

The Death of Wolfgang Amadeus Mozart: An Epidemiologic Perspective

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The early death of the composer Wolfgang Amadeus Mozart on 5 December 1791 has fascinated the world for more than 2 centuries. It has been suggested that his final illness was caused by poisoning, renal failure, Henoch–Schönlein purpura, trichinosis, and many other conditions. The official daily register of deaths in Mozart's Vienna was evaluated to provide an epidemiologic framework into which the observations of contemporary witnesses of his death can be integrated. All recorded deaths in Vienna during November and December 1791 and January 1792 were analyzed, together with the corresponding periods in 1790 to 1791 and 1792 to 1793. The deaths of 5011 adults (3442 men, 1569 women) were recorded over these periods. The mean ages of death were 45.5 years (SD, 18.5) for men and 54.5 years (SD, 19.9) for women. Tuberculosis and related conditions accounted for the highest number of deaths;

cachexia and malnutrition ranked second, and edema was the third most common cause. According to eyewitness accounts, the hallmark of Mozart's final disease was severe edema. Deaths from edema were markedly increased among younger men in the weeks surrounding Mozart's death compared with the previous and following years. This minor epidemic may have originated in the military hospital. Our analysis is consistent with Mozart's last illness and death being due to a streptococcal infection leading to an acute nephritic syndrome caused by poststreptococcal glomerulonephritis. Scarlet fever, which represents the same underlying disease from an etiologic perspective, is a less likely possibility.

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The composer Wolfgang Amadeus Mozart died at home in Vienna, Austria, on 5 December 1791 at the age of 35 years. One week later, a Berlin newspaper started the rumor that he was poisoned (1), the first of many speculations concerning his death (2). Several persons witnessed his last illness, but they mostly wrote down their recollections decades after the event took place. A wide range of possible final illnesses has been postulated over the centuries. We present findings from a source that has been overlooked in Mozart research: the daily register of deaths in Vienna. This provides a population framework into which the known facts about Mozart's last illness can be integrated.

THE CIRCUMSTANCES OF MOZART'S DEATH

According to contemporaries, Mozart may have been ill during a visit he made to Prague (Czech Republic) in September 1791 (3, 4). However, this illness could not have been very serious, because after Mozart returned to Vienna, he completed the musical score of *The Magic Flute* (K 620); conducted its premiere and was involved in several more performances; visited the spa town of Baden (Austria), where his wife Constanze was taking the waters;

and conducted his last completed composition, a Masonic cantata at the opening of a new Masonic lodge in November 1791 (5). In the same period, he composed the clarinet concerto (K 622) and started writing the score of *Requiem* (K 626). His last surviving letter, written to Constanze on 14 October 1791, made no mention of any illness or discomfort; indeed, it depicts a busy life socializing with the composer Antonio Salieri, eating well, and sleeping well (6). Two days after his last public performance, in the Masonic lodge on 20 November 1791, Mozart took to his bed with the illness that would lead to his death.

The most detailed description of this illness was provided by Mozart's sister-in-law, Sophie Haibel, 33 years later (6). She recalled that Mozart's body was very swollen, which made him unable to turn in bed; that he was conscious and in good mental condition until the last day of his life; and that he was attended by the distinguished physician Thomas Franz Closset (1754 to 1813), who ordered cold compresses for his burning head "after which he lost consciousness and never woke up again." Haibel states that Mozart died at 12:55 a.m. at home in Vienna on Monday 5 December 1791.

Constanze's second husband, Georg Nikolaus von Nissen (1761 to 1826), wrote an authoritative biography of Mozart that was published in 1828 (4) in which he states that Mozart's final illness lasted for 2 weeks. During Mozart's illness, at least 1 venesection seems to have been performed. von Nissen suggests that Mozart's lifestyle—drinking throughout the day and frequently composing at night—might have contributed to his premature end. von Nissen suggested tuberculosis as the cause of death—but later proposed cerebral inflammation—and indicated that his illness followed a predictable course. von Nissen also states that many people died of the same illness over this period. He confirmed that Mozart worked on *Requiem* until the last day of his life (4), singing some parts to his assistant Franz Süssmayr (7).

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Appendix

Appendix Table

Appendix Figure

Conversion of graphics into slides

Audio summary

The only testimony derived from a contemporary physician was published in 1824 by Eduard Guldener von Lobes (1763 to 1827) (8). He did not attend Mozart himself but shared information he had obtained from Closset. Guldener von Lobes strongly refuted the notion that Mozart had been poisoned and concluded that the composer had died of a rheumatic inflammatory fever of a type that was common in Vienna at the time, accompanied by “a deposit on the brain.” Another contemporary source (9) states that Mozart’s final illness was painful.

The cause of death in the official register was *hitziges Frieselfieber*, fever and rash. In the 18th century, *hitziges Frieselfieber* was defined as miliary fever, a syndrome of morbilliform exanthema, fever, and goose pimples together with coughing, cramps, and occasional “white eruption”; the condition was known to be frequently fatal (10). This implies that Mozart had a rash at the time of his death. It is probable that *hitziges Frieselfieber* was a lay diagnosis rather than one that originated from the physician attending Mozart, because even for physicians in this period, it represented symptoms rather than a disease entity (11). It is notable that accounts of Mozart’s illness from his relatives do not mention a rash, which suggests this may have been a late manifestation noted by those who attended his death rather than being present throughout the illness.

In summary, Mozart’s final illness seems to have been characterized by an epidemic nature, a relatively rapid onset, 2 weeks’ duration, severe edema, pain of unknown localization, fever and rash, no dyspnea (because Mozart was able to sing parts of *Requiem*), and consciousness until 2 hours before death. He was also bled at least once.

One theory is that Mozart died of syphilis or through the effects of treatment with salts of mercury (2). Other hypotheses have included rheumatic fever (11), renal failure due to chronic glomerulonephritis (12), Henoch–Schönlein purpura (13), and trichinosis contracted by consuming insufficiently heated pork chops (14).

Missing from these speculations has been a clear framework for understanding death in Mozart’s Vienna. We present new information about the causes of death during the weeks surrounding Mozart’s death and integrate the known information about his final illness with an evaluation of the official death lists of the period.

MATERIALS AND METHODS

Daily Registry of Deaths

Deaths in Vienna were recorded in handwritten registers starting in 1607, and these registers have survived from 1648 to 1920 (15). All deaths were recorded, with the exception of a few people from the high nobility and some religious institutions (who buried their dead in separate graveyards), as well as convicts. It was not necessary for a physician to give the cause of death, and it is probable that that information was often provided by relatives or other

Key Summary Points

The most common causes of death in Mozart’s Vienna were tuberculosis, cachexia and malnutrition, edema, gastrointestinal inflammatory disease, and cerebrovascular and neurologic disease.

Deaths involving edema increased markedly among younger men in the weeks surrounding Mozart’s death. The hallmark of Mozart’s final disease, according to eyewitness accounts, was severe edema.

An acute nephritic syndrome caused by poststreptococcal glomerulonephritis may have caused Mozart’s death.

lay persons or even by the office clerk who did the paperwork (16).

Starting in the early 18th century, handwritten death lists were transcribed into a printed version and published for a few years in the *Verzeichnis der Verstorbenen* (housed in the Vienna Town Hall library). We used this register to examine the patterns of deaths in the months surrounding Mozart’s death and compare them with the patterns in the same months of the preceding and following year.

Data Extraction

We analyzed the data for all recorded deaths in Vienna for the fall to winter season that surrounded Mozart’s death (November and December 1791 and January 1792) and for 2 comparison periods consisting of the same months in 1790 to 1791 and 1792 to 1793. We transcribed information taken from photocopies of the register lists for all persons 18 years or older, including the day of death, name, sex, age, cause of death, and place of death. We classified the latter into death at home, in the general hospital, in the military hospital, and other. We tested the accuracy of data extraction by repeating the transcriptions of randomly selected pages while blinded to the original transcriptions, and detected no errors.

Some 48 causes of death were listed, and we classified them into diagnostic groups on the basis of the organ systems involved. For example, *Lungensucht*, *Lungengeschwür*, and *Lungenwindsucht* were all categorized as tuberculosis and related conditions, whereas *Abzehrung*, *Auszehrung*, and *Entkräftung* were categorized as cachexia and malnutrition (possibly secondary to serious diseases, such as cancer). Two investigators defined each diagnostic group on the basis of modern etiologic equivalents of the conditions listed by using the *Lexikon der historischen Krankheitsbezeichnungen* (17). We referred ambiguous cases to Anton Neumayr, MD, PhD, professor of gastroenterology at the University of Vienna and an authority on historical diagnosis.

Statistical Analysis

We compared the average ages of death for men and women by using *t* tests, with and without the inclusion of soldiers among the male sample. We analyzed the incidence of deaths from different groups of diagnoses over time and divided the sample into younger men (≤ 40 years), older men (>40 years), and women. We assessed the proportion of deaths that resulted from each group of diagnoses by analysis of variance, with month of death and demographic group (younger men, older men, and women) as between-person factors. We conducted post hoc tests by using the Tukey least significant difference test, with a *P* value less than 0.05 as the significance level. However, we present exact *P* values in the results.

RESULTS

Over the 9 months studied, 5011 deaths occurred. The data were not complete because 1 page was missing from the register (19 December 1792) and about 15 persons could not be included because of ink stains. Deaths of 3442 men and 1569 women were included in the register (Appendix, available at www.annals.org). Men who died were significantly younger than women who died on average (mean, 45.5 years [SD, 18.5] vs. 54.5 years [SD, 19.9]; $t = 15.3$; $P < 0.001$). When soldiers were excluded, the average age of death for civilian men increased to 49.8 years (SD, 17.6).

The Table lists the 10 largest diagnostic groups, which account for about 90% of our sample. Tuberculosis and related disorders were the most common causes of death, followed by cachexia and malnutrition, edema and related conditions, and gastrointestinal and inflammatory disease (Appendix, available at www.annals.org). Cerebrovascular disease ranked fifth, with a mean age of death of 62.8 years (SD, 15.6). Mozart's official diagnosis of

hitziges Frieselfieber was given in only 4 (0.08%) of the 5011 cases analyzed.

Deaths from edema and related conditions showed a striking increase among younger men during the period surrounding Mozart's death, compared with the previous and following years (Figure, top). None of the other conditions showed a similar peak in the winter of 1791 to 1792. As shown in the Figure, 25.8% of deaths among younger men in December 1791 and 20.6% of those in January 1792 were attributed to edema or related conditions. The level in December 1791 significantly differed from that of all other months ($P = 0.036$ to <0.001) except January 1792 ($P = 0.14$) and from the death rates among older men and women ($P = 0.006$ and <0.001 , respectively). In numerical terms, 47 men who were 40 years or younger died from edema or related conditions in December 1791, compared with 16 in December 1790 and 10 in December 1792. A substantial proportion of the deaths due to edema in the weeks surrounding Mozart's death took place in the military hospital (Figure, bottom).

DISCUSSION

The most common causes of death in Mozart's Vienna were tuberculosis and related disease, cachexia and malnutrition, edema and related disease, gastrointestinal inflammatory disease, and cerebrovascular and neurologic disease. In the months surrounding Mozart's death, edema and related disease was the only diagnostic group that showed an increased incidence among younger men. Because contemporary information suggests that Mozart's death was due to an epidemic condition over these months, the cause of his death might be in this category.

Our data have serious limitations, so conclusions must be drawn with extreme caution. The source data originated

Table. The 10 Most Common Causes of Death in the Vienna Death Registry During November, December, and January, 1790–1793

Diagnostic Group	Original Names*	Most Common Cause	Deaths, n
Tuberculosis and related conditions	<i>Lungensucht, Lungengeschwür, Lungenwindsucht, Blutsturz, abzehrenden Fieber</i>	Tuberculosis, sarcoidosis	1186
Cachexia and malnutrition	<i>Abzehrung, Auszehrung, Entkräftung</i>	Malnutrition, cancer, diabetes mellitus	736
Edema and related conditions	<i>Wassersucht</i>	Heart failure, renal failure	559
Gastrointestinal inflammatory disease	<i>Faulfieber, Ruhr, Gedärmbrand, Nervenfieber</i>	Typhoid fever, dysentery, colitis	557
Cerebrovascular disease	<i>Schlagfluss, Schleimschlag, Schlag</i>	Cerebrovascular event, neurologic disease	439
Lung disease I	<i>Lungenentzündung, Lungenbrand, Dampf</i>	Pneumonia, fibrosis, emphysema, asthma, pulmonary cancer	367
Lung disease II	<i>Brustwassersucht, Seitenstechen</i>	Pulmonary edema, pleuritis, pulmonary embolism	237
Fever and inflammatory conditions	<i>hitzigen Fieber, Schleimfieber, Entzündungsfieber, Entzündung</i>	Infectious disease, bronchitis, gastric fever, typhus, inflammation	158
Liver and gallbladder disease	<i>Gallfieber, Leberentzündung</i>	Disease with jaundice-like hepatitis, gallstones, cholangitis, cirrhosis	150
Internal disease	<i>Brand, kalten Brand, innerlichen Brand</i>	Gangrene, disease with high fever and no external signs	148

* The most common terms entered into the register of deaths are listed.

more than 200 years ago, and the causes inserted in the register of deaths were lay descriptions as well as medical terms. Although the register is thought to be relatively complete, for noninfants at least, we cannot judge the accuracy of data entry, and the ages of the deceased people and causes of death may contain errors. Our translation of cause information into modern diagnostic categories is also open to debate, because many causes of death were descriptions of symptoms and signs rather than conclusive diagnoses. Furthermore, the 200 or so physicians working in Vienna in 1791 may have given different names to the same conditions (11). Another important limitation is that we have no precise records of the number of adults living in Vienna during this period (and thus no denominator), and such factors as rapid changes in the number of military personnel in the city are difficult to take into account.

Nevertheless, our analysis suggests a minor epidemic in deaths involving edema around the time of Mozart's death. This probably originated in the military hospital. Streptococcal infection leading to postinfectious glomerulonephritis is a possible cause of death involving edema under these circumstances.

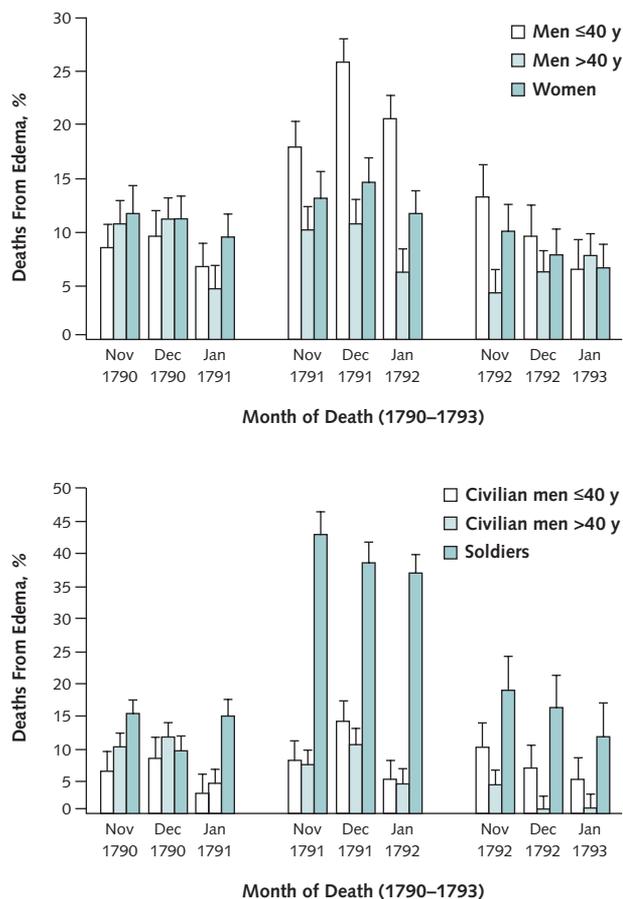
Streptococcal epidemics are often associated with pharyngitis. Guldener von Lobes (8) states, "In the autumn of 1791 he [Mozart] fell ill of an inflammatory fever, which at that season was so prevalent that few persons entirely escaped its influence." This would match a diagnosis of streptococcal pharyngitis, which could have afflicted many people—a small proportion of whom could have developed such sequelae as rheumatic fever or poststreptococcal glomerulonephritis.

Edema is associated with both renal and cardiac conditions, but these would need to have been chronic in nature before they caused edema. Mozart's musical output and his schedule of public performances in his final year make a chronic disease unlikely. Another potentially epidemic condition that causes fluid collection in the joints is rheumatic fever, but this also seems unlikely because it is seldom fatal in the acute stage (18).

Glomerulonephritis with the nephritic syndrome, an acute renal condition of which poststreptococcal glomerulonephritis is the postinfectious prototype (18), can also be considered. Acute glomerular inflammation expresses itself clinically in the acute nephritic syndrome and, in its most dramatic form, is characterized by the sudden onset (over days to weeks) of acute renal failure and oliguria. Poststreptococcal glomerulonephritis is a leading cause of the nephritic syndrome and the disease can be epidemic, especially during the winter months. On presentation, patients have headache and generalized symptoms, such as anorexia, nausea, vomiting, malaise, and back pain. Edema, in addition to hypervolemia and hypertension, is a hallmark of the disease.

The known facts of Mozart's fatal illness, including the features of edema, malaise, and back pain, seem compatible with this diagnosis. Mozart probably had a rash—

Figure. Deaths from edema and related conditions in Vienna during November, December, and January, 1790–1793.



Top. Deaths among men and women in the fall and winter of 1790–1791, 1791–1792, and 1792–1793. Error bars represent SEs. **Bottom.** Deaths among civilians and soldiers in the fall and winter of 1790–1791, 1791–1792, and 1792–1793. Error bars represent SEs.

often found in streptococcal disease (18)—during his final illness. Dyspnea is not a frequent symptom, and can only be expected in the late stages of the disease when the patient is supine. However, we do not know whether Mozart had pharyngitis, oliguria, or hypertension, all of which are characteristic of poststreptococcal glomerulonephritis. In the present day, this condition is mainly seen in children 2 to 6 years of age with pharyngitis (18).

Scarlet fever, or scarlatina, is another possibility. This streptococcal infection is accompanied by a characteristic "sandpaper" rash that typically begins on the first or second day of the illness and subsides in 6 to 9 days (18). Scarlet fever was associated with deadly epidemics in the 18th century (19), and the incidence of subsequent glomerulonephritis was apparently high (20). However, none of the accounts of relatives who looked after Mozart describe the rash that was presumably present when Mozart died, which suggests that it was a late rather than an early symptom. This makes a diagnosis of scarlet fever less likely.

Practically all the known symptoms of Mozart's final illness are also applicable to infective endocarditis. Nevertheless, we believe this is unlikely for 2 main reasons. First, edema is a late manifestation in endocarditis and is present in only a small proportion of cases (18). Second, infectious endocarditis is not an epidemic disease.

In summary, our analysis of the registry of deaths in Mozart's Vienna highlights the possible role of a minor epidemic condition involving edema that primarily affected young men. This, together with the evidence from contemporary witnesses, could fit a streptococcal epidemic leading to an acute nephritic syndrome caused by post-streptococcal glomerulonephritis. Less likely is postscarlatinal nephritis—which represents the same disease (streptococcal infection) from an etiologic perspective—whereas bacterial endocarditis and rheumatic fever seem improbable. It is unlikely that a single venesection during Mozart's final illness made a substantial contribution to the course of this nephritic syndrome, although an infection resulting from venesection could have hastened his death. Further detailed analysis, such as evaluation of meteorologic records, analyses of the occupations of other people who died during this period, or a study of the registration of deaths in the military hospital, might shed further light on the cause of Mozart's death.

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APPENDIX

The **Appendix Figure** shows the distribution of deaths across the 3 periods analyzed. Markedly more men died in the winter of 1790–1791 than in later years, whereas deaths among women stayed relatively constant. Previous analyses (21) have shown that a smallpox epidemic occurred in 1790, but not in the other years we studied.

An important factor that affected the pattern of mortality during these years was the war between the Austro-Hungarian and Ottoman Empires from 1787 and 1791. The main hostilities took place in 1788 and 1789, and a truce was announced in September 1790 (22). The war undoubtedly influenced the national health, and this probably accounts for the larger number of deaths that occurred in the winter of 1790 to 1791 and, to a lesser extent, in 1791 to 1792. It is also partially responsible for the larger number of deaths among men than women. The difference became smaller in the years after 1790 to 1791, when the war had ended (**Appendix Figure, A**).

Further insight into this pattern is provided by the place of death and the predominant causes of death over the 3 periods studied. The **Appendix Table** summarizes the recorded location of deaths. The number of deaths in the military hospital were substantially higher in the fall and winter of 1790 to 1791 than in later periods, whereas the number of deaths at home were relatively stable.

It is no surprise that tuberculosis (called *morbus Viennensis* in the late 18th and 19th century) and related disorders (**Appendix Figure, B**) accounted for the highest number of deaths. This rate remained relatively stable over the months we analyzed, although we noticed a small but nonsignificant increase around the time of Mozart's death. Panels *C* and *D* of the **Appendix Figure** show the number of deaths from gastrointestinal inflammatory diseases and from fever and inflammatory conditions, both of which increased in the fall and winter of 1790 to 1791.

Our analysis of the register of deaths confirms that Mozart's death at the age of 35 years was premature; the average age of death for civilian men in this era was 49.8 years. In 1791, only 7.2% of adults who died were 30 to 39 years of age (23). The age-specific death rate for men and women 30 to 39 years of age has been estimated at 24 deaths per 1000 people, compared with 22 in 1856 and 8 in 1900. Therefore, even in Mozart's time, dying at this age was rare.

It can be argued that if Mozart had a streptococcal infection, then some of his family and friends would have contracted it over the same period. No such infections are recorded. However, Mozart's short sleep times, long working days and nights, and possible excessive alcohol intake may have contributed to a heightened vulnerability. Contemporary research (24, 25) provides a scientific foundation for this possibility by demonstrating, for example, a relationship between sleep deprivation and susceptibility to infections, possibly caused by altered systemic immune function. The people surrounding Mozart may have been in better physical condition, particularly his wife Constanze, who had returned the previous month from taking the waters in Baden. Even if Mozart's family members had contracted streptococcal pharyngitis, it may not have been thought worth mentioning in recollections of the period.

Appendix Table. Recorded Locations of Death

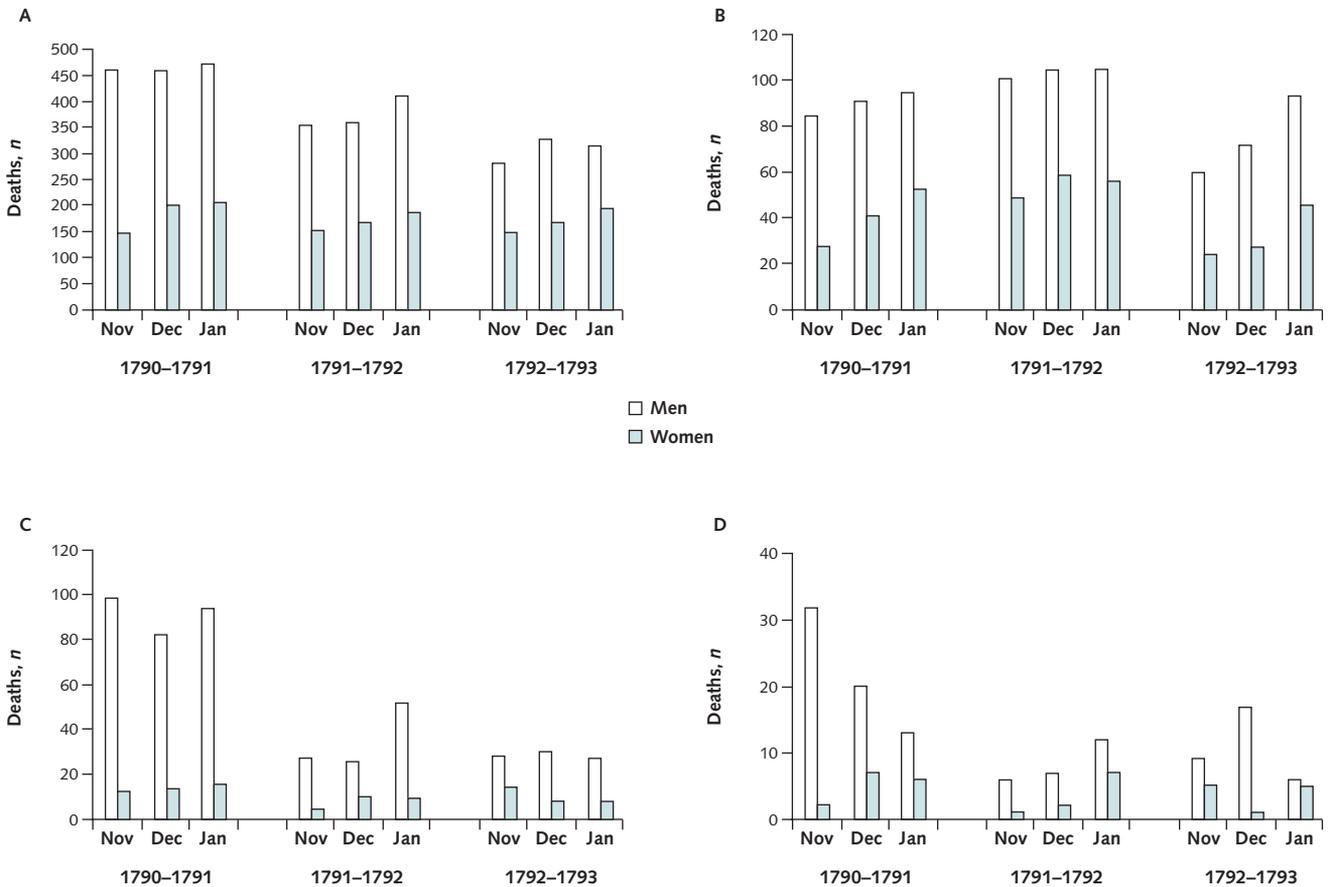
Location	Deaths in November 1790–January 1791, <i>n</i>	Deaths in November 1791–January 1792, <i>n</i>	Deaths in November 1792–January 1793, <i>n</i>	Total Deaths, <i>n</i>
Men				
Home	547	499	536	1582
General hospital*	168	237	194	599
Military hospital†	490	298	103	891
Other institutions‡	187	89	93	369
Women				
Home	249	217	243	709
General hospital*	159	255	234	648
Military hospital†	18	16	6	40
Other institutions‡	129	22	22	173

* Allgemeinen Krankenhaus.

† Militärspital.

‡ Barmherzige Brüder, Elisabethinerinnen, Invalidenhaus, Arrestantenspital.

Appendix Figure. Deaths among men and women in the 3 periods studied.



A. Total deaths. B. Deaths from tuberculosis and related diseases. C. Deaths from gastrointestinal inflammatory diseases. D. Deaths from fever and inflammatory conditions.