosis	2.07	2.09
Complications of pregnancy, childbirth and puerperium	0.04	0.03
Total	796.79	1046.95

Note: Rates per 100,000 inhabitants
Source: Based on data from the MNP.INE. (see annex)

mortality. The fact that the crude mortality rate for the rural population is higher is due to its greater age resulting from the intense rural migration during the fifties and sixties. Clearly, if there are more old people, there are more deaths. (See Table 2).

If the crude death rates are calculated giving both populations the same structure, the situation is inverted. Using the standard population method based on the total Spanish population, in Spain there are 7.8 deaths per thousand rural inhabitants and 8.5 per thousand urban inhabitants. So mortality in the rural population is lower.

Although Table 1 does not allow evaluation of the differences between urban and rural mortality, it shows that there is no great difference between the two with respect to causes of death. The first nine causes appear in the same order for both the rural and urban populations covering not only diseases of a degenerative nature but also other causes that are closely associated with living conditions such as myocardial infarction – which is in third position for both populations – or cancer of the respiratory system – which is in sixth position.

Table 2: *Differences in specific death rates by age (1990–1992) and differences in age structure*

Age	Specific death rates			Age structure (%)		
	Rural	Urban	Difference	Rural	Urban	Difference
0	637.91	780.04	142.13	0.96	1.01	−0.05
1– 4	43.62	41.57	−2.05	4.00	4.23	−0.22
5– 9	22.39	20.86	−1.53	5.83	6.42	−0.59
10–14	24.21	22.29	−1.92	7.00	8.25	−1.25
15–19	68.41	58.09	−10.32	7.48	8.96	−1.48
20–24	98.24	101.57	3.33	7.76	8.52	−0.76
25–29	99.07	136.42	37.35	7.70	8.08	−0.39
30–34	112.56	145.65	33.09	6.93	7.51	−0.58
35–39	140.89	148.66	7.77	5.75	6.68	−0.93
40–44	195.73	196.55	0.82	5.39	6.45	−1.06
45–49	290.66	291.81	1.16	5.14	5.81	−0.67
50–54	421.01	451.05	30.04	5.09	5.07	0.01
55–59	626.57	701.28	74.71	6.47	5.53	0.94
60–64	949.13	1100.71	151.58	6.48	5.07	1.42
65–69	1511.60	1737.99	226.38	5.89	4.33	1.56
70–74	2526.49	2886.47	359.98	4.38	3.12	1.26
75–79	4416.83	4791.87	375.03	3.59	2.41	1.18
80–84	8125.87	8611.60	485.73	2.51	1.56	0.96
85+	17707.15	17642.44	−64.71	1.62	1.00	0.62
Total	1046.95	796.79	−250.16	100%	100%	

Note: Rates per 100,000 inhabitants.
Source: Based on data from the MNP. INE.

Table 3: *Life expectancy* (1990–92)

Age	Rural	Urban	Differences
0	77.67	76.72	0.95
1	77.18	76.29	0.89
5	73.32	72.42	0.90
10	68.40	67.50	0.90
15	63.50	62.58	0.92
25	53.98	53.04	0.94
30	49.24	48.38	0.86
35	44.51	43.71	0.80
40	39.81	39.03	0.78
45	35.18	34.40	0.78
50	30.66	29.87	0.79
55	26.25	25.49	0.76
60	22.00	21.30	0.70
65	17.95	17.37	0.58
70	14.17	13.72	0.45
75	10.74	10.46	0.28
80	7.79	7.65	0.14
85	5.45	5.45	0.00

Source: Based on INE data

Greater life expectancy for the rural population

Table 3 shows life expectancy by age for urban and rural populations. This indicator is not affected by differences in the age structure of populations. It shows that life expectancy for rural inhabitants is greater, with a difference of practically one year (0.95 years).[19] This favourable situation for rural inhabitants is maintained throughout the life cycle. Taking gender differences (Table 4), the differences between the rural and urban environments are mostly found in men. While differences for women are minimal, with a difference of just half a year (0.55 years), in the case of men these differences give a life that is longer by 1½ years for those in the rural environment. These differences continue even at old ages. At 65, rural males still expect to live just over one year longer than urban males so it is urban adult males who face the worst situation.

Table 4: *Life expectancy by gender* (1990–92)

Age	Males			Females		
	Rural	Urban	Difference	Rural	Urban	Difference
0	74.52	72.85	1.67	81.04	80.53	0.51
1	74.07	72.45	1.62	80.52	80.07	0.45
5	70.21	68.58	1.63	76.64	76.19	0.45
10	65.31	63.67	1.64	71.71	71.26	0.45
15	60.42	58.76	1.66	66.78	66.33	0.45
20	55.72	54.00	1.72	61.89	61.43	0.46
25	51.12	49.41	1.71	57.01	56.57	0.44
30	46.50	44.89	1.61	52.13	51.73	0.40
35	41.86	40.37	1.49	47.27	46.90	0.37
40	37.26	35.80	1.46	42.44	42.08	0.36
45	32.73	31.27	1.46	37.67	37.31	0.36
50	28.34	26.88	1.46	32.98	32.61	0.37
55	24.10	22.69	1.41	28.38	28.01	0.37
60	20.06	18.75	1.31	23.87	23.52	0.35
65	16.27	15.12	1.15	19.49	19.20	0.29
70	12.79	11.86	0.93	15.34	15.12	0.22
75	9.72	9.05	0.67	11.55	11.42	0.13
80	7.11	6.66	0.45	8.29	8.25	0.04
85	5.03	4.79	0.24	5.74	5.79	−0.05

Source: Based on INE data

The fact that differences in life expectancy are concentrated in males makes lifestyle an important factor for explaining the differences observed between the rural and urban environments. Other explanations, such as the different socio-economic situation or health care, would have a similar effect on both genders whereas lifestyles are different for males and females.

However, rather than indicating that rural and urban mortality differ, the differences found indicate that in fact they are fairly similar. It must be remembered, for example, that differences in life expectancy at birth between males and females stand at about 7 years[20] and that the distance between the mortality rates of the two most divergent Communities, namely Andalusia and Castilla-León, is about 3.5 years (Jiménez Aboitiz, Gómez Redondo, Camarero and Serrano, 1998). Under no circumstances can one year of difference in life expectancy be considered a large difference but, as stated above, nor are there any reasons for this difference to exist.

High urban mortality and living conditions

So what is it that leads to this greater life expectancy in the rural environment? The first answer can be obtained by analyzing the contributions of the different causes of death to this difference. These data are given in Table 5. Interpretation of the figures should be based on the fact that if it is the rural population that has greater life expectancy, then the causes can affect mortality in two ways. Firstly, they may help to increase the difference as with those causes that have a marked effect on the urban population. Or they may also help to reduce or hold back the difference as with those causes that produce high rural mortality. The latter causes are shown

Table 5: *Difference in life expectancy. Contribution of causes of death to greater rural life expectancy*

Causes	Contributions	%
Endocrine, nutritional and metabolic diseases and immune disorders	16	17.0
Cancer of the respiratory system	14	14.8
Neoplasms	13	14.0
Cancer of the digestive system	12	13.1
Myocardial infarction and other ischaemic heart diseases	10	11.0
Cirrhosis of the liver	9	9.9
Congenital anomalies and perinatal causes	6	6.8
Breast cancer	6	5.8
Diseases of the blood, mental disorders and disorders of the sense organs	5	5.2
Diabetes	4	4.5
Pneumonia	4	4.5
Diseases of the digestive system	3	3.4
Diseases of the circulatory system	3	3.3
Infectious and parasitic diseases	3	2.9
Diseases of the genitourinary system	3	2.7
Diseases of the respiratory system	2	2.2
Cervical and uterine cancer	2	1.9
Chronic bronchitis, emphysema and asthma	1	1.4
Tuberculosis	1	1.2
Complications of pregnancy, childbirth and puerperium	0	0.0
Diseases of the skin and subcutaneous tissue	0	−0.1
Prostate cancer	−1	−0.6
Violent death	−2	−1.6
Suicide	−3	−2.8
Ill-defined conditions	−3	−2.9
Cerebrovascular diseases	−7	−7.0
Motor vehicle accidents	−10	−10.4
Total	95	100%

Note: Contributions in difference of life expectancy are expressed in one hundredths of a year.
Source: Based on data from the MNP (INE) (See Annex).

with negative values in Table 5. It must be remembered that the difference of one year in life expectancy between the two populations is the result of the balance between both high urban mortality and high rural mortality for each of the causes.

Table 5 shows that the rural environment wins with practically all causes but there are two main exceptions in the causes of death for which the difference is inverted – vehicle accidents and cerebrovascular diseases. These two completely different causes can be described graphically. Death either comes early from living fast (accidents while young), or late from living at a slow pace (cerebral infarction in the elderly). The latter cause of death is degenerative and affects only the elderly. In most cases, it could be said to occur just because death is inevitable in the long run.

So, in comparison with urban mortality, high rural mortality is due not to pathological causes or causes which could be avoided with health care but to vehicle accidents, suicide, violent death, etc. This high mortality basically has social origins

that are related to behaviour. Obviously, these rural mortality patterns do not point to differences in economic development and or, clearly, to differences in access to the health care system or the quality of care received.[21]

The explanation for high urban mortality is largely linked to conduct and behaviour. The first cause of death are diseases related to disorders of the immune system as a result of the appearance during the 1980s of AIDS which was transmitted mostly amongst drug addicts sharing syringes. The second cause of death is cancer of the respiratory system, probably related to smoking although also to atmospheric contamination. Myocardial infarction and malignant neoplasms, which point to less healthy lifestyles in cities, come next. Although in sixth position, cirrhosis of the liver is closely associated with alcoholism, which points to the relevance of social causes behind mortality. The above results seem to confirm that there are no marked differences in health care.[22] They also show that the differences are not so much the result of a hypothetically better rural environmental quality but rather of the more aggressive habits found in cities.

Relative rural longevity

Age can throw light on the importance of conduct or the environment as explanations for higher rural life expectancy. Table 6 shows the contribution of each age group to the differences in hundredth parts of one year of life in life expectancy. Thus, positive values indicate that the age group in question contributes to the imbalance between average length of life for the populations compared, coming out in favour of the rural environment. But negative values do the opposite. For example, the group of newborn babies contributes 0.07 years to the total difference in life expectancy in favour of rural inhabitants, whereas the group aged 15–19 contributes 0.03 years to the difference in life expectancy for both populations, but in favour of urban inhabitants.

Table 6 shows that it is the elderly population that contributes most to the greater life expectancy of rural populations. The largest contributions to the difference are made between the ages of 60 and 79. This supports the hypothesis that rural longevity is greater, that is, that death takes place later than in the urban environment. This will be discussed below. Meanwhile, let us study the contribution of children and young people, which is where the most unexpected effects can be seen.

Infant mortality

An important fact is that the group of babies (aged under one year) has lower mortality in the rural environment than in the urban environ-

Table 6: *Contributions of each age group to differences in life expectancy*

Years	Differences	%
0	7	7.0
1– 4	−1	−0.7
5– 9	0	−0.5
10–14	−1	−0.8
15–19	−3	−3.2
20–24	1	1.0
25–29	8	8.4
30–34	7	7.3
35–39	2	2.3
40–44	0	0.4
45–49	1	0.7
50–54	4	4.2
55–59	8	8.6
60–64	13	13.3
65–69	15	15.6
70–74	16	16.5
75–79	11	12.0
80–84	7	7.6
>85	0	0.2
Total	95	100%

Differences in hundredths of a year.
Source: Based on INE figures.

ment although the difference is not large.[23] This situation contrasts with previous studies. The study by Arbeló analyzing Spanish infant mortality during the first half of this century shows that, except for perinatal mortality, the situation is always better in the urban environment than in the rural environment,[24] for both neonatal mortality and post-neonatal mortality.[25] The same conclusions are reached by Sánchez Verdugo (1959) and Gómez Redondo (1992). The data offered in the study by López Zumel (1978) for 1970 point to the same trend, namely, that infant mortality produces a loss in life expectancy of 1.16 years whereas in the urban environment the effect is much smaller (0.44 years), that is, one third less.

The current convergence in levels of infant mortality by habitat reinforces the hypothesis that there is no appreciable difference in childcare between the two habitats. Considering that infant mortality as a phenomenon is very sensitive to conditions of hygiene and nutrition, the convergence can be seen as an indicator that standards of living have reached similar levels in the urban and rural environments.

The study carried out by Clifford and Brannon (1985) shows that infant mortality follows a parabolic pattern in relation to habitat size. It is lowest at the two extremes – that is, the most urban and the most rural areas – and highest in the middle areas.[26] These authors stress the importance of the socio-economic variable in infant mortality, given that the middle-sized habitats include the suburbs of large urban areas and in these locations the population tends to have a lower socio-economic level.

Since our study establishes a dichotomy, the main suburban areas are classified as urban. Probably the lower economic and cultural level of these habitats reduces the gain in life expectancy for the more urban centres, but this does not affect the leading position of the rural environment.

Mortality amongst young people

The advantageous situation of the rural environment disappears for young people aged between 1 and 19, and rural adolescents especially have higher mortality. The main cause of this is traffic accidents especially for the 15–19 age group . The main cause of death for young people in urban areas, however, are immune disorders, as a result of the spread of AIDS, mostly between the ages of 25 and 35. Drug addiction and dangerous or drunken driving involve different types of risk, although they point to a convergence in lifestyles. Both are a form of evasion. For one group, the 'trip' serves to escape from the social control exerted by the vicinity, and for the other, the 'trip' serves to escape from reality.

The patterns of mortality for young people show that the limitation exerted by young people on life expectancy that characterizes advanced societies is not exclusively an urban phenomenon in Spain. Deaths at early ages occur across the board, indicating that living conditions for rural and urban young people are similar.

Early urban deaths

It is as from the age of 50 when urban deaths start to limit life expectancy most intensely. Cancer in various forms and myocardial infarction becomes the main features of high urban mortality and a characteristic of urban life. This trend only changes at much later ages because of the increase in cerebral infarction in the rural environment.

Half of the gain in life expectancy achieved by rural inhabitants over urban inhabitants takes place between the ages of 60 and 80. This means that the differences arise amongst the elderly and, if we take life expectancy as the single indicator of differences in living conditions, it can be said that there are no marked differences between rural and urban life. In fact, retirement is reached with practically the same life expectancy and death takes place almost at the same age.

So, it is in this generation group that the greatest differences in living conditions have existed because this is precisely the group that includes the protagonists of the rural exodus, those who had to decide between becoming urban proletariats or agricultural workers. At the time, they had to choose between different lifestyles. And this is also the group for which the environmental difference was greatest. One group had to put up with the harshness of work in the open air, and the other group had to put up with the harshness of work in artificial environments.[27] The differences show a greater relative erosion in length of life in cities, but the small size of this difference points to a clear convergence between rural and urban mortality levels.

To some extent, the poor figures for cities are balanced out by the appearance in the rural environment of new risks resulting, on the one hand, from intensification of agricultural activity (with the use of pesticides and fertilizers) and, on the other hand, from the change from agricultural activity to activities in the tertiary and secondary sectors.[28] For example, the work by López-Abente (1991) showed greater incidence of certain types of cancer amongst farmers than amongst the population in general. According to his study, farmers are especially prone to brain cancer,[29] which is suspected as being related to exposure to certain chemical substances that are used in plant health products. This author states that the risk for farmers of contracting this type of cancer is 70% greater than for the population in general.

Gender and differences in mortality

The above section states that differences in life expectancy appeared amongst men rather than women. These differences are similar for rural and urban women – the line is very close to the abscissa axis – although urban mortality is slightly higher in old age. The pattern for men is very different. The differences are comparatively larger and high urban mortality is concentrated at two different periods – late youth (25–34 years) and old age. In addition, adolescence presents disadvantages for young rural men.

Table 7 shows the contribution by age and cause of death in men to the higher rural life expectancy. In general, they show something similar to what was seen for the population as a whole. This is reasonable because it is essentially the male population that is responsible for the differences between the rural and urban environments. AIDS takes lives amongst young urban inhabitants and road accidents amongst young rural inhabitants. Cancer, especially of the respiratory and digestive systems, and myocardial infarction are responsible for the deaths of older men. So conduct and habits have an effect on the mortality of young men whereas the differences between the living conditions of the urban and rural environments at least during the process of urbanization and industrialization affected mortality amongst older men.

Although there is little difference in life expectancy for urban and rural women, certain characteristics can be seen (see Table 8). AIDS has a high effect on mortality

Table 7: *Contributions of the causes of death to differences in life expectancy between rural and urban men*

Causes	Contributions	%
Cancer of the respiratory system	29	17.4
Endocrine, nutritional and metabolic diseases and Immunity disorders	25	15.0
Cancer of the digestive system	21	12.6
Neoplasms	19	11.4
Myocardial infarction and other ischaemic heart diseases	19	11.4
Diseases of the circulatory system	13	7.8
Cirrhosis of the liver	12	7.2
Diseases of the respiratory system	9	5.4
Pneumonia	6	3.6
Diseases of the digestive system	6	3.6
Diabetes	5	3.0
Congenital anomalies and perinatal causes	5	3.0
Infectious and parasitic diseases	4	2.4
Diseases of the blood, mental disorders and disorders of the sense organs	4	2.4
Diseases of the genitourinary system	3	1.8
Tuberculosis	2	1.2
Chronic bronchitis, emphysema and asthma	2	1.2
Prostate cancer	1	0.6
Cerebro-vascular diseases	1	0.6
Breast cancer	0	0.0
Cervical and uterine cancer	0	0.0
Complications of pregnancy, childbirth and puerperium	0	0.0
Diseases of the skin and subcutaneous tissue	0	0.0
Ill-defined conditions	0	0.0
Violent death	−1	−0.6
Suicides	−4	−2.4
Motor vehicle accidents	−14	−8.4
Total	167	100%

Note: the contributions are expressed in hundredths of a year.
Source. Based on INE data. (see annex).

for young urban women, although to a smaller extent than for young men. Young rural women are not affected by motor vehicle accidents. However, breast cancer is significant, with an especially high effect on urban women (Table 8). The fact that this disease is in the second position as a cause of high urban mortality is very significant because in principle this mortality can be reduced with proper information, follow-up and early detection, all of which seem more plausible in urban than in rural areas.

The best position for rural life expectancy is seen at old ages (from 60 to 79). Neoplasms, myocardial infarction, cirrhosis of the liver and breast cancer reduce life expectancy for urban women at these ages. The importance of cirrhosis of the liver, which is in fourth position as cause of death for urban women, is of interest because in most cases it is the result of alcoholism. This shows that, whereas there is greater convergence of habits between urban and rural men, in women at later ages there is less convergence.

Table 8: *Contribution of causes of death to differences in life expectancy between rural and urban women*

Causes of death	Contributions	%
Neoplasms	10	20.4
Breast cancer	9	18.4
Congenital anomalies and perinatal causes	8	16.3
Cirrhosis of the liver	7	14.3
Endocrine, nutritional and metabolic diseases and immunity disorders	6	12.2
Cancer of the digestive system	6	12.2
Myocardial infarction and other ischaemic heart diseases	6	12.2
Diseases of the blood, mental disorders and disorders of the sense organs	6	12.2
Cancer of the respiratory system	4	8.2
Pneumonia	3	6.1
Diabetes	3	6.1
Diseases of the genitourinary system	3	6.1
Cervical and uterine cancer	3	6.1
Infectious and parasitic diseases	2	4.1
Diseases of the digestive system	1	2.0
Chronic bronchitis, emphysema and asthma	1	2.0
Violent death	1	2.0
Tuberculosis	0	0.0
Prostate cancer	0	0.0
Complications of pregnancy, childbirth and puerperium	0	0.0
Suicide	0	0.0
Diseases of the respiratory system	−1	−2.0
Diseases of the skin and subcutaneous tissue	−1	−2.0
Motor vehicle accidents	−2	−4.1
Ill-defined conditions	−5	−10.2
Diseases of the circulatory system	−7	−14.3
Cerebro-vascular diseases	−14	−28.6
Total	49	100%

Note: contributions are expressed in hundredth parts of a year.
Source: based on INE data. (see annex).

The panorama for urban women changes at elderly ages – over 75. Here there are both positive and negative contributions. For both rural and urban women, the causes of death are mostly degenerative although the actual diseases differ – diseases of the circulatory system and cerebro-vascular diseases in the case of rural women, and diseases of the blood, mental disorders and disorders of the sense organs as well as myocardial infarction[30] in urban women.

López-Zumel (1978) showed that urban women are in a much better position than rural women. He attributed this to the fact that urban women benefited from better health conditions and suffered fewer of the drawbacks of labour activity Twenty years later, the scene is different because the two reasons favouring urban women have changed. Extension of the health system, on the one hand, and the entry of urban women into the labour force on the other mean that rural women now have good health care and that urban women also suffer from the drawbacks of labour activity.

Conclusions

The analysis carried out shows convergence between urban and rural life expectancy. It is no longer the case that the rural population has a higher mortality rate because of a comparatively low socio-economic level and poorer health care. In fact, the differences noted offer greater life expectancy in the rural environment although the difference of only one year is a relatively short period, hardly justifying the suggestion that improved environmental quality lengthens life expectancy – especially taking into account that the extra year occurs at an advanced age. Also of relevance here is the fact that the differences are mostly seen amongst men, whereas amongst women the differences in life expectancy are minimal.

In view of the recent history of Spanish society in which the current urban phenomenon is the result of the intense rural migration that took place from the mid 1950s to the end of the 1960s, it is these older generations which have seen the greatest differences in living conditions and consumption, but also many of the urban elderly spent their childhood and youth in a rural environment and this must be taken into account when interpreting the small differences that exist. Over coming years, because of more similar patterns amongst young people in both urban and rural environments, the differences noted today are likely to disappear gradually leading to minimal differences in the life expectancy of the two habitats.

The analysis confirms the hypothesis that in the rural environment life expectancy is greater than in the urban environment but it does not confirm the causes of this. The data presented in this study indicate that this improved situation is the result not only of environmental factors but also of the prolongation outside cities of the urban and industrial culture of Spanish society.

In addition, if Spain is at the start of the fourth phase of the demographic transition, this is even more so for rural Spain. High mortality amongst young people is also appearing in the rural environment, although for different causes. Although drug addiction puts an end to the lives of many young urban inhabitants, it is traffic accidents that are the main cause of death amongst young people in the rural environment. This high level of accidents amongst rural young people not only points to the need for policies for accident prevention but also shows the hidden face of Spanish rural life.

Acknowledgements

Notes

1. In the case of Spain, rural mortality has not been treated as a specific subject but only partially in some demographic research. References can be found in the classic texts on Spanish demography: Pascua (1934) and Arbeló (1962), as well as in the more recent study by Gómez Redondo (1992) which deals exclusively with infant mortality. In the more general study by Villar Salinas (1942), on the pretext of analyzing the effects of the Civil

War, a thorough study is made of the Spanish post-war population. Apart from certain specific studies such as that by Jesús de Miguel (1973) which includes comments on trends in rural and urban suicides, more general works such as those by Bielza de Ory (1989), Ferrer Regales and Calvo Miranda (1994), are based on crude rates so their analysis is insufficient. Within specific territorial limits, of importance are the articles by Mendizábal, Mompart and Pujadas (1991) on Catalonia and the one by Vidal y Recaño (1986) on seven small districts. The subject received greater attention from the point of view of historical demography: Reher (1994 and 1996), Sanz Gimeno and Ramiro Fariñas (1995), Fuster (1986). In this area, the research under way by Reher, Pérez Moreda and Bernabeu Mestre on trends in youth mortality looks especially promising. The preliminary findings of this research can be consulted in Reher (1996). Special mention should be made of the study by López Zumel (1978) which is the only work that sets out to compare rural and urban mortality, and the work by López-Abente (1991), which is the only one referring to the specific mortality of farm workers.

2. The only reference to this are the tables published by López-Zumel (1978). However, these are of more theoretical than practical interest because they compare the province of Madrid – as an urban area – with the surrounding provinces – as rural areas – and only with data from 1970. Although they may serve as a guide to trends at the time, they cannot be used as a tool for calculating projections.

3. As an example of the lack of information on this subject, note the explanation given by the eminent demographer Alfred Sauvy in his consideration of rural and urban variables in mortality when he stated that traditionally country life is healthier than town life because "in the country there is an abundant supply of two natural goods – sunshine and oxygen. On top of this double inferiority, town life traditionally offers its social scourges – alcoholism, prostitution, poor housing, etc." (1959, p. 486). Moral explanations for urban-rural differences are constantly found. For example, López Zumel (1978), after finding that mortality amongst young women is higher in Madrid, states that "in the health of women, this *reflects* the consequences of *a certain type of lifestyle of doubtful moral characteristics* that is often led at these ages by *certain groups of women* that tend to be found in Madrid" (p. 91). (author's italics)

4. The districts used in our analysis are the Spanish administrative division called municipality 'municipio'. Rural district has been defined as the municipalities of less than 10,000 inhabitants. A lot of different settlements may be included in one single municipality. Fifty five per cent of rural Spanish population live in settlements smaller than 2,000 inhabitants and eighty one per cent do it in settlements smaller than 5,000 inhabitants.

5. For a detailed explanation of the methodology based on differences in life expectancy between two populations, see Pollard (1988).

6. In 1991, 15.7% of rural men and 20.3% of rural women were aged over 65, whereas in districts with more than 10,000 inhabitants the figures were 10.2% and 14.5% respectively. For further information on this situation, which is the result of the intense rural migration and urban concentration that took place during the 1950s and 1960s, see Camarero (1994 and 1997).

7. This same result was given repeatedly by several researchers. John Graunt, who laid the foundations for life expectancy tables, noted that in the London of the 17th century, there were more burials than christenings, although the opposite was the case in the country. Graunt's explanation for this was the increasing contamination (Graunt, 1989). During the 19th century, the statistician Farr stated in 1843 that the ratio between density and mortality could be expressed as the sixth root of demographic density. Thirty years later, the eighth root expressed this relationship better. This meant that the ratio between density and mortality was levelling off and the situation for urban areas was gradually improving and coming closer to the rural areas (Villar Salinas 1942).

8. Today it seems surprising that they could have considered an innate factor to explain urban-rural differences in mortality. At the start of the century it was not so surprising

and basically Sorokin's research in this area was based on the theory accepted at the time of selective migration. It was common to consider that the people who emigrated to urban centres were superior both physically and mentally and that therefore, genetically, rural populations would become increasingly recessive (see, for example, Gini 1959).

9. They also rejected others, such as the order of birth or family size.

10. This theory is defended by Boserup (1984). See also McKeown (1978).

11. The study refers to the State of North Carolina and shows that life expectancy was higher in the rural environment both at the time of writing and historically.

12. See note 3.

13. Nadal explained in 1976: "Tuberculosis goes hand in hand with poor housing, malnutrition, poverty. It is commonly known as TB and is rife amongst human communities lacking in clean air, healthy food and basic hygiene" (p. 167).

14. Pérez Moreda (1991) correctly asserted that the relationship between lack of food and mortality is not a simple one but rather the effect of the synergy arising between a crisis of subsistence and disease as a determinant of mortality.

15. Reher, Pérez Moreda and Bernabeu Mestre have shown that, prior to the fall in infant mortality, there was a drop in the mortality of young people (Reher 1996).

16. See also Pascua (1934), Gómez Redondo (1992) and Reher (1996).

17. For example, the service entitled 'Domestic Economy Agents' that was set up by the Department for Agricultural Extension in 1960 had an enormous influence in Spain. It aimed to work in the areas of "nutrition, family care and hygiene, food conservation, and the creation of family-run vegetable plots with a view to improving the diet of rural families" (Sánchez de Puerta 1996).

18. Olshansky and Ault (1986); Rogers and Hackenberg (1987).

19. Although this figure might seem small, it is statistically significant. In order for readers to evaluate the figures used, the following are the figures for standard error for life expectancy at birth: Rural $e_o = 0.0473$; Urban $e_o = 0.0283$. For any other age they are always smaller.

20. For 1990, the difference is 7.27 years (Gómez Redondo 1995). In order to evaluate the significance of a one-year gain in life expectancy, take as reference the fact that during the period from 1970 to 1990 women gained almost two years (1.89) over men (ibid.).

21. Morbidity is concentrated at very advanced ages, above eighty.

22. With respect to the sufficiency of health care in the rural environment, there is no difference at all between the urban and rural environments in mortality during pregnancy, this being a cause of death that can be easily reduced with a proper health care structure.

23. In fact, it can be considered statistically insignificant with a confidence level of 95% in view of the standard error referred to above.

24. Arbeló considers perinatal mortality as including all stillbirths, deaths at birth and deaths during the first week of life. He gives no explanation for this type of mortality being lower in the rural environment, which goes against the trends observed in general infant mortality. The reason is probably because of deficient recording of stillbirths in the rural environment. This can be seen in the diverging trends of perinatal mortality. During the period analyzed by Arbeló, the trend in the urban environment is clearly a downward one whereas in the rural environment it turns upwards. The urban drop points to improved mortality in general whereas in the rural environment, the number of deaths increases because of improved data collection rather than because mortality shows a real increase. It must be remembered that the results broken down by habitat that are given here cannot be strictly compared with those for the first half of the century because the data available then were difficult to separate between for the urban (capitals) and rural (rest of the province) environments.

25. Deaths of babies less than one month old are considered within neonatal mortality, and deaths between the ages of one month and less than one year are considered within post-neonatal mortality.

26. Myers and Hastings (1995), however, found much higher infant mortality in rural areas.

27. In his research carried out in 1970, López Zumel (1978) compared "one territory in which the population and economy were progressing which had optimal health conditions with another in which the population was at a standstill, the economy was based on agriculture and in which health care was of poorer quality". He pointed to working conditions as the main explanation for the better mortality for rural men: "The cause of the excess mortality for men at these ages lies in aspects relating to work for men in developed city society" (p. 86).

28. In a recent work, it was found that in areas of the south of the United States in which there had been an intense process of reconversion of agricultural economies to tertiary economies, rural gains with regard to coronary mortality had been much lower than in urban areas (Barnett, Strogatz, Armstrong and Wing 1996).

29. A greater propensity is also pointed out in farmers for stomach cancer, probably related to dietary habits, although in the generations born after 1925 this propensity shows a marked decrease.

30. Although myocardial infarction is not considered a degenerative disease above the age of 80, it can be considered as being caused by degeneration.

References

Arbeló Curbelo, A. (1962) La mortalidad de la infancia en España. 1901-1950 (Madrid: Consejo Superior de Investigaciones Científicas)

Barnett, E. et al. (1996) Urbanization and coronary heart disease mortality among African Americans in the US South. *Journal of Epidemiology and Community Health* 50 (3) pp. 252–257

Bielza de Ory, V. (1989) La población. In V. Bielza de Ory ed., *Territorio y sociedad en España II. Geografía humana* (Madrid: Taurus)

Boserup, E. (1984) Población y cambio tecnológico (Barcelona: Grijalbo)

Camarero, L. (1992) Evolución y tendencias recientes de la población rural en España. *Política y Sociedad*, nº 8

Camarero, L. (1994) Del éxodo rural y del éxodo urbano: ocaso y renacimiento de los asentamientos rurales en España (Madrid: Ministerio de Agricultura, Pesca y Alimentación)

Camarero, L. (1997) Pautas demográficas y espaciales de las transformaciones del medio rural: Ruralidad y agricultura. In C. Gómez Benito and J.J. González, *Agricultura y sociedad en la España contemporánea* (Madrid: Ministerio de Agricultura, Pesca y Alimentación)

Clifford, W.B., Y. Brannon and S. Yevonne (1985) Rural-urban differentials in mortality. *Rural Sociology* 50 (2), pp. 210-224

De Miguel, A. (1987) España cíclica. Ciclos económicos y generaciones demográficas en la sociedad española contemporánea (Madrid: Fundación Banco Exterior)

De Miguel, J. (1973) El ritmo de la vida social. Análisis sociológico de la dinámica de la población en España (Madrid: Tecnos)

Ferrer Regales, M. and M. Calvo Miranda (1994) Declive demográfico, cambio urbano y crisis rural (Barañáin: EUNSA)

Fuster, V. (1986) Determinants of family size in rural Galicia. *International Journal of Anthropology* 1 (2), pp. 129–134

Gini, C. (1959) La teoría de las migraciones adaptativas. *Estudios Demográficos* 4, pp. 521-540

Gómez Redondo, R. (1992) La mortalidad infantil española en el siglo XX (Madrid: Centro de Investigaciones Sociológicas)

Gómez Redondo, R. (1995) Vejez prolongada y juventud menguada. Tendencias en la evolución de la esperanza de vida de la población española, 1970-1990. *Revista Española de Investigaciones Sociológicas* 71, pp. 79-108

Graunt, J. (1989) [1662] Observaciones naturales y políticas mencionadas a continuación en un índice y hechas sobre los boletínes de mortalidad. In M. De Mora Charles, *Los inicios de la teoría de la probabilidad. Siglos XVI y XVII* (Erandio: Universidad del País Vasco)

López-Abente Ortega, G. (1991) Cáncer en agricultores. Mortalidad proporcional y estudios caso-control con certificados de defunción (Madrid: Fondo de Investigación Sanitaria)

López Zumel, J.M. (1978) Contrastes entre Madrid y sus provincias limítrofes. *Agricultura y Sociedad* 8, pp. 61-127

McKeown, T. (1978) El crecimiento moderno de la población (Madrid)

Mendizábal, E. et al. (1991) La mortalite des zones rurales et montagnardes de Catalogne. *Espace, Populations, Societes* (1), pp. 161-164

Myers, S.M. and D.W. Hastings (1995) Convergence in rural-urban patterns of nuptiality and mortality: a life table update. *Sociological Spectrum* 15 (3) pp. 227-256

Nadal, J. (1976) La población española (Siglos XVI a XX) (Barcelona: Ariel)

Olshansky, S.J. and A.B. Ault (1986) The fourth stage of the epidemiologic transition: the age of delayed degenerative diseases. *The Milbank Quarterly* 64, pp. 355-391

Omran, A.R. (1972) Epidemiologic transition: Theory. In J.A. Ross ed., *International Encyclopedia of Population*, Vol 1, pp. 172-175

Pérez Moreda, V. (1991) Alimentación, desnutrición y crecimiento económico. Reflexiones sobre la obra el hambre en la historia. *Agricultura y Sociedad* 61, pp. 207-222

Pascua, M. (1934) La mortalidad infantil en España (Madrid: Departamento de Estadísticas Sanitarias de la Dirección General de Sanidad)

Pollard, J.H. (1988) On the decomposition of changes in expectation of life and differentials in life expectancy. *Demography* 25 (2) pp. 265-276

Reher, D.S. (1996) La familia en España. Pasado y presente (Madrid: Alianza Editorial)

Rogers, R.G. and R. Hackenberg (1987) Extending epidemiologic transition theory. *Social Biology* 34, pp. 234-243

Sánchez de Puerta Trujillo, F. (1996) Extensión agraria y desarrollo rural (Madrid: MAPA)

Sánchez Verdugo, J. (1959) La población Española: Como se distribuye, como nace y como muere. *Estudios Demográficos* 4, pp. 291-368

Sanz Gimeno, A. and D. Ramiro Fariñas (1995) Estructuras Internas de la Mortalidad de la Infancia (0-4 años) en la España del siglo XX. Comunicación presentada en el IV Congreso de la Asociación de Demografía Histórica, Bilbao, Mimeo

Sauvy, A. (1959) Los factores sociales de la mortalidad. *Estudios Demográficos* 4, pp. 457-487

Sorokin, P. and C.C. Zimmerman (1929) Principles of rural-urban sociology (New York: Henry Holt)

Vidal, T and J. Recano (1986) Rural demography in Spain today. *Espace, Populations, Societes* (3), pp. 63-73

Villar Salinas, J. (1942) *Repercusiones demográficas de la última guerra civil española* (Madrid: Real Academia de Ciencias Morales y Políticas)

Annex

Detailed description of the causes of death used

1. Infectious and parasitic diseases (Except 2)
2. Tuberculosis
3. Neoplasms (Except 4 to 8)
4. Cancer of the digestive system
5. Cancer of the respiratory system
6. Breast cancer
7. Cervical and uterine cancer
8. Prostate cancer
9. Endocrine, nutritional and metabolic diseases and immune disorders (Except 10)
10. Diabetes
11. Diseases of the blood, mental disorders and disorders of the sense organs

12. Diseases of the circulatory system (Except 13 and 14)
13. Myocardial infarction and other ischaemic heart diseases
14. Cerebrovascular diseases
15. Diseases of the respiratory system (Except 16 and 17)
16. Pneumonia
17. Chronic bronchitis, emphysema and asthma
18. Diseases of the digestive system
19. Cirrhosis of the liver
20. Diseases of the genitourinary system
21. Complications of pregnancy, childbirth and puerperium
22. Diseases of the skin and subcutaneous tissue
23. Congenital anomalies and perinatal causes
24. Ill-defined conditions
25. Violent death (except 26 and 27)
26. Motor vehicle accidents
27. Suicide

Luis A. Camarero Rioja
Rosa Gómez Redondo
Universidad Nacional de
Educación a Distancia

Ricardo Jiménez Aboitiz
Universidad de Valladolid