The Biological Force behind Excess Male External Cause Mortality: An Analysis of Unnatural Deaths Among Catholic Order Members*

Paper to be presented at the PAA 2010 Annual Meeting, Dallas, Texas, April 15-17

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Abstract
It is still unclear if and how biological factors contribute to excess male mortality due to "external causes" (accidents, injuries, homicides, and suicides). Sex hormones and reproductive roles are supposed to drive sex differences in behaviors increasing the male external cause mortality risk. This study analyses the external cause mortality of Catholic nuns and monks from three Bavarian cloisters whose similar environments allow to isolate the impact of biological factors from a number of confounding causes. Using obituaries, entries in the profession books of religious orders and cemetery registers 2,533 deaths of nuns and monks could be linked to a specific cause of death for the years 1946-2005. Whereas nuns show statistically significantly lower external cause mortality than general population women, monks' external cause mortality parallels or even exceeds that of general population males. These findings contradict the reproductive role hypothesis and provide some evidence for the sex hormones hypothesis.

* This is a shortened and slightly modified version of the paper "Unnatural deaths among nuns and monks: is there a biological force behind male external cause mortality?", published in *Journal of Biosocial Science* (2009) 41: 831-844.

1. Introduction

That women live longer than men has been shown in numerous studies and can be observed in every country of the world today (Barford et al. 2006). Many factors have been identified as contributing to the sex gap in mortality (among others, Nathanson 1984; Wingard 1984; Waldron 1985; Vallin 2006). In general, these factors can be grouped into the two basic categories of biological (anatomical, physiological and genetic) and non-biological factors (social and behavioral factors such as health lifestyles, risk-taking, or working in stressful or hazardous jobs). However, in many cases it is impossible to assign a specific factor to one of these broad categories. For instance, smoking, unhealthy diet, excessive body weight in relation to height, lack of exercise and stress are thought to operate primarily by raising the mortality from coronary heart disease. That female hormones protect women against this kind of disease shows how biological differences between the sexes could play an important mediating role between non-biological factors and ultimate mortality (see Retherford 1975).

Excessive male mortality due to 'external causes' (accidents, injuries, homicides and suicides) is another example for such cases since biological factors may determine sex differences in behavior that lead to external cause deaths (Waldron 1983b). Basically, two different mechanisms are suggested for explaining this phenomenon. First, the effects of prenatal and post-pubertal male hormones might drive sex differences in physical activity levels and physical aggressiveness, which may contribute to males being at higher risk for fatal accidents and other violent deaths. Although more recent research suggests that sex differences in central cholesterol and serotonin levels might be more important biological causes for male aggressiveness than androgens (Wallner and Machatschke 2009) we will refer to this explanation as 'sex hormones hypothesis'. Second, inherent sex differences in reproductive function (women's role as bearers and carers of children versus males' internal competition to mate with females) appear to have influenced the cultural evolution of gender roles and consequently to have indirectly contributed to sex differences in behavior, like risk-taking or heavy drinking, which are major causes of the higher rates of

external cause deaths among males (Hirschi 1969; Waldron 1983a, 1983b; Hagan 1989; Carey and Lopreato 1995). We will refer to this interplay between sex-specific biological functions and cultural gender roles and its consequences on male and female risk-taking as 'reproductive role hypothesis'.

The idea that biological factors might cause or contribute to male external cause mortality is primarily based on theoretical considerations and indirect indicators like the correlation between the trends of male and female external cause mortality and the changes of gender roles in different societies. The rise of the women's movement in conjunction with shifting economic factors has led to a steady increase in female labor force participation accompanied by an adjustment of gender roles and lifestyles. Despite the fact that true gender equality has not yet been achieved, women have made significant inroads into many traditionally male-dominated occupations and adopted typical male behaviors such as smoking habits. Many scholars suggested that increased gender equality, particularly in the economic sector would lead to a narrowing of sex differentials in several kinds of externally caused deaths (e.g., Adler and Adler 1975; Hindelang et al. 1978; Fox and Hartnagel 1979). More recent empirical tests of this hypothesis showed, however, that such a narrowing cannot be observed and that the differences between male and female external cause mortality persist (Maxim and Keane 1992; Hemström 1999). This is the most used indicator for claiming the existence of biological factors influencing male external cause mortality.

Since the links between biological and non-biological factors behind external cause mortality are highly complex and difficult to disentangle empirically, many questions regarding the existence and the nature of such biological causes are still unanswered and subject to controversial discussion. However, there is one group of women and men where individual behaviors and environmental conditions, i.e. the non-biological factors, are as close to being equal as can be found in modern societies, what permits to isolate the impact of biological factors from many confounding factors: the members of religious orders. Nuns and monks lead a 'simple lifestyle' that is determined by vows (living in poverty,

chastity and obedience), with similar daily regimes as regards time for sleep, work, study and recreation, and also with respect to diet, housing and medical care. Furthermore, cloistered life entails no sex-specific influences of reproductive roles, marital status or familial responsibilities (Madigan and Vance 1957; Luy 2003).

Several findings suggest that the high number of external cause male deaths is partly due to health and mortality risks connected to occupation (e.g., Leigh 1988; Waldron 1991; Hemström 1999). Although professions differ between nuns and monks, sex-specific health risks connected to occupation are unlikely among the order members, above all regarding the typical external risk factors in this context, like heavy lifting, heavy shaking or vibration, contact with dirt, inadequate ventilation and exposure to gas, vapor or smoke and exposure to chemicals and carcinogens. Aside from the typical internal occupations in male and female cloisters like household work, farming and similar occupations, most monks practice as priests while nuns mainly work as school and pre-school teachers. These preconditions make order members a valuable experimental group with a long tradition in specific medical and epidemiological research (e.g., Fecher 1927; Madigan 1957; Barrow et al. 1960; McCullagh and Lewis 1960; Fraumeni et al. 1969; Kinlen 1982; Snowdon 2001; Luy 2003).

This study is built on these specific preconditions and represents the first attempt to empirically test the sex hormones and the reproductive role hypotheses. If the latter hypothesis were true and the reproductive roles of women and men were the driving force behind sex differences in external cause mortality we should expect nuns to have higher levels of mortality due to external causes of death than women of the general population since the behavior of nuns is not influenced by the cultural female role of bearers and carers of children. Monks, on the other side, should then show lower levels of external cause mortality than their secular counterparts since monastic life can be expected to prevent men from most external causes of death. If, however, the sex hormones hypothesis were true the external cause mortality of monks should not differ from those of the general population men since both are subject to the same influences of androgens and serotonin levels,

whereas in this case nuns should show a protective cloister effect and thus lower mortality due to external causes as compared to lay women. The following section describes the data and methods of this study. Finally, the results and conclusions are presented and discussed in the light of limitations in the data and in the study design.

2. Data and methods

The data used for the following analysis stem from one Benedictine monastery and two Franciscan nunneries in Bavaria which had already been part of a previous study on sex mortality differences in cloistered populations (Luy 2003). During the last few years, the data were updated and the individual files were extended to contain information on causes of death in these three religious communities. In order to ensure maximum possible homogeneous conditions only post-war years were considered for this analysis. Since there was no access to the official causes of death certificates of these individuals for data protection reasons it was necessary to explore alternative sources. For the Benedictine monks obituaries have been used, which in most cases contain information on the cause of death. For 711 of the 958 monks who died since 1946 obituaries were available of which 491 allowed identifying a specific cause of death. By their pure nature, the obituaries contain descriptions rather than precise reports of causes of death. Nevertheless, the identification of external causes of death is quite reliable as the following excerpt from an obituary demonstrates:

> *"The Superior and the Community of […] ask for your prayers and remembrance at Holy Mass for the repose of the soul of our beloved Brother Denis Robert […] who died on Sunday morning, 26 August 1990. […] Br. Denis was seized by gunmen in his room on our compound at 11.30.pm Saturday, 25 August; outside his room he was shot in the head, and never recovered consciousness; he died at the […] Hospital at 6.30.am Sunday, 26 August, despite the great efforts of the Sisters to safe his life. He was fortified by the Last Rites of the Church. After the Requiem Mass in our chapel at midday, his body was taken to his home."*

Regarding external causes of death, the obituaries contained reports about traffic accidents, several kinds of injuries, homicides and even suicides:

> *"On the feast of the Presentation of the Lord, 2 February 2002, our Brother Gordian […] departed from us quite unexpectedly. […] After, as he described it, 'an intensive novitiate, which was very fruitful for my spiritual life, and I got used to our community more and more', he asked to be allowed to make his temporary profession, which he did on 23 June 2001. Br. Gordian was always a friendly and kind confrere. With the start of the new year 2002 he was supposed to familiarize himself more and more with the management of the garden. Suddenly he was overwhelmed by melancholy and became despondent. In spite of all kinds of help he could not fend it off. The scene of his death is an expression of his deep longing to be with God. The candle that burns there is a sign for us of light and hope even in the darkest night."*

The nunnery with the highest number of members involved in the study offered better circumstances. Since the foundation of this sisterhood causes of death have been entered directly into the profession book where all individuals ever joining the community are registered. Figure 1 shows two pages of this profession book. Each line refers to one order member and contains columns with (starting from the left) the entry number, order and family name, given first name, birth date, place of birth, date of entry, date of first profession (beginning of novitiate for three years), date of second profession (lifetime order membership), date of death, cause of death and additional comments like missionary activity, local transfers, reasons for extraordinary dates of profession or dates of exits and dismissals, respectively. In this profession book, only for 12 out of 1,442 post-war deaths is the information on cause of death missing. In the second nunnery causes of death are not recorded in the profession book which contains information on entry number, birth name, place of birth, order name, date of birth, date of entry, date of first profession, date of second profession, place of profession, date of death and additional comments (see Fig. 2). However, from a nun's name and date of death it was possible to link the personal files from the profession book with the entries in the local cemetery register which included information on causes of death for 612 out of all 875 nuns deceased since the end of World

War II. In sum, 2,533 deaths of order members could be linked to a specific cause of death, of which 69 belong to the group of external cause deaths.

Although cause-of-death statistics generally include many sources of bias it is important to note that the collected information on causes of death for the nuns and monks in question contains additional uncertainties. The most important difference to official cause-of-death statistics is that the information is not necessarily based on medical doctors' declarations. In some cases the information used might indeed stem from medical diagnosis, while others might be based on the personal judgment of the documenting convent member or on information provided by other persons such as nurses or family members. However, the information on nuns' and monks' causes of death from these sources can still be expected to provide information that is more or less comparable to official statistics, at least with regard to the broad categories of causes of death.

External cause mortality of the cloistered and the general population was then compared by means of standardized mortality rates (SMRs) for ages 45 onwards using the European age standard for the age groups 45-64, 65-74 and 75+. Ages below 45 were excluded because the numbers of deaths attributable to external causes are too low among Bavarian nuns and monks. SMRs were calculated for the calendar years 1958, 1963, 1972, 1978, 1983, 1988 and 1993 for the West German general population (data taken from Statistisches Bundesamt 1961, 1966, 1976, 1981, 1986, 1991, 1996) and for the periods 1946/76 (1960), 1950/80 (1965), 1955/85 (1970), 1960/90 (1975), 1965/95 (1980), 1970/2000 (1985) and 1975/2005 (1990) for the Bavarian order members (referring to the same periods that were also used by Luy (2003) for his study on the overall mortality of the Bavarian cloistered population). Finally, 95 % confidence intervals were calculated for external cause SMRs of the Bavarian nuns and monks in order to test the statistical significance of the differences to the women and men of the West German general population.

3. Results

Figure 3 shows the trends in external cause mortality from age 45 onwards for order members from 1960 to 1990 (solid lines) and for the West German general population from 1958 to 1993 (dotted lines). Among the general population external cause mortality has always been higher for men than for women. Nuns show an even lower external cause mortality than women of the general population, indicating the protection effect of cloistered life with regard to accidents, injuries and homicides. The differences diminish with the reduction of external cause mortality among West German women, being statistically significant at the 95 % confidence level until 1980 (confidence intervals not shown in Fig. 3). Table 1 provides additional information on the more specific nature of external cause mortality for deceased order members. More than 80 per cent of nuns' external cause deaths are documented as hip fractures. It is very likely that most of these deaths were not directly caused but only initiated by these injuries and thus would have entered into official cause-of-death statistics as heart failures rather than as external cause deaths. Thus, if official cause-of-death certificates were available the level of external cause mortality among nuns might be given as considerably lower.

Among males the differences between order members and the general population show a different picture. Between 1960 and the mid-1970s mortality due to external causes among monks was much closer and statistically insignificant to the corresponding level of the male general population as compared to the differences between the female populations. From the mid-1970s onwards external cause mortality has even been higher among monks than among men of the general population despite their living in the same protective environment as nuns. However, at no time the differences are statistically significant at the 95 % confidence level. Table 1 shows that the majority of external cause deaths among monks are due to road traffic accidents. That monks often work as priests, which leads them to drive cars more frequently than nuns, might partly explain their higher number of fatal traffic accidents as will be discussed below. However, it is unlikely that the outings connected to their priesthood activity are completely accountable for the high occurrence of

this typically male cause of death among monks. This conclusion is supported by the fact that other injuries and homicides (happening outside the monasteries) also happen more often to monks than to nuns (see Tab. 1).

The low external cause mortality of nuns contradicts the reproductive role hypothesis but the high external cause mortality of monks provides some evidence for the sex hormones hypothesis. If the biological reproductive role of general population women was the driving force behind their more careful and responsible lifestyles and health behaviors as stated by the reproductive role hypothesis, nuns should miss this protective effect and thus should show higher external cause mortality than their counterparts in the general population. On the contrary, life as an order member even reduced the risk of dying from accidents, injuries, homicides and suicides until the women of the general population reached a similar low level of external cause mortality. Moreover, the specific kinds of external causes of deaths among nuns seem to reflect the general state of health in old age rather than an inclination to engage risky behavior. Among men, however, cloister walls do not protect against the higher male risks of external cause mortality, especially not against the typical male risk-taking behaviors as reflected by the excess mortality due to traffic accidents, other injuries and homicides. This indicates the existence of specific causes connected to the male biology as stated by the sex hormones hypothesis.

4. Discussion

The main contribution of this study is that it empirically tests the reproductive role and the sex hormones hypotheses as possible biological causes behind excess male mortality due to external causes of death. According to the author's knowledge, such an attempt has not been done before nor has there ever been an analysis of external causes of deaths among nuns and monks. The specific characteristics of the members of religious orders are valuable for getting insights into the role of biological factors for male excess mortality due

to external causes, and maybe even into the specific mechanisms of these impacts as stated by the sex hormones and the reproductive role hypotheses.

The data presented in Figure 3 show an almost parallel decline of male and female levels of external cause mortality for the West German general population as well. No similar decline is to be found among either Bavarian nuns or monks. It could be that the level of external cause mortality has already reached its minimum among nuns and thus cannot show any further decline. Another reason might be that due to the tremendous decline in the number of new entries since the 1950s the cloistered population is ageing considerably and to a much higher degree than the German general population (Luy 2003). For instance, the number of people aged 65 and older per 100 people aged 25-64 increased in the general German population from 18.3 in 1950 to 35.1 in 2005, whereas for nuns the corresponding numbers are 13.6 in 1950-54 and 384.1 in 2001-05, and for monks 11.3 in 1950-54 and 98.6 in 2001-05. Maxim and Keane (1992) have shown for almost all kinds of external cause deaths a rising risk with age. As the authors pointed out, “the high rates of motor vehicle accidents and other accidents among the aged is not likely to be because of excessive risk-taking. Rather, they may face an increased susceptibility to harm because of an environment, and objects in that environment, that may not be safely designed for those with lessened physical dexterity and reaction time” (Maxim and Keane 1992: 341). Thus, as already mentioned in the presentation of the empirical results of this study, it is possible that the high degree of ageing of the cloistered population is connected with increased exposure to the risk of certain kinds of external cause deaths.

Several limitations in the data and in the study design restrict the general validity of the conclusions regarding the support of the sex hormones hypothesis and the refusal of the reproductive role hypothesis. Generally, results based on case numbers as low as this must be interpreted with caution. The calculation of 95 % confidence intervals reduces some—though, in the end, not all—of these uncertainties. The mentioned uncertainties resulting from the used sources for identifying the causes of death of nuns and monks have to be kept in mind as well. The aspect most difficult to assess, however, is the role of different

occupations among nuns and monks in causing the huge differences in fatal road traffic accidents. Monks, especially those serving as priests in communities around their monastery, are more likely to use the car for commuting than nuns, whose major occupation activities as nurses or school and kindergarten teachers take place inside or close to their nunneries. Consequently, monks are spending a greater amount of time in vehicles than nuns and therefore have a greater exposure to the risk of being in road traffic accidents.

However, using cars more often does not necessarily mean that road traffic accidents, in particular fatal ones, have to occur more often as well. Several authors have argued—and shown empirically—that different kinds of external causes of death are strongly interrelated suggesting that certain types of individuals pursue lifestyles that expose them to violence and risk-taking in general (Porterfield 1960; Holinger and Klemen 1982; Kivelä 1985; Maxim and Keane 1992; Mishra and Lalumière 2009). In most cases, external cause mortality is directly caused by risky behavior. Jessor's (1991) problem-behavior theory suggests that the degree to which individuals engage in risky behaviors is determined by a balance of instigations (e.g., peer modeling) and controls (e.g., parental monitoring). Daly and Wilson (2001) describe risky behavior (and crime) as analogous outcomes of steep future discounting, where the quality of one's future affects the utility of immediate risky behavior. Since instigation must be assumed to be rather low among nuns and monks and the expectations regarding their personal future are unlikely to be sex differentiated, we can conclude that among the members of religious orders the impact of sex-specific environmental conditions on risk-taking behavior is low as well.

In this theoretical framework the high mortality of monks due to road traffic accidents reflects a level of general risk-taking rather than being a pure consequence of spending more time on the streets. This is supported by the fact that monks serving as priests, as those who use cars most frequently, belong to the highest education group where extreme risk-taking is known to be less common than among lower education groups. Furthermore, several studies have shown the co-existence of criminal and non-criminal risky behaviors

within individuals (Grasmick et al. 1993; Caspi et al. 1997; Junger and Tremblay 1999). These and the studies mentioned in the previous paragraph support the notion of a general construct of deviance or problem behavior encompassing both criminal and risky behavior (Donovan and Jessor 1985; Osgood et al. 1988; Bartusch et al. 1997). In this context it is interesting that among the studied Catholic communities two monks have been victims of homicides while such events are not reported from nunneries (see Tab. 1). This is, however, an interesting side observation only and does not reflect a statistically significant finding.

Although we can conclude that most external cause deaths reflect impulsive risky behavior to some degree, not all are direct indicators of risk propensity. Riskier driving is likely to lead to more car collision fatalities. There are, however, several independent influences on traffic accident fatalities including the availability of emergency care and vehicle safety features, among others. Thus, while some of the variations in fatalities are possibly due to risk-taking, they are not solely due to a variation in risk behavior. The aforementioned high degree of ageing in the cloistered population might be connected with decreasing concentration during road traffic participation. This might contribute to the high number of fatal traffic accidents among monks in comparison to both nuns and men of the general population. Moreover, the fact that the two nunneries are closer to a bigger city and thus to hospitals than the monastery included in this study might have contributed to the high differences in traffic accident fatalities as well. One could also speculate that monks might be operating older automobiles than men of the general population, lacking some of the more recent safety features and therefore being less safe. To sum up, the various forms of external cause deaths appear to be not etiologically distinct and thus cannot be subsumed under the single concept of ‘risk-taking’ that might be affected by biological impacts. Rather, individual and structural factors appear to play a part in the various forms of non-natural mortality. In this context one might also question if a monk’s motivation for risky driving (e.g., to arrive at the bed of a dying person as fast as possible) is basically the same as in the case of a drunk reckless driver. It is unclear whether, even if the latter can be explained by operation of male hormones, the former can be explained in the same way or whether these are risk-taking behaviors of a different nature.

In the light of the numerous limitations of this study it is important to emphasize once again that the presented findings give some indications for the contribution of biological factors to excess male mortality from external causes, supporting in particular the sex hormones hypothesis, but they do not provide any proof. Still, the finding that cloistered life shows the expected protective effect against external cause deaths among women but not among men remains an interesting finding and adds material to the still open discussion on the role of biological factors in causing male excess mortality from external causes. There are much less confounding factors when comparing the mortality of males and females among the cloistered population. Regarding external cause mortality, it is in principle only the unequal participation in road traffic which remains, reflected by the extensive discussion of this issue in the preceding sections. Typical confounding and predictive factors such as social status, income, family status or job hazard levels do not apply to the population of order members. Nevertheless, further research is necessary to evaluate the conclusions drawn herein. For instance, studies could be done in similar experimental settings, like among mono- and dizygotic twins, incarcerated women and men, or members of academic societies.

References

Adler, F. and H.M. Adler. 1975. *Sisters in crime: the rise of the new female criminal*. New York: McGraw-Hill.

Barford, A., D. Dorling, G. Davey Smith, and M. Shaw. 2006. “Life expectancy: women now on top everywhere.” *British Medical Journal* 332: 808.

Barrow, J.G., C.B. Quinlan, G.R. Cooper, V.S. Whitner, and M.H.R. Goodloe. 1960. “Studies in atherosclerosis. III. An epidemiologic study of atherosclerosis in Trappist and Benedictine monks: a preliminary report.” *Annals of Internal Medicine* 52(2): 368-377.

Bartusch, D.R.J., D.R. Lynam, T.E. Moffitt, and P.A. Silva. 1997. “Is age important? Testing a general versus developmental theory of antisocial behavior.” *Criminology* 35: 13-49.

Carey, A.D. and J. Lopreato. 1995. “The biocultural evolution of the male-female mortality differential.” *The Mankind Quarterly* 36(1): 3-28.

Caspi, A., D. Begg, N. Dickson, H. Harrington, J. Langley, T.E. Moffitt, and P.A. Silva. 1997. “Personality differences predict health-risk behaviors in young adulthood: evidence from a longitudinal study.” *Journal of Personality and Social Psychology* 73(5): 1052-1063.

Daly, M. and M. Wilson. 2001. “Risk-taking, intrasexual competition, and homicide.” *Nebraska Symposium on Motivation* 47: 1-36.

Donovan, J.E. and R. Jessor. 1985. “Structure of problem behavior in adolescence and young adulthood.” *Journal of Consulting and Clinical Psychology* 53(6): 890-904.

Fecher, C.J. 1927. “Decline of tuberculosis death rates among sisters.” *America* 38: 58-60.

Fox, J. and T.F. Hartnagel. 1979. “Changing social roles and female crime in Canada: a time series analysis.” *The Canadian Review of Sociology and Anthropology* 16(1): 96-104.

Fraumeni, J.F., J.W. Lloyd, E.M. Smith, and J.K. Wagoner. 1969. “Cancer mortality among nuns: role of marital status in etiology of neoplastic disease in women.” *Journal of the National Cancer Institute* 42(3): 455-468.

Grasmick, H.G., C.R. Tittle, R.J.Jr. Bursik, and B.J. Arneklev. 1993. “Testing the core empirical implications of Gottfredson and Hirschi's general theory of crime.” *Journal of Research in Crime and Deminquency* 30(1): 5-29.

Hagan, J. 1989. *Structural criminology*. New Brunswick, NJ: Rutgers University Press.

Hemström, Ö. 1999. “Does the work environment contribute to excess male mortality?” *Social Science & Medicine* 49(7): 879-894.

Hindelang, M.J., M.R. Gottfredson, and J. Garofalo. 1978. *Victims of personal crime: an empirical foundation for a theory of personal victimization*. Cambridge: Ballinger.

Hirschi, T. 1969. *Causes of delinquency*. Berkley, CA: University of California Press.

Holinger, P.C. and E.H. Klemen. 1982. “Violent deaths in the United States 1900-1975: relationships between suicide, homicide and accidental deaths.” *Social Science & Medicine* 16(22): 1929-1938.

Jessor, R. 1991. “Risk behavior in adolescence: a psychosocial framework for understanding and action.” *Journal of Adolescent Health* 12(8): 597-605.

Junger, M. and R.E. Tremblay. 1999. “Self-control, accidents and crime.” *Criminal Justice and Behavior* 26(4): 485-501.

Kinlen, L.J. 1982. “Meat and fat consumption and cancer mortality. A study of strict religious orders in Britain.” *The Lancet* 1, Apr 24(8278): 946-949.

Kivelä, S.-L. 1985. “Relationship between suicide, homicide and accidental deaths among the aged in Finland in 1951-1979.” *Acta Psychiatrica Scandinavia* 72(2): 155-160.

Leigh, J.P. 1988. “Odds ratios of work-related deaths in United States workers.” *British Journal of Industrial Medicine* 45(3): 158-166.

Luy, M. 2003. “Causes of male excess mortality: insights from cloistered populations.” *Population and Development Review* 29(4): 647-676.

Madigan, F.C. 1957. “Are sex mortality differences biologically caused?” *The Milbank Memorial Fund Quarterly* 35: 202-223.

Madigan, F.C. and R.B. Vance. 1957. “Differential sex mortality: a research design.” *Social Forces* 35(3): 193-199.

Maxim, P.S. and C. Keane. 1992. “Gender, age, and the risk of violent death in Canada.” *Canadian Review of Sociology and Anthropology* 29(3): 329-345.

McCullagh, E.P. and L.A. Lewis. 1960. “A study of diet, blood lipids and vascular disease in Trappist monks.” *The New England Journal of Medicine* 263(12): 569-574.

Mishra, S. and M. Lalumière. 2009. “Is the crime drop of the 1990s in Canada and the USA associated with a general decline in risky and health-related behavior?” *Social Science & Medicine* 68(1): 39-48.

Nathanson, C.A. 1984. “Sex differences in mortality.” *Annual Review of Sociology* 10: 191-213.

Osgood, D.W., L.D. Johnston, P.M. O'Malley, and J.G. Bachman. 1988. “The generality of deviance in late adolescence and early adulthood.” *American Sociological Review* 53(1): 81-93.

Porterfield, A.L. 1960. “Traffic fatalities, suicide, and homicide.” *American Sociological Review* 25: 897-901.

Retherford, R.D. 1975. *The changing sex differential in mortality*. Westport, London: Greenwood Press.

Snowdon, D.A. 2001. *Aging with grace. What the nun study teaches us about leading longer, healthier, and more meaningful lives*. New York et al.: Bantam Books.

Statistisches Bundesamt. 1961. *Statistisches Jahrbuch für die Bundesrepublik Deutschland 1960*. Stuttgart, Mainz: Kohlhammer.

----------. 1966. *Statistisches Jahrbuch für die Bundesrepublik Deutschland 1965*. Stuttgart, Mainz: Kohlhammer.

----------. 1976. *Statistisches Jahrbuch 1975 für die Bundesrepublik Deutschland*. Stuttgart, Mainz: Kohlhammer.

----------. 1981. *Statistisches Jahrbuch 1980 für die Bundesrepublik Deutschland*. Stuttgart, Mainz: Kohlhammer.

----------. 1986. *Statistisches Jahrbuch 1985 für die Bundesrepublik Deutschland*. Stuttgart, Mainz: Kohlhammer.

----------. 1991. *Statistisches Jahrbuch 1990 für die Bundesrepublik Deutschland*. Stuttgart: Metzler-Poeschel.

----------. 1996. *Statistisches Jahrbuch 1995 für die Bundesrepublik Deutschland*. Stuttgart: Metzler-Poeschel.

Vallin, J. 2006. “Mortality, sex, and gender.” Pp. 177-194 in *Demography: analysis and synthesis. Volume II,* edited by G. Caselli, J. Vallin, and G. Wunsch. Amsterdam et al.: Elsevier.

Waldron, I. 1983a. “The role of genetic and biological factors in sex differences in mortality.” Pp. 141-164 in *Sex differentials in mortality: trends, determinants and consequences,* edited by A.D. Lopez and L.T. Ruzicka. Canberra: Australian National University Press.

----------. 1983b. “Sex differences in human mortality: the role of genetic factors.” *Social Science & Medicine* 17(6): 321-333.

----------. 1985. “What do we know about causes of sex differences in mortality? A review of the literature.” *Population Bulletin of the United Nations* 18: 59-76.

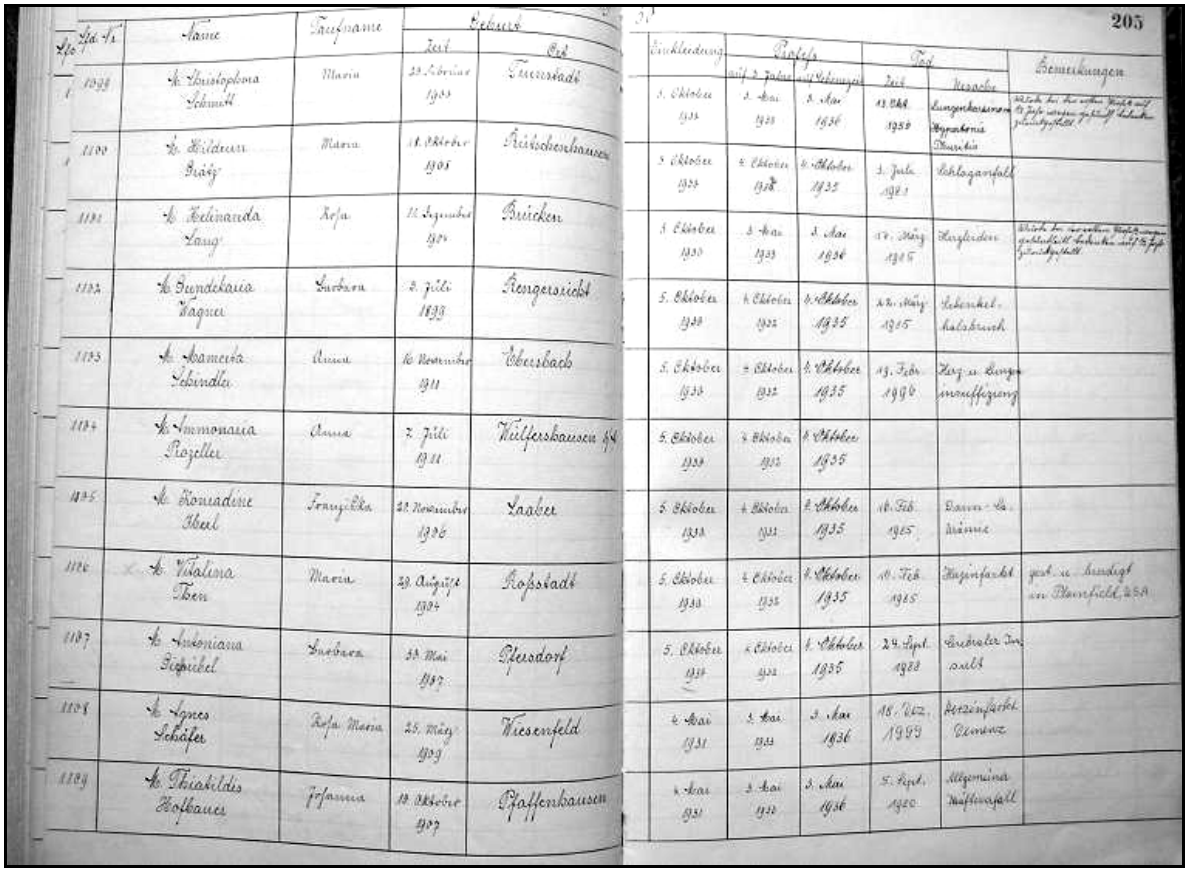
----------. 1991. “Effects of labor force participation on sex differences in mortality and morbidity.” Pp. 17-38 in *Women, work, and health*, edited by M. Frankenhaeuser, U. Lundberg, and M. Chesnay. New York, London: Plenum Press.

Wallner, B. and I.H. Machatschke. 2009. “The evolution of violoence in men: the function of central cholesterol and serotonin .” *Progress in Neuro-Psychopharmacology & Biological Psychiatry* 33(3): 391-397.

Wingard, D.L. 1984. “The sex differential in morbidity, mortality, and lifestyle.” *Annual Review of Public Health* 5: 433-458.

Figures and Tables

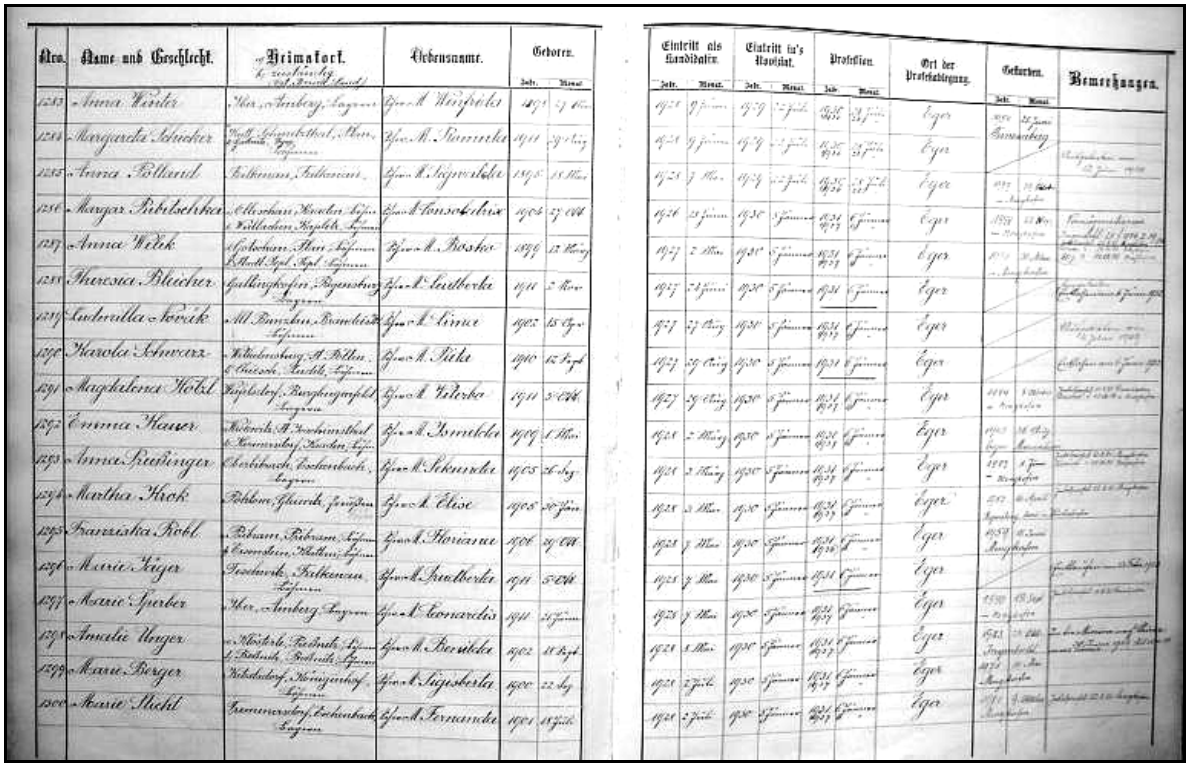
Figure 1: Entries into the profession book of the St. Franciscus sisters of Oberzell



Lfd. Nr.	Name	Taufname	Geburt: Tag	Geburt: Ort	Einkleidung	Profeß: auf 2 Jahre	Profeß: auf Lebzeiten	Tod: Tag	Tod: Ursache	Bemerkungen
1098	M. Christophora Schmidt	Maria	23. Februar 1903	Tuttenstadt	5. Oktober 1925	5. Mai 1928	5. Mai 1936	13. Okt. 1959	Lungenkrebs	
1100	M. Hildrun Dräxl	Maria	14. Oktober 1905	Reichenhausen	5. Oktober 1925	5. Oktober 1928	5. Oktober 1935	3. Juli 1981	Schlaganfall	
1101	M. Ferdinanda Lang	Rosa	11. September 1904	Brücken	5. Oktober 1930	5. Mai 1933	5. Mai 1936	28. März 1976	Herzleiden	
1102	M. Brundekaria Wagner	Barbara	2. Juli 1893	Georgenzell	5. Oktober 1928	5. Oktober 1932	5. Oktober 1935	24. März 1965	Lebenskrankheit	
1103	M. Ameida Schindler	Anna	16. November 1911	Oberbach	5. Oktober 1930	5. Oktober 1932	5. Oktober 1935	13. Febr. 1990	Herz- u. Lungeninsuffizienz	
1104	M. Immonana Rotzeller	Anna	2. Juli 1911	Wülfershausen a/d	5. Oktober 1929	5. Oktober 1932	5. Oktober 1935			
1105	M. Konradine Ibert	Franziska	22. November 1906	Laaber	5. Oktober 1930	5. Oktober 1933	5. Oktober 1935	16. Feb. 1965	Darm-Ca.	
1106	M. Vitalina Thon	Maria	29. August 1904	Roßstadt	5. Oktober 1930	5. Oktober 1933	5. Oktober 1935	16. Feb. 1965	Herzinfarkt	geb. in Neudorf im Pfarrfield, 259
1107	M. Antoniana Stöpfel	Barbara	30. Mai 1897	Pfersdorf	5. Oktober 1919	5. Oktober 1922	5. Oktober 1935	24. Sept. 1988	Endokarditis Insuffiz.	
1108	M. Agnes Schäfer	Rosa Maria	25. März 1903	Wiesenfeld	2. Mai 1931	3. Mai 1934	3. Mai 1936	18. Dez. 1999	Herzinfarkt Demenz	
1109	M. Thiaskildis Hofbauer	Johanna	19. Oktober 1907	Pfaffenhausen	2. Mai 1931	3. Mai 1934	3. Mai 1936	5. Sept. 1980	Allgemeine Altersschwäche	

Photo: M. Luy

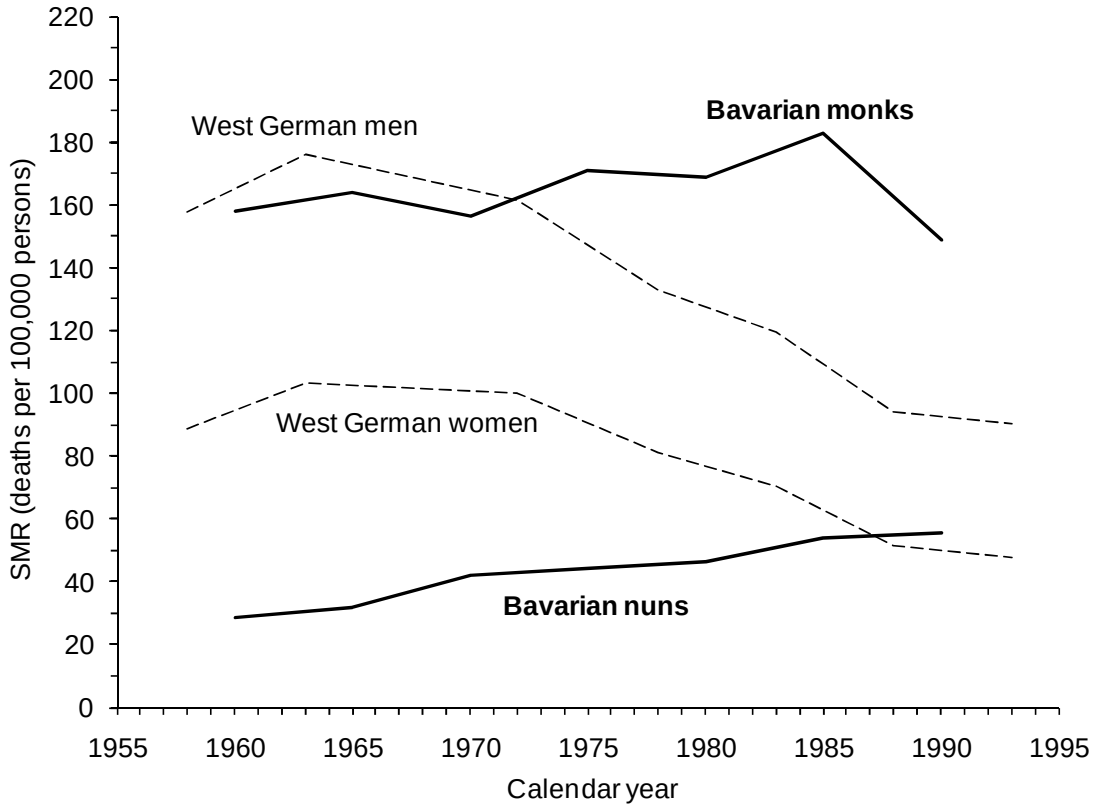
Figure 2: Entries into the profession book of the St. Franciscus sisters of Gemünden/Main



Nro.	Name und Geschlecht.	Heimatort.	Ordensname.	Geburt. Jahr.	Monat.	Eintritt als Kandidatin. Jahr.	Monat.	Eintritt in's Noviziat. Jahr.	Monat.	Profession. Jahr.	Monat.	Ort der Professablegung.	Gestorben. Jahr.	Monat.	Bemerkungen.
1283	Anna Winter	Ober Arnberg Bayern	Schw. M. Wenzeslaa	1871	17 Nov.	1928	9 Januar	1929	12 Juli	1935 1936	24 Juni 31 Juli	Eger	1956	22 Januar	
1284	Margareta Schricker	Pfaffl. Schambach Obern. b. Lohr Bayern	Schw. M. Simmeka	1911	29 Aug.	1929	9 Januar	1930	12 Juli	1936 1937	24 Juni 31 Juli	Eger	Bamberg		
1285	Anna Pollandt	Falkenau Falkenau	Schw. M. Sigwaldis	1895	18 Mai	1924	3 Mai	1924	12 Juli	1926 1927	24 Juni 31 Juli	Eger	1933 — Augsburg	19 Juli	
1286	Margar. Pikelschka	Ellenbach Kreuzberg Schles. b. Wüstewaltersdorf Bayerb. Bayern	Schw. M. Konradine	1905	27 Okt.	1930	25 Januar	1930	8 Januar	1931 1932	8 Januar 8 Januar	Eger	1954 — Straubing	22 Nov.	
1287	Anna Welk	Gotschau Mähr. Schönau b. Mistek Böhm. Böhm.	Schw. M. Boskia	1898	23 Aug.	1930	8 Januar	1931	8 Januar	1932 1933	8 Januar 8 Januar	Eger	1959 — Augsburg	30 März	
1288	Theresia Blecher	Gallingkofen Regensburg Bayern	Schw. M. Lutberta	1911	2 Nov.	1930	8 Januar	1931	8 Januar	1932 1933	8 Januar 8 Januar	Eger			
1289	Ludmilla Novák	Alt Bunzlau Bunzlau Böhmen	Schw. M. Irma	1902	15 Dez.	1930	8 Januar	1931	8 Januar	1932 1933	8 Januar 8 Januar	Eger			
1290	Karola Schwarz	Wiedenbrück N. Hessen b. Cassel Kurhess. Hessen	Schw. M. Fides	1910	15 Sept.	1930	8 Januar	1931	8 Januar	1932 1933	8 Januar 8 Januar	Eger			
1291	Magdalena Kobl	Hajdedorf Burgenlandkomitat Ungarn	Schw. M. Veterba	1911	5 Okt.	1930	8 Januar	1931	8 Januar	1932 1933	8 Januar 8 Januar	Eger	1954 — Augsburg	8 Okt.	
1292	Emma Kauer	Mährisch N. Neuhammerthal b. Neumarkt Kreis Troppau	Schw. M. Benedicta	1909	1 Mai	1928	2 Mai	1930	8 Januar	1931 1932	8 Januar 8 Januar	Eger	1963 — Augsburg	28 März	
1293	Anna Sießinger	Oberlibbach Oberlibbach Bayern	Schw. M. Sebastiana	1905	26 Aug.	1928	2 Mai	1930	8 Januar	1931 1932	8 Januar 8 Januar	Eger	1957 — Augsburg	4 Juni	
1294	Martha Krok	Pohlom Glatz Preußen	Schw. M. Elise	1905	20 Juni	1928	3 Mai	1930	8 Januar	1931 1932	8 Januar 8 Januar	Eger	1947 — Augsburg	10 April	
1295	Franziska Robl	Pirkam Pirkam Böhmen b. Eisenstein Böhmen Böhmen	Schw. M. Floriana	1906	29 Okt.	1928	3 Mai	1930	8 Januar	1931 1932	8 Januar 8 Januar	Eger	1957 — Augsburg	18 Juni	
1296	Maria Jäger	Trockenbrück Pirkenau Bayern	Schw. M. Irmelberta	1911	5 Okt.	1928	3 Mai	1930	8 Januar	1931 1932	8 Januar 8 Januar	Eger			
1297	Marie Sperber	Ober Arnberg Bayern	Schw. M. Leonardis	1911	25 Juni	1928	3 Mai	1930	8 Januar	1931 1932	8 Januar 8 Januar	Eger	1959 — Augsburg	18 Sept.	
1298	Amalie Unger	Mistelgau Pfarrhof Bayern b. Bayreuth Bayreuth Bayern	Schw. M. Bernhilde	1902	18 Sept.	1928	3 Mai	1930	8 Januar	1931 1932	8 Januar 8 Januar	Eger	1963 — Augsburg	28 Aug.	
1299	Marie Berger	Pilsdorf Königinhof Böhmen	Schw. M. Sigisberta	1900	22 Aug.	1928	2 Juli	1930	8 Januar	1931 1932	8 Januar 8 Januar	Eger	1954 — Augsburg	10 Juni	
1300	Marie Stichl	Tremmersdorf Eichenbach Bayern	Schw. M. Fernanda	1901	18 Juli	1928	2 Juli	1930	8 Januar	1931 1932	8 Januar 8 Januar	Eger	1970 — Augsburg	3 März	

Photo: M. Luy

Figure 3: Trends in age-standardized mortality from external causes of death for ages 45 onwards (deaths per 100,000 persons) for West German women and men and for Bavarian nuns and monks, 1955-1995



Notes: relative period- and age-specific proportion of external cause deaths among the deceased nuns and monks of the three cloisters has been projected to the total number of deaths among all order members included in this study; SMRs (standardized mortality rates) are standardized with the European age standard and refer to the periods 1946/76 (1960), 1950/80 (1965), 1955/85 (1970), 1960/90 (1975), 1965/95 (1980), 1970/2000 (1985), and 1975/2005 (1990) for the Bavarian order members and to the calendar years 1958, 1963, 1972, 1978, 1983, 1988, and 1993 for the West German general population

Table 1: Specific natures of external cause deaths of Bavarian nuns and monks, 1946-2005

	Bavarian nuns		Bavarian monks	
	cases	in percent	cases	in percent
Hip fractures	34	81.0	2	7.4
Traffic accidents	4	9.5	17	63.0
Other injuries	3	7.1	5	18.5
Homicides	0	0.0	2	7.4
Suicides	1	2.4	1	3.7
Total	42	100.0	27	100.0

Note: figures include deaths of all ages