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Civil War History, Volume 57, Number 4, December 2011, pp. 307-348 (Article)

Published by The Kent State University Press
DOI: *https://doi.org/10.1353/cwh.2011.0061*

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Counting the Civil War Dead

For more than five decades, *Civil War History* has served as the leading venue for scholarly publications on the Civil War era. Even in light of this impressive run, the editors of *Civil War History* feel that the following contribution by J. David Hacker of Binghamton University, SUNY, stands among the most consequential pieces ever to appear in this journal's pages. Hacker, a specialist in quantitative methods, has utilized recently released microdata samples from nineteenth-century censuses to examine one of the archetypal "facts" about the Civil War—the oft-cited total of 620,000 plus deaths. Through a comparison of male survival rates between 1860 and 1870 with male survival rates in surrounding censuses, Hacker finds the traditional statistic understates the number of actual Civil War deaths by approximately 20 percent. In his estimation, the most probable number of deaths attributable to the Civil War is 752,000, although the upper bounds of his data set point to as many as 851,000 deaths.

As an exercise in the recalculation of a statistic, "Counting the Civil War Dead" might be regarded by skeptics either as a form of what Thomas Kuhn

This work was supported in part by NIHCD grant number 1 K01-HD052617-01. The author would like to thank Samuel H. Preston, Diane Miller Sommerville, and anonymous reviewers for helpful suggestions and James M. McPherson, Lesley J. Gordon, and Kevin Adams for their gracious introductions.

Civil War History, Vol. LVII No. 4 © 2011 by The Kent State University Press

described as "normal science" or as a misleading evocation of numeracy that belies the constructed nature of statistics. Such readings, we believe, miss the mark. "Counting the Civil War Dead" does more than modify a hoary bit of Civil War trivia; instead, it implicitly asks us to consider several questions that lie at the heart of the modern historical enterprise. How do "facts" emerge and become accepted by the profession writ large? How does the inevitably limited nature of historical evidence constrain our thinking about the past—and can we ever transcend these limits? Simply put, *can we ever count the Civil War dead?*

As readers will soon discover, the practical answer is no. The use of the most sophisticated tools of quantitative analysis can certainly overturn what was once accepted wisdom, but, in the final analysis, they can only provide us with a probabilistic range of excess male deaths during the 1860s.[1] In a very real sense, however, fixating upon a precise number obscures the actual meaning of the numbers, as scholars such as William Blair, David Blight, Jane Turner Censer, Drew Gilpin Faust, Barbara Gannon, Caroline Janney, Stuart McConnell, and John Neff have clearly established the central roles occupied by loss and trauma in postbellum America. By placing the Civil War's enormous death toll at the center of the postwar world, this generation of scholarship forces us to stop and reconsider the war's meaning for period Americans. And since, as Hacker implies, the majority of the uncounted dead were likely southerners (thanks to deficiencies in Confederate record-keeping and the troubled postwar condition of the south), the "ghosts of the Confederacy" now seem more numerous and persistent than ever. In terms of the scale of the carnage, Richmond in 1865 was Paris in 1918.

Thus, what you are about to read takes us to "the frontiers of historical imagination" (to borrow a phrase from Kerwin Klein) and serves as a reminder that for all we know about the Civil War, there is still plenty that we do not—and can never—know. To prepare us for this journey, James McPherson has graciously provided this commentary on Hacker's work.

1. For a recent examination of an attempt to construct a similar count for North Carolina, see "Counting the Dead," *Wall Street Journal,* March 26, 2011, http://tinyurl.com/42htvmo, accessed July 13, 2011.

Commentary on "A Census-Based Count of the Civil War Dead" by James M. McPherson

I have been waiting more than twenty-five years for an article like this one. As I was working on my two syntheses of the Civil War era, *Ordeal by Fire* and *Battle Cry of Freedom,* I became increasingly aware that the standard estimate of 258,000 Confederate war dead was a significant undercount. Many Confederate records were lost or incomplete, especially for the last—and bloodiest—year of the war. The number of disease-related deaths of Confederate soldiers was clearly underreported. There were no reported Confederate noncombat deaths from "miscellaneous" causes—accidents, drownings, causes not stated, et cetera—compared with nearly twenty-five thousand such deaths recorded for Union armies. While the census data do not enable J. David Hacker to estimate Union and Confederate deaths separately, his discussion makes it clear that he believes the undercount of Confederate deaths was considerably greater than the Union undercount.

Hacker's conclusion that the total number of Civil War deaths was probably about 750,000—some 20 percent greater than the widely accepted figure of 620,000—seems soundly based. This conclusion involves a number of assumptions, but all of them are quite reasonable and persuasive. The methodology based on differentials in the survival of men and women between the censuses of 1860 and 1870 is carefully framed and explained. By noting that thousands of soldiers died from war-related causes within a few years of their discharges but were not counted in the usual statistics of war dead, the author makes a common-sense point that seems not to have occurred to other students of Civil War mortality. And the suggestion that a number of unrecorded deaths from guerrilla warfare swelled the total also makes sense.

When I was working on *Battle Cry of Freedom,* I also became interested in the question of indirect war-related deaths of civilians. We know that the mortality in contraband camps may have been as high as 25 percent. I wondered about mortality from disease, malnutrition, or exposure among the unknown but large number of white and black refugees in the South—and even among southern civilians who did not become refugees. I consulted demographic historians, asking whether civilian deaths in excess of what might have been expected between the 1860 and 1870 censuses could be calculated. The answer was no. Knowing that chaotic conditions in large parts of the South must have caused many premature deaths, I came up

with an estimate of fifty thousand. This number was carefully hedged, and I have been occasionally disconcerted to see it cited as gospel truth. But I am pleased that Hacker considers it a reasonable estimate.

The figure of 750,000 soldier deaths would translate into 7.5 million American deaths in a war fought in our own time by the United States, with its tenfold greater population than during the Civil War. Such a figure calls into question Mark Neely's assertion that the Civil War was "remarkable for its traditional restraint."[2] The Civil War did indeed result in more American soldier deaths than all the other wars this country has fought combined.

2. Mark E. Neely Jr., *The Civil War and the Limits of Destruction* (Cambridge: Harvard Univ. Press, 2007), 108.

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According to the most frequently cited figure, 620,000 men died in the American Civil War. Most historians know that the century-old estimate is a crude approximation. The Union and Confederate forces lacked adequate personnel records; procedures to identify and count the dead, wounded, and missing in action; and a system to notify survivors. Postwar efforts to count the Union dead drew from battlefield reports, regimental muster-out rolls, and information brought forward by widows and orphans when applying for pension benefits. A direct count of the Confederate dead proved impossible. The destruction of the Confederate army and many of its records during the war forced late-nineteenth-century investigators to infer the number of Confederate dead from the mortality experience of Union soldiers and crude approximations of the number of men participating on both sides.[1]

On the one hand, a dry statistic, cited uncritically as evidence that the Civil War was the "bloodiest" war in American history; on the other hand, the death toll is one of the most important measures of the war's social, economic, and demographic costs. Refining and critiquing the existing estimate should be a priority of Civil War historians.

This article relies on new public-use microdata samples of the 1850, 1860, 1870, and 1880 censuses to make an alternative, census-based estimate of white male deaths caused by the Civil War. Together with existing estimates of mortality among black troops, the new estimate indicates that approximately 750,000 men lost their lives in the conflict, 130,000 more than the commonly accepted figure. If correct, 1 in 10 white men of military age in 1860 died as a result of the war and 200,000 white women were widowed, a substantial increase from the 1 in 13 white men dying and 163,000 white women widowed implied by the earlier total.[2]

1. Drew Gilpin Faust, *This Republic of Suffering: Death and the American Civil War* (New York: Knopf, 2008), 250–65.

2. These ratios assume that the military age population was age 13–43 at the time of the 1860 census and was undercounted by 6 percent. See discussion of census underenumeration below. Widowhood estimates assume that 28 percent of the men who died in the war were married at the time of their death. J. David Hacker, Libra Hilde, and James Holland Jones, "The Effect of the Civil War on Southern Marriage Patterns," *Journal of Southern History* 76.1 (2010): 39–70.

The bulk of the article describes the data, methods, and assumptions required to construct the new estimate. Each step and assumption introduces potential error. The final estimate, therefore, has an unknown, but likely substantial, margin of error (a probable range of 650,000 to 850,000 deaths is suggested). The new estimate, moreover, is an indirect measure of *excess* male deaths occurring between the 1860 and 1870 censuses, not a direct count of the number of currently enlisted men killed in the war. Although excess male deaths include military men killed in the war, it also includes men who died between the date of their discharge from the armed forces and the 1870 census from wounds, infections, and diseases contracted during their service and nonenlisted men killed in guerilla raids and in other war-related violence. The number of excess deaths excludes, however, the deaths of men in military service who would have died in the absence of war.[3]

Despite these limitations, there are several reasons to prefer the larger, census-based estimate of war-related deaths over the conventional figure. If the scholarly objective in estimating the death toll is to evaluate the war's human and economic costs, all war-related deaths should be considered in assessments of those costs, not just the deaths that occurred among men in military service. In addition, as discussed in more detail below, the existing estimate of 620,000 male deaths is based on faulty assumptions and is likely too low. There is, in other words, a large and unknown error associated with the conventional estimate. A census-based estimate of 650,000 to 850,000 excess male deaths revises the probable death toll upward while highlighting the uncertainty in both the new and existing estimates.

This article also includes estimates of the number of excess deaths among white males born in the southern slave states, the "border" slave states of Missouri, Kentucky, Maryland, Delaware, and the District of Columbia, and the

3. This latter group is equivalent to the number of men participating in the war who would have died between April 1861 and April 1865 given the normal level of nineteenth-century mortality. If Thomas Livermore's estimate that Union and Confederate soldiers contributed a combined 8 million years of military service is approximately correct, and further assuming that white men of military age experienced a 1 percent chance of dying each year, then about 80,000 of the men who died in the war would have died in the period April 1861–April 1865 had the war not been fought. Thomas Leonard Livermore, *Number and Losses in the Civil War in America, 1861–65* (1901; repr., Bloomington: Indiana Univ. Press, 1957), 50, 61. For typical rates of nineteenth-century mortality, see Michael R. Haines, "Estimated Life Tables for the United States, 1850–1910," *Historical Methods* 31.4 (1998): 149–69, and J. David Hacker, "Decennial Life Tables for the White Population of the United States, 1790–1900," *Historical Methods* 43.2 (2010): 45–79.

remaining free states and territories in the North and West.[4] These estimates indicate that white men born in the southern and border states experienced proportionally greater death rates than white men born in the northern and western states and territories. Using the preferred set of assumptions, excess mortality was 13.1 percent for white males age 10–44 born in the southern slave states, 12.7 percent for white males age 10–44 born in the slave border states, and 6.1 percent for white males age 10–44 in the free states and territories. Excess mortality was greater among certain age cohorts. An estimated 22.6 percent of southern-born white males age 20–24 in 1860, for example, lost their lives as a result of the war. The article makes no attempt, however, to estimate Union and Confederate deaths. Unfortunately, the research method, which relies on place of birth, cannot be used to construct Union and Confederate estimates without incurring substantial error. Internal migration, while largely along an East-West axis and thus intra-sectional, was substantial enough across sectional boundaries to matter. Together with the potential error inherent in the estimation method, it is impossible to determine whether the undercounted deaths in the traditional estimate were the result of undercounted Union deaths, undercounted Confederate deaths, the postwar deaths of men from wounds and illness incurred during the war, or the war-related deaths of men not in the Union or Confederate forces.

Background

In her recent study of death and dying in the Civil War, Drew Gilpin Faust noted that the existing estimate of 620,000 Civil War dead was the result of an extensive postwar reconstruction, "a combination of retrospective investigation and speculation that yielded totals that posterity has embraced as iconic."[5] An emerging nation state, an increasingly numerate population, and the hope that quantification could somehow explain and document the unprecedented sacrifice of so many young men drove efforts to identify, rebury, and count the Union dead. Muster-out reports compiled by each regiment at the end of

4. As discussed below, birthplace data in the census do not distinguish between West Virginia– and Virginia-born individuals until the 1870 census. As a result, West Virginia, often treated as a border state, had to be included with Virginia as part of the southern slave states.

5. Drew Gilpin Faust, "'Numbers on Top of Numbers': Counting the Civil War Dead," *Journal of Military History* 70.4 (2006): 997.

the war ostensibly recorded the name and ultimate fate of each man serving in each regiment. Subsequent information, however, suggested that these reports substantially undercounted the Union dead. The estimated death toll of men in the Union forces increased from 279,689 in the year following the war to 360,222 in the early twentieth century, partly a result of widows and orphans bringing forward information when applying for pensions and survivors' benefits.[6]

Although the long-term rise does not inspire confidence in the final figure, it is a model of precision compared to the "educated guess" of 258,000 Confederate deaths.[7] That estimate was the combined result of two former Union officers working in the late nineteenth century. William F. Fox, a lieutenant colonel in the Union army, spent several decades trying to count Union and Confederate regimental losses from official and unofficial reports. Fox estimated that 94,000 Confederate soldiers were killed in action or died from wounds incurred on the battlefield. He complained, however, that official records were incomplete, especially during the last year of the war; commanders under Robert E. Lee were pressured to underreport wounds; and battlefield reports, which Fox was forced to use in the absence of official reports, likely underreported deaths (many men counted as wounded in battlefield reports subsequently died of their wounds). Fox observed that subsequent information received through affidavits filed at the Pension Bureau increased the total number of Union men killed or died of wounds by 15,000 and clearly expected that Confederate totals would have increased a similar amount if subjected to a similar revision process.[8] Thomas Livermore, a major in the New Hampshire volunteers whose book, *Numbers and Losses in the Civil War in America* remains the single-best source of the number of men participating and dying in the conflict, used Union records of noncombat mortality and a comparison of enlistment records to arrive at a figure of 164,000 Confederate deaths from noncombat causes. Despite his concerns that Fox's estimate of battle deaths could "be accepted only as a minimum," Livermore combined

6. Faust, *This Republic of Suffering,* 250–65.

7. Ibid., 257.

8. William F. Fox, *Regimental Losses in the American Civil War, 1861–1865* (Albany, N.Y.: Albany Publishing Co., 1889), chap. 15. The federal pension system, which helped retroactively to create military service records for Union soldiers, was not open to Confederate veterans and their surviving kin.

the two estimates to arrive at a total of 258,000 Confederate deaths, a total that remains unrevised more than a century later.[9]

Livermore's method of estimating noncombat mortality in the Confederate army poses a large source of potential error. The estimate was the product of the number of accident and disease-related deaths in the Union army and Livermore's estimate of the ratio of Union and Confederate soldiers serving the equivalent number of three-year enlistments.[10] Livermore's underlying assumption was that disease and accidental deaths had an equal impact on Confederate and Union troops. There are three reasons to question that assumption. First, because of the South's much lower urbanization and population density, Confederate soldiers were less likely to have been previously exposed to acute infectious diseases than Union soldiers.[11] They were thus more likely to enter the war without acquired immunities and, consequently, suffered disproportionately from the outbreak of camp diseases. Chulhee Lee's recent analysis of more than 28,000 Union army recruits—collected as part of the Early Indicators project under the direction of Robert Fogel at the University of Chicago—indicates that Union soldiers from rural areas were twice as likely to die from infectious diseases as soldiers from urban areas.[12] Second, clothing and food were often in short supply in the Confederate army, increasing the chance of death from exposure and reducing resistance to disease. Malnutrition and avitaminosis were especially rampant in the Confederate forces during the last year of the war. Third, Confederate troops suffered from a dearth of medicine and inferior medical care. Union soldiers, in contrast, benefited from a well-organized medical department, an adequate supply of medicine, and efforts of voluntary organizations to improve camp conditions.[13] As a result of these factors, Livermore's estimate of noncombat

9. Livermore, *Number and Losses in the Civil War in America,* 8.

10. Ibid., 8, 50, 61.

11. Roger L. Ransom, *Conflict and Compromise: The Political Economy of Slavery, Emancipation, and the American Civil War* (New York: Cambridge Univ. Press, 1989), 129.

12. Chulhee Lee, "Prior Exposure to Disease and Later Health and Mortality: Evidence from Civil War Medical Records," in *Health and Labor Force Participation over the Life Cycle: Evidence from the Past,* ed. Dora L. Costa (Chicago: Univ. of Chicago Press, 2003), 51–87.

13. For the most part, Civil War medicine was not effective. The dearth of quinine in the Confederate forces, a treatment for malaria, may have had a significant effect, however. Frank Freemon has observed that the Union army had such a large supply of quinine that it could afford to administer it daily to soldiers in malarial areas. Frank Reed Freemon, "Medical Care during the American Civil War" (PhD diss., Univ. of Illinois, 1992), 176. Although many women and men volunteered to provide medical care in the South, there were no organizations comparable to

deaths in the Confederate army is probably much too low. Livermore explicitly recognized this, noting that the death rate from disease and accident in the Confederate army was "at least" as great as that in the Union army.[14]

Recently, historians have shown renewed interest in the war's death toll. Although no researcher has yet tried to reestimate the total number of war-related deaths, historians have examined the social, cultural, and economic impact of Civil War deaths. Maris Vinovskis has observed that more men died in the American Civil War than all wars in the United States from the Revolution through the Korean Wars combined. Approximately 18 percent of southern white men of military age lost their lives in the conflict, compared to just 6 percent of northern men. As a result, Civil War deaths had a disproportionate and longer lasting effect on southern society. Although much work remains to be done, historians have investigated the state, regional, and national impact of male deaths on widowhood, orphanhood, family structure, the postwar marriage market, and the federal pension system.[15] Similarly, attempts by historians to quantify the economic impact of the Civil War

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the U.S. Sanitary Commission and Western Sanitary Commission. In his summary of medicine in the Civil War, Richard Shryock notes, "Women's relief agencies, in the form of local hospital societies or even of such statewide bodies as the Georgia Relief and Hospital Association, were formed in the Confederacy. But only in the Union, where states' rights were not taken so seriously, did such efforts result in the founding of regional or national organizations—notably of the Christian Commission, the Western Sanitary Commission, and the United States Sanitary Commission." Richard Harrison Shryock, *Medicine in America: Historical Essays* (Baltimore: Johns Hopkins Univ. Press, 1966), 102.

14. Livermore, *Number and Losses in the Civil War in America,* 8.

15. These percentages are based on Livermore's death estimates and Vinovskis's division of the 1860 white male population age 13–43 into Union and Confederate populations. The latter required splitting West Virginia and Virginia according to their proportions in 1870, the border states according to estimates of Union and Confederate enlistments, and Tennessee according to its June 1861 secession vote. These percentages are not comparable to the estimates based on region of birth made later in this article. Maris A. Vinovskis, "Have Social Historians Lost the Civil War? Some Preliminary Demographic Speculations," *Journal of American History* 76.1 (1989): 34–58; Amy E. Holmes and Maris A. Vinovskis, "The Impact of the Civil War on American Widowhood," in *The Changing American Family,* ed. Scott J. South and Stewart E. Tolnay (Boulder, Colo.: Westview, 1992), 63–85; Hacker, Hilde, and Jones, "The Effect of the Civil War on Southern Marriage Patterns," 39–70; Robert C. Kenzer, "The Uncertainty of Life: A Profile of Virginia's Civil War Widows," in *The War Was You and Me: Civilians in the American Civil War,* ed. Joan E. Cashin (Princeton, N.J.: Princeton Univ. Press, 2002), 112–35; Catherine Clinton, *Civil War Stories* (Athens: Univ. of Georgia Press, 1998), 42–80; Megan McClintock, "Civil War Pensions and the Reconstruction of Union Families," *Journal of American History* 83.2 (1996): 456–80; and Theda Skocpol, *Protecting Soldiers and Mothers: The Political Origins of Social Policy in the United States* (Cambridge, Mass.: Belknap Press of Harvard Univ. Press, 1992).

depend in part on estimates of the number of men killed and wounded.[16] Drew Gilpin Faust's recent monograph examines the lasting cultural impact of Civil War mortality. In their attempts to identify, count, and rebury the dead and to find meaning in the loss of so many young men's lives, postwar Americans stressed the bravery of Civil War soldiers and the shared sacrifice needed for national reconciliation.[17]

The rhetorical use of the number of Civil War deaths has not escaped the attention of historians. Mark Neely has recently chided historians' "cult of violence" and "fetish" with the number of men killed and wounded. He maintains that the Civil War's frequent characterization as the "bloodiest" or "deadliest" war in American history is obtained only by combining Union and Confederate casualties, by ignoring that approximately two-thirds of deaths were the result of noncombat causes, and by overplaying the supposed brutality of the conflict. He emphasizes instead the relative constrained nature of the conflict. In all but a few rare exceptions, civilians were not directly targeted by armies, and civilian deaths appear to have been minimal.[18]

Neely notes the irony in the frequent citation of the war's death toll and the failure of historians to systematically reexamine Livermore's century-old estimate.[19] But it is not hard to see why. Despite new sources, new and exhaustively researched regimental histories, and online access to many records—including official records, unofficial reports, genealogical data, and census records—a full revision of Fox and Livermore's work would require years, if not decades, of old-fashioned archival work. And although the product of that effort might be worthwhile, it is still likely to result in a substantial undercount of war-related deaths. Many men who died in or as a result of the

16. Claudia Goldin and Frank Lewis, "The Economic Costs of the American Civil War: Estimates and Implications," *Journal of Economic History* 35.2 (1975): 299–326.

17. Faust, *This Republic of Suffering.*

18. Mark E. Neely Jr., *The Civil War and the Limits of Destruction* (Cambridge, Mass.: Harvard Univ. Press, 2007). See also Mark Grimsley, "'Rebels' and 'Redskins': U.S. Military Conduct toward White Southerners and Native Americans in Comparative Perspective," in *Civilians in the Path of War,* ed. Mark Grimsley and Clifford J. Rodgers (Lincoln: Univ. of Nebraska Press, 2002), 137–62, and Mark E. Neely Jr., "Was the Civil War a Total War?" *Civil War History* 50.4 (2004): 434–58.

19. Neely, *Civil War and the Limits of Destruction,* 208–11. Faust's study of nineteenth-century attempts to count the Civil War dead, Neely contends, "serves most importantly to show how old and how little analyzed are figures so important to understanding the Civil War." "We can add to our 'to do' list," he suggests, "a future sophisticated statistical assessment of the traditional figures given for losses in the Civil War" (210).

war left no trace in the historical record. No effort on the part of historians, no matter how exhaustive, will find them.[20] Like Livermore, historians must turn to indirect methods and assumptions to count the Civil War dead.

A Two-Census Approach to Estimating Excess Male Deaths in the American Civil War

Two-census estimation methods have been a standard tool of demographers since the nineteenth century.[21] The basic method is simple. If a population was fully and accurately counted in two censuses separated by a span of years and experienced negligible in- and out-migration between the two censuses (i.e., the population was "closed to migration"), then changes in the size of birth cohorts (defined by age group) can be assumed to be due to mortality. In the case of two censuses separated by ten years, a birth cohort in the first census would be ten years older in the second census. Subtracting the number of cohort members counted in the second census from the number counted in the first census results in the number of cohort members dying in the intervening ten years. Subtracting the number of men age 30–34 counted

20. The North Carolina Civil War Death project at the North Carolina Office of Archives and History is attempting to document the state's Civil War dead. See Joshua B. Howard, "North Carolina Civil War Death Study," http://www.nccivilwar150.com/features/nc-civil-war_death-study.htm, accessed Apr. 14, 2011. According to Howard, the anticipated final count that can be confirmed in historical sources—between 33,000 and 35,000—will be well below the 40,000 credited to the state in the 1866 *Final Report of the Provost Marshal General to the Secretary of War.* Both the number of North Carolina soldiers that can be confirmed on rosters and the number of deaths that can be confirmed for these men, however, are sure to be too low. Ideally, researchers should employ a capture-recapture method for estimating the undercount. For a similar effort to identify Virginia's military dead, see Edwin Ray, comp., *Virginia Military Dead Database,* Library of Virginia, Richmond, Virginia, http://www.lva.virginia.gov/public/guides/vmd/, accessed Apr. 14, 2011. For an application of capture-recapture methods to count homicides in U.S. history, see Douglas Lee Eckberg, "Stalking the Elusive Homicide: A Capture-Recapture Approach to the Estimation of Post-Reconstruction South Carolina Killings," *Social Science History* 25.1 (2001): 67–91, and Randolph Roth, *American Homicide* (Cambridge, Mass.: Belknap Press of Harvard Univ. Press, 2009).

21. For a nineteenth-century example, see Levi Meech, *System and Tables of Life Insurance,* rev. ed. (New York: Spectator Co., 1898). For a description of the basic two-census method, see Samuel H. Preston, Patrick Heuveline, and Michel Guillot, *Demography: Measuring and Modeling Population Processes* (Malden, Mass.: Blackwell, 2001). For an application of a two-census method to estimate the life expectancy of the black population between 1850 and 1870, see Antonio McDaniel and Carlos Grushka, "Did Africans Live Longer in the Antebellum United States? The Sensitivity of Mortality Estimates of Enslaved Africans," *Historical Methods* 28.2 (1995): 97–105.

by 1870 census from the number of men age 20–24 in the 1860 census, for example, yields the number of the latter who died in the intervening ten years. Typically, demographers rely on cohort survivorship ratios to construct a "life table" showing implied mortality rates and life expectancy by age and sex. When estimating the excess number of deaths from a war or catastrophic event, it is necessary to first establish a base level of "normal" mortality, perhaps by estimating mortality in adjacent intercensal periods. The excess number is obtained by subtracting the observed number of deaths from the number expected under normal conditions.[22]

The accuracy of the estimates derived from two-census methods is dependent on the availability and quality of the census data and the validity of the required assumptions. Censuses suffer from a variety of errors, including age misreporting and coverage errors, which spuriously create movements of individuals into and out of cohorts. To partially control for age-reporting errors, which can produce erratic results by age group, demographers may impose a model age-mortality pattern. Given the unique mortality patterns produced during wars, however, a model pattern cannot be employed. Changes in census coverage can make mortality appear exceptionally high or low. Perhaps the most critical assumption is that the population be closed to migration. In-migration between the two censuses biases mortality estimates downward, and out-migration biases them upward. Although it is possible to use in- and out-migration data to adjust the size of each cohort, these data are often not available.

The greatest challenges in the application of two-census methods to estimate mortality in the American Civil War are the lack of a population closed to migration and suspected changes in the completeness of coverage of the 1850, 1860, 1870, and 1880 censuses. The requisite data are not available to make adjustments for in- and out-migration. Although the number and demographic characteristics of overseas immigrants to the United States were recorded, data on overland immigrants from Canada and Mexico and on overseas and overland emigrants were not systematically recorded until the twentieth century. Fortunately, the newly released Integrated Public Use Microdata Series (IPUMS) samples of the 1850–80 censuses make it possible

22. Because most populations experience negative or positive growth over time, excess deaths must be estimated from the excess mortality rate.

to limit the analysis to the native-born white population.[23] As discussed in more detail below, the native-born white population can be assumed closed to migration. By focusing on sex differentials in mortality between the censuses, it is possible to limit errors caused by changes in the level of census underenumeration. Because civilian deaths in the American Civil War were relatively small compared to military deaths, especially among white women age 10–44, excess mortality among white men age 10–44 can be inferred from changes in the expected "normal" ratio of male to female.

The following methodological description discusses each assumption needed to estimate excess male mortality and its likely margin of error.

Assumption 1: The native-born white population of the United States in the late-nineteenth century was closed to migration.

Table 1 shows the number of number of native-born whites by sex and age group in the 1850, 1860, 1870, and 1880 censuses.[24] The subsequent analysis assumes that this population was closed to migration. Although a small number of native-born whites emigrated and resided abroad, and a small number of native-born whites residing abroad eventually reentered the United States, the numbers are negligible compared to the overall native-born population. Canada—the principal destination of out-migrants born in the United States—recorded 56,214 U.S.-born whites in its census of 1851 and 64,406 in the census of 1861, representing approximately 0.3 percent of the United States native-born white population in those years.[25] If all U.S.-born individuals enumerated by the 1851 Canadian census were living in the United States and counted by the 1850 census before moving to Canada

23. The number of native-born white males and females in five-year age groups for each census year cannot be obtained from published census reports for 1850, 1860, and 1870. Although the reports include cross-tabulations by age, sex, and race, they do not break down the results by nativity. The 1850, 1860, and 1870 IPUMS samples are needed to create the necessary cross-tabulations. Steven Ruggles et al., *Integrated Public Use Microdata Series: Version 5.0* [Machine-readable database] (Minneapolis: Univ. of Minnesota, 2010). The required data is available by age, sex, race, and nativity in the 1880 census publication. U.S. Census Office, Department of the Interior, *Tenth Decennial Census of the United States, 1880,* vol. 1, *Statistics of the Population of the United States at the Tenth Census* (Washington, D.C.: GPO, 1883), 548–51.

24. The 1850–1870 results were estimated by weighing each IPUMS sample with the included person weight variable and cross-tabulating age, sex, race, and nativity.

25. Peter D. McClelland and Richard J. Zeckhauser, *Demographic Dimensions of the New Republic: American Interregional Migration, Vital Statistics, and Manumissions, 1800–1860* (New York: Cambridge Univ. Press, 1982), 91.

between 1850 and 1851, and remained outside the United States at the time of the 1860 census, two-census estimates of mortality in the 1860s would overstate mortality by 56,214 individuals. Very roughly, this would represent about 3 percent of the expected 2 million deaths suffered among the native-born white population in the 1850s.

Offsetting biases make this small potential bias and other scenarios that could create a measurable upward or downward bias in mortality estimates highly unlikely, however. Many U.S.-born individuals lived entirely abroad between 1850 and 1880 and thus would have no impact on two-census based estimates of mortality. Others who resided for a small time abroad but lived in the United States during census years also have no impact on census-based mortality estimates. The small minority of native-born whites who were captured by a census, emigrated, survived the following intercensal period, and remained abroad at the time of the subsequent census was to some degree offset by cohort members who lived abroad during the first census and returned to the United States in time to be enumerated by the second census. Given the small numbers and offsetting biases, in- and out-migration of native-born whites to the United States was low enough to be negligible.

Assuming a closed population of native-born whites enumerated in two censuses, cohort survival ratios can be calculated without adjustments for in- and out-migration. The calculation is straightforward. The number of cohort members in the second census is divided by the number in the first census. For example, the number of native-born white men age 20–24 counted by the 1860 census (1,055,632), is divided by the number age 10–14 in the 1850 census (1,147,038), to yield a ten-year survival ratio of 0.9203. In other words, just over 92 percent of native-born white males age 10–14 in 1850 survived the ten-year interval between the 1850 and 1860 censuses. Conversely, about 8 percent died.

Table 2 shows ten-year survival ratios for each five-year age group between ages 5 and 44 in the first census. Between 1850 and 1860, male survival ratios ranged from a high of 0.9374 for boys age 5–9 in 1850 to a low of 0.8164 for men age 20–24. Over the three decades shown in table 2, the lowest survival probability was the 0.7172 estimated for men age 20–24 in 1860 to age 30–34 in 1870. One of the next lowest, 0.7669, was for men age 15–19 in 1860. The reason for the relatively low survival ratios is not hard to surmise: the war dramatically lowered the survival probability of men in these cohorts. Assuming both censuses achieved the same coverage of their respective populations,

Table 1. Native-born white population in the United States (1850–80)

Age group	Males				Females			
	1850	1860	1870	1880	1850	1860	1870	1880
0–4	1,423,462	2,053,500	2,351,694	2,918,193	1,383,318	2,021,279	2,263,412	2,819,587
5–9	1,316,436	1,698,039	1,993,156	2,694,398	1,266,758	1,674,058	1,960,723	2,625,324
10–14	1,147,038	1,446,005	1,988,994	2,361,832	1,106,856	1,377,428	1,931,509	2,280,260
15–19	956,661	1,233,984	1,533,347	1,965,748	968,287	1,260,281	1,627,402	2,007,090
20–24	830,860	1,055,632	1,267,929	1,945,279	812,808	1,070,750	1,335,344	1,928,938
25–29	654,370	855,794	950,049	1,472,960	634,318	791,899	1,032,467	1,397,625
30–34	548,139	678,327	757,104	1,128,308	505,521	638,730	810,596	1,088,315
35–39	452,270	584,639	692,199	920,264	418,015	531,753	691,875	938,963
40–44	372,137	471,681	543,292	726,832	349,205	447,572	555,144	751,013
45–49	310,999	400,900	496,808	621,164	288,765	355,900	462,956	609,787
50–54	256,448	332,500	431,861	538,133	238,868	309,831	397,586	512,672
55–59	165,102	225,940	323,188	403,260	161,663	213,946	275,323	378,541
60–64	146,113	194,447	250,966	345,575	137,924	190,055	245,968	321,270
65–69	93,573	121,785	180,649	243,803	91,750	116,072	172,926	232,245
70–74	61,019	77,378	116,794	165,062	63,448	82,476	117,319	164,476
75–79	35,364	46,194	62,097	94,598	36,275	48,482	65,909	99,574
80–84	20,515	24,696	32,062	44,492	20,104	24,198	39,474	51,949
85+	10,913	13,798	14,427	19,364	15,154	16,395	18,639	26,397
Total	8,801,419	11,515,239	13,986,616	18,609,265	8,499,037	11,171,105	14,004,572	18,234,026

Sources: Steven Ruggles et al., *Integrated Public Use Microdata Series: Version 5.0* (IPUMS)[Machine-readable database], (Minneapolis: University of Minnesota, 2010); U.S. Census Office, *Department of the Interior, Tenth Decennial Census of the United States, 1880, vol. 1, Statistics of the Population of the United States at the Tenth Census* (Washington, D.C.: GPO, 1883), 548–51.

Note: Totals were obtained by weighting the IPUMS samples with the person weight variable.

Table 2. Intercensal survivorship probabilities for the native-born white population (1850–80)

Age group (at first census)	Age group (at second census)	Males			Females		
		1850–60	1860–70	1870–80	1850–60	1860–70	1870–80
5–9	15–19	0.9374	0.9030	0.9862	0.9949	0.9721	1.0236
10–14	20–24	0.9203	0.8768	0.9780	0.9674	0.9694	0.9987
15–19	25–29	0.8946	0.7699	0.9606	0.8178	0.8192	0.8588
20–24	30–34	0.8164	0.7172	0.8899	0.7858	0.7570	0.8150
25–29	35–39	0.8934	0.8088	0.9686	0.8383	0.8737	0.9094
30–34	40–44	0.8605	0.8009	0.9600	0.8854	0.8691	0.9265
35–39	45–49	0.8864	0.8498	0.8974	0.8514	0.8706	0.8814
40–44	50–54	0.8935	0.9156	0.9905	0.8872	0.8883	0.9235

the survival ratios indicate that approximately 1 in 4 native-born white men age 15–24 enumerated by the 1860 census did not survive to be counted by the 1870 census.

Assumption 2: Changes in the net undercount of the native-born white population among the four censuses affected males and females equally.

No census, however, ever achieves a complete count. Many people are missed, and a few are counted twice. The difference between the omissions and duplicates is the net census undercount. In the conventional two-census method, changes in the net undercount between two censuses will spuriously bias mortality estimates. Some research suggests that the changes in coverage from one nineteenth-century census may have been large. In 1890, the Census Office estimated that the 1870 census undercounted the southern population by approximately 10 percent, representing about 3 percent of the national population. The result was blamed on the unsettled conditions in the postwar South and the lack of oversight and training of assistant marshals.[26] Changes in the federal law governing the 1880 census, which shifted enumeration responsibility from assistant marshals appointed by local patronage to trained enumerators appointed by the Census Office, and a dramatic increase in the number of enumerators in the field, likely resulted in a decline in the net undercount in 1880. In 1870, 6,530 census marshals were responsible for enumerating a population of 38.6 million, an average of about 4,800 individuals per marshal. In 1880, 31,382 enumerators completed the task for a population of 50.2 million, or about 1,600 individuals per enumerator.[27]

The probable impact of changes in net census coverage on survival estimates can be seen in table 2. For both males and females, the highest survival ratios are found between the 1870 and 1880 censuses. Although these relatively high ratios may reflect the fact that the 1870s were a particularly healthy decade, it is more likely that the 1870 census was undercounted relative to the 1880 census,

26. U.S. Census Office, *Report on the Population of the United States at the Eleventh Census: 1890,* vol. 1 (Washington, D.C.: GPO, 1895). See also Henry Gannett, "The Alleged Census Frauds in the South," *International Review* 10 (May 1881), 459–67; Francis Amasa Walker, "Enumeration of the Population, 1870–1880," in *Discussions in Economics and Statistics,* vol. 2, *Statistics, National Growth, Social Economics,* ed. Davis R. Dewey (New York: Henry Holt and Co., 1899), 61–65; and discussion in J. David Hacker, "New Estimates of Census Coverage in the United States, 1850–1930," *Social Science History* (forthcoming).

27. Margo J. Anderson, *The American Census: A Social History* (New Haven: Yale Univ. Press, 1988), 242.

biasing survival ratios upwards. The theoretically impossible ten-year survival ratio for native-born white females age 5–9 in the 1870 census to age 15–19 in the 1880 census (1.024) strongly suggests this probability. If the population was closed to migration, equally enumerated by both the 1870 and 1880 censuses, and accurately reported by age, survival probabilities must be below one. Humans between the ages of 15 and 19 do not spontaneously materialize.

Census underenumeration can be thought of as having two components—underenumeration of entire households and underenumeration of individuals within households. Remote households, migrating families in transit on census day, and families in temporary quarters and tenements were at a high risk of being missed outright. Within households, very young children, borders and lodgers, and non-nuclear family members were more likely to be missed. Although not completely distinct, missed households can be thought of as resulting from enumerator error while missed individuals within households can be thought of as resulting from respondent error. The improvements implemented by the Census Office likely resulted in more improved coverage of households than more intensive coverage of individuals within households. Unless the households successfully enumerated in 1880 that were missed in 1870 had dramatically different sex ratios—a highly dubious proposition—their inclusion can be expected to have an approximately equal impact on the male and female net undercount.

Support from this contention is provided by a demographic analysis of the 1850–1930 censuses. Net census underenumeration estimated by age and sex for the native-born white population for census years between 1850 and 1930 using a modified version of the reverse-survival method described by Coale and Zelnik (1963) suggests that the overall net census undercount for native-born white males was 6.2 percent in 1850, 6.0 percent in 1860, rose to 6.9 percent in 1870 (the highest undercount in the 1850–1930 series), and fell to 3.7 percent in 1880 (the lowest undercount in the 1850–1930 series). For white females, the estimates are 6.0 percent in 1850, 5.5 percent in 1860, 6.5 percent in 1870 (also the highest undercount in the series), and 3.6 percent in 1880 (also the lowest undercount in the series). There is a strong correlation in the male and female series, supporting the assumption that changes in the net undercount affected males and females equally.[28]

28. Hacker, "New Estimates of Census Coverage."

Given this assumption, sex differentials in survivorship, unbiased by differential undercounting, can be calculated by subtracting the female survival ratios shown in table 2 from the corresponding male survival ratios. Table 3 shows the results by age group and intercensal interval. Negative values indicate a female advantage in ten-year survivorship, and positive values indicate a male advantage. In the 1850–60 and 1870–80 intercensal intervals, values were negative during childhood, reflecting greater female survivorship, and positive during most age groups between young adulthood and age 44, reflecting greater male survivorship. The pattern is characteristic of mortality in national populations with life expectancy below 45 and suggestive of higher female mortality from pulmonary tuberculosis, infectious diseases, and maternal causes.[29] The differentials are negative for all age groups in the 1860–70 interval, however, no doubt reflecting excess male mortality during the war.

Assumption 3: War-related mortality among white females age 10–44 was negligible relative to war-related mortality among white males age 10–44.

Although examples abound, the total number of civilian deaths during the Civil War is unknown. Refugees in all wars, especially the very young and very old, are at a heightened risk of death. The vast majority of the war's civilian deaths occurred in the South. No doubt some of the South's many refugees, who fled from battles and areas occupied by the Union army, died.[30] Food and supply shortages likely contributed to higher than normal mortality in the South. Many southern families suffered from food shortages during the "hard winter" of 1864–65. "Deaths from Starvation," according to a group of

29. Samuel H. Preston, *Mortality Patterns in National Populations: With Special Reference to Recorded Causes of Death* (New York: Academic Press, 1976), 91. Although females in modern populations with high life expectancies enjoy lower mortality rates at all ages, a consistent female advantage was not typical of nineteenth-century populations. A recent comparative study of mortality in rural villages in eighteenth- and nineteenth-century Europe and Asia, for example, reports a remarkably consistent pattern of higher female mortality during prime childbearing ages across most study populations, suggesting that maternal mortality and maternal depletion played a large role in the consistent pattern. George Alter, Matteo Manfredini, and Paul Nystedt, "Gender Differences in Mortality," in *Life under Pressure: Mortality and Living Standards in Europe and Asia, 1700–1900,* ed. Tommy Bengtsson et al. (Cambridge, Mass.: MIT Press, 2004), 327–57. For the nineteenth-century United States, see the discussion in Hacker, "Decennial Life Tables."

30. Joan E. Cashin, "Into the Trackless Wilderness: The Refugee Experience in the Civil War," in *A Woman's War: Southern Women, Civil War, and the Confederate Legacy,* ed. Edward D. C. Campbell Jr. and Kym S. Rice (Richmond: Univ. Press of Virginia, 1996), 29–54.

Table 3. Sex differential in intercensal survivorship (male-female) for native-born whites, 1850–80

Age group (at first census)	Age group (at second census)	1850–60	1860–70	1870–80	Average of 1850–60 and 1870–80 intercensal intervals
5–9	15–19	–0.05752	–0.06912	–0.03740	–0.04746
10–14	20–24	–0.04707	–0.09260	–0.02065	–0.03386
15–19	25–29	0.07673	–0.04933	0.10181	0.08927
20–24	30–34	0.03058	–0.03983	0.07488	0.05273
25–29	35–39	0.05513	–0.06485	0.05921	0.05717
30–34	40–44	–0.02485	–0.06821	0.03352	0.00433
35–39	45–49	0.03501	–0.02085	0.01602	0.02552
40–44	50–54	0.00624	0.02726	0.06701	0.03663

Alabama residents in a letter to Confederate president Jefferson Davis, "have absolutely occurred."[31] Slaves who took the opportunity to escape bondage and flocked to Union army camps suffered outbreaks of camp diseases.

Direct targeting of the civilian population in the Civil War, however, appears to have been a rare exception rather than the rule. Even as the occupying Union army resolved to make the southern population, in the words of Gen. William T. Sherman, "feel the hard hand of war," Union actions were directed against southern property, not at individuals.[32] Compared to the total warfare waged in many twentieth-century wars, civilian deaths probably represented a low proportion of war-related deaths. James McPherson has suggested 50,000 as a possible total.[33]

Because the modified two-census method used in this analysis focuses on sex differentials in survival between the ages of 10 and 44, war-related deaths among native-born southern white women age 10–44 will bias the estimate. If McPherson's estimate of 50,000 civilian deaths is approximately correct, native-born southern white women's expected "share" of the civilian deaths represents approximately 9,000 deaths. Southern white women age 10–44, however, probably enjoyed a significantly lower risk of death than other members of the civilian population, particularly the very young, the very old, and the enslaved populations. In all likelihood, an estimate of 50,000 civilian deaths implies a lower total for native-born white southern women age 10–44.

If correct, 9,000 or fewer deaths among southern white women represent a very small error relative to the expected numbers of male deaths. Because war-related deaths among white women age 10–44 will have an almost direct relationship with the final estimate of male deaths, accounting for the expected deaths would increase the final estimate of excess male deaths in the 1860s by about 9,000 (less than 1.2 percent of the probable total). Doubling McPherson's guess of civilian deaths to 100,000 and the estimated number of

31. Quoted in Drew Gilpin Faust, Thavolia Glymph, and George C. Rable, "A Woman's War: Southern Women in the Civil War," in *A Woman's War: Southern Women, Civil War, and the Confederate Legacy,* ed. Edward D. C. Campbell Jr. and Kym S. Rice (Richmond: Univ. Press of Virginia, 1996), 1–27.

32. Mark Grimsley, *The Hard Hand of War: Union Military Policy toward Southern Civilians, 1861–1865* (New York: Cambridge Univ. Press: 1995).

33. Although it appears reasonable, McPherson does not indicate how he arrived at the estimate. James M. McPherson, *The Battle Cry of Freedom: The Civil War Era* (New York: Ballantine, 1988), 619.

white female deaths to 18,000 would increase the estimated male death toll by about 18,000 (just 2.4 percent of preferred estimate shown below). The calculations that follow assume zero deaths among the civilian white female population. The possible impact of women's war-related deaths is discussed in the conclusion, however, when contemplating the likely margin of error in the final estimate.

Assumption 4: The expected "normal" age pattern in the sex differential in survival for the 1860s is best approximated by averaging the sex differentials in survival observed in the 1850–60 and 1870–80 intercensal periods.

As shown in table 3 above, the male-female differential in the ten-year survival ratio was positive for most age groups in the 1850s and 1870s (greater male survival relative to female survival). Although at a somewhat different level, the age pattern for the 1850–60 and 1870–80 intercensal periods had remarkably consistent shapes, favoring females in age groups below age 15 in the first census and males in age groups above age 15. The greatest male advantage in survival was from age 15–19 in the first census to age 25–29 in the second census. Men and women between these age groups experienced peak rates of first marriage, and women experienced peak rates of childbearing. The differential declined with age, possibly the result of reduced childbearing rates at older ages and a corresponding lower risk of death in childbirth.[34] The pattern is dramatically different in the 1860–70 war decade. The differential is negative in all age groups (indicating lower male survival ratios relative to female ratios).

The final column in table 3 shows the average differential in the male-female survival ratio for the two periods by age group. If the average reflected the expected, or "normal," sex differential in the proportion surviving at each age group in the 1860s, subtracting the observed sex differential in the 1860–70 intercensal period from the average yields an estimate of the excess male proportion that failed to survival the 1860s (i.e., the excess proportion dying or excess male mortality). The last column of table 4 shows the results. Relative to the average of the sex differentials in 1850–60 and 1870–80 intercensal periods, males in the 1860s experienced excess mortality at all ages. The estimated

34. Maternal causes may have been secondary to the impact of pulmonary tuberculosis and other infectious diseases that had a disproportionate impact on women. See Preston, *Mortality Patterns in National Populations.*

Table 4. Implied excess male proportion dying in the period 1860–1870 relative to choice of comparative standard

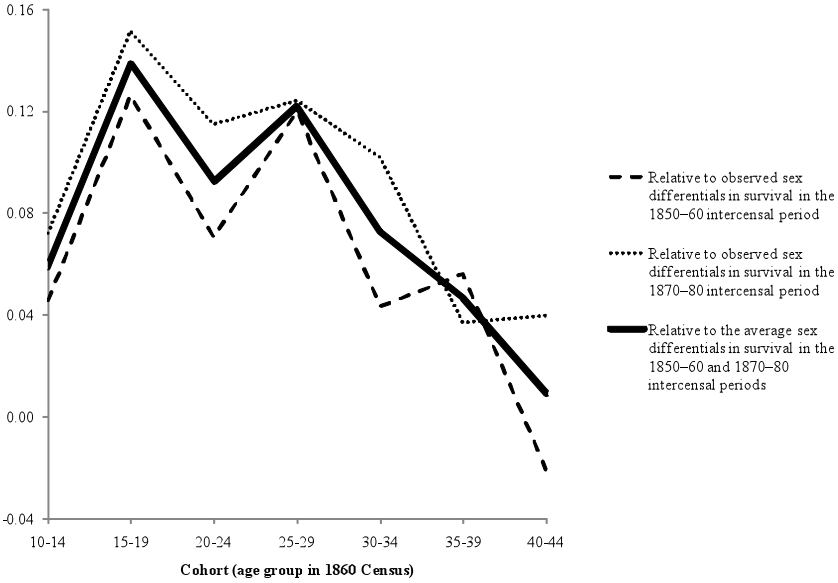
Age group (at 1860 census)	Comparative standard		
	1850–60 interval	1870–80 interval	Average of 1850–60 and 1870–80 intercensal intervals
10–14	0.04553	0.07195	0.05874
15–19	0.12606	0.15114	0.13860
20–24	0.07042	0.11471	0.09256
25–29	0.11998	0.12407	0.12202
30–34	0.04335	0.10173	0.07254
35–39	0.05587	0.03688	0.04637
40–44	–0.02102	0.03975	0.00936

excess was substantial, especially in younger groups; an additional 13.9 percent of native-born white men age 15–19 in 1860 (age 16–20 at the onset of the war in 1861 and age 20–24 at the end of the war in 1865) failed to survive the 1860s. The result is consistent with known participation rates by age. According to McPherson, the median age of Civil War soldiers was 23.5. Nearly two-fifths of all soldiers were age 21 or younger at the time of enlistment.[35]

Table 4 also shows estimated excess male mortality rates when the 1850–60 interval is used as the sole reference of the expected normal pattern of sex differentials in survival and when the 1870–80 interval is used as the sole reference. The three resulting age patterns of excess male mortality are plotted in figure 1. As illustrated in the graph, the inferred rates of excess male mortality are lower at most ages when the 1850–60 intercensal period is used as the reference for the expected sex differential in survival than they are when the 1870–80 interval is used as the reference. The difference suggests that either sex differentials in survival varied between the 1850s and 1870s or that census

35. James M. McPherson, *Ordeal by Fire: The Civil War and Reconstruction,* 2d ed. (New York: McGraw-Hill, 1992), 355. In his sample of Confederate soldiers from Mississippi, Larry Logue reports an average age of 25.6 years. Larry M. Logue, "Who Joined the Confederate Army? Soldiers, Civilians, and Communities in Mississippi," *Journal of Social History* 26.3 (1993): 611–23. Joseph Glatthaar's analysis of a six-hundred-man sample from Robert E. Lee's army indicates that volunteers in 1861 had a median age of 24 and a mean age of 25. Soldiers who entered the war in later years were considerably older. Joseph Glatthaar, *General Lee's Army: From Victory to Collapse* (New York: Free Press, 2008), 24, 358.

Figure 1. Excess male proportion dying in the interval 1860–70 by age cohort



coverage or age misreporting changed in a manner that biased the results. Although our knowledge of nineteenth-century U.S. mortality is limited, demographers have observed that sex differentials in mortality vary with the level of mortality and disease environment. The mortality transition from high to low mortality, and the accompanying epidemiological transition from infectious to degenerative diseases as the leading causes of death, was more accelerated for females than males.[36] As a result, a large female advantage in life expectancy emerged in the early twentieth century. There is little reason to suspect that the overall level of mortality changed significantly between the 1850s and 1870s, however, and no reason to believe that mortality was higher in the 1870s. Most studies of nineteenth-century mortality indicate that the mortality transition did not commence in the United States until after 1880. The two best studies, based on different types of evidence, indicate modestly lower mortality rates in the 1870s than in the 1850s.[37]

36. Preston, *Mortality Patterns in National Populations;* Hacker, "Decennial Life Tables."

37. Michael R. Haines, "The Use of Model Life Tables to Estimate Mortality for the United States in the Late Nineteenth Century," *Demography* 16.2 (1979): 289–312, is based on mortality censuses conducted by the Census Office. Clayne L. Pope, "Adult Mortality in America before

Long-run growth in the proportion of the nation's population living in urban areas and redistribution of the population from east to west may have caused changes in the prevalence of different diseases between the 1850s and 1870s, which in turn may explain the observed higher ratios of male to female survival in the 1870–80 intercensal intervals. The percentage of the population living in urban areas nearly doubled between 1850 and 1880, increasing from 15.4 percent in 1850 to 19.8 percent in 1860, 25.7 percent in 1870, and 28.2 percent in 1880. During the same period the nation added California, Minnesota, Oregon, Kansas, West Virginia, Nebraska, Nevada, Nebraska, and Colorado as new states, and New Mexico, Utah, Washington, Dakota Territory, Arizona, Idaho, Montana, and Wyoming as new territories. Although an impressive expansion of the nation's territory and suggestive of a dramatic movement of the population westward into new and perhaps different disease environments, it is important to remember that most western states were sparsely populated. The geographic center of the population moved just 80.6 miles west between 1850 and 1860, another 44.1 miles between 1860 and 1870, and 58.1 miles between 1870 and 1880.[38]

If increasing urbanization and western migration explain the difference in sex differentials in survival observed in the 1850s and 1870s, the essential questions are when those changes affected the sex differentials and what pattern best characterizes the "normal" pattern for the 1860s. A good case can be made for gradual change and the choice of the average of the two periods. Both urbanization and western migration were steady, long-term processes affecting both sexes, with little sign of interruption during the war. If we average the percentages of the population living in urban areas at the beginning and end of each decade to represent the average for the intercensal intervals, the percentage living in urban areas in the 1860s (22.7 percent) was very close to halfway between the averages for the 1850s and 1870s (22.3

1900: A View from Family Histories," in *Strategic Factors in Nineteenth Century American Economic History: A Volume to Honor Robert W. Fogel,* ed. Claudia Goldin and Hugh Rockoff (Chicago: Univ. of Chicago Press, 1992), 267–96, is based on genealogical data.

38. Michael R. Haines, "Population Characteristics," in *Historical Statistics of the United States,* vol. 1, part A, *Population,* ed. Richard Sutch and Susan B. Carter (New York: Cambridge Univ. Press, 2006), 1.17–25, 1.36, table Aa22–35; U.S. Bureau of the Census, *Fourteenth Census of the United States Taken in the Year 1920: Population 1920. Number and Distribution of Inhabitants* (Washington, D.C.: GPO, 1921), 34. Although the movement of the geographic center of the population between 1850 and 1880 was impressive relative to other thirty-year periods in U.S. history, it does not in itself suggest a dramatic shift in the disease environment.

Table 5. Implied number of excess native-born white male deaths in the period 1860–1870 relative to comparative standard

Age group (at 1860 census)	1860 Population (native-born white males)	Excess deaths by comparative standard		
		1850–1860	1870–1880	Average of 1850–1860 and 1870–1880 intercensal intervals
10–14	1,446,005	65,836	104,041	84,938
15–19	1,233,984	155,556	186,507	171,031
20–24	1,055,632	74,333	121,088	97,710
25–29	855,794	102,682	106,174	104,428
30–34	678,327	29,408	69,006	49,207
35–39	584,639	32,661	21,560	27,111
40–44	471,681	(9,915)	18,749	4,417
Total	6,326,062	450,561	627,124	538,842

percent). The center of the population in the mid-1860s was likely less than ten miles from the average of the geographic centers in the mid 1850s and mid 1870s. Although we have no way of knowing whether—in the absence of the war—sex mortality differentials in the 1860s would have been closer to the pattern observed in the 1850s or closer to the pattern observed in the 1870s, the choice of the average pattern is the most defensible.[39]

Multiplying the excess male mortality rates shown in table 4 by the number of native-born white men in the 1860 census in each age group yields estimates of the excess number of native-born white men dying in the 1860s. The estimates assume no net undercount in the 1860 census. Table 5 shows the resulting estimates and highlights the impact of the choice of reference on the estimated totals. If the 1850–60 interval is used as the sole expected normal pattern of sex differentials in survival for the 1860s, the final estimate of excess native-born white male deaths in the 1860s is approximately 451,000. If the 1870–80 interval is used as the expected normal pattern, the final estimate is approximately 627,000 excess deaths. The preferred estimate, based on the average of the two intervals, is 539,000. Clearly, the choice of comparative standard has a large impact on the final estimate of excess male deaths and introduces a large margin of potential error.

Assumption 5: Foreign-born white males experienced the same rate of excess mortality as native-born white males.

Approximately one-fifth of the white men of military age enumerated by the 1860 census were foreign born. To this point the analysis has examined only native-born white men. Did foreign-born men face a heightened or lowered risk of death in the 1860s relative to native-born men, related perhaps to a different participation rate in the war effort or to a different risk of death during the war? The literature on the participation of foreign-born males is mixed. Early work suggested that the foreign-born men were overrepresented in the Union army, confirming southerners' characterization of the Union army as an army of foreigners.[40] Research by James McPherson, in contrast,

39. On the importance of urban and rural residence on nineteenth-century mortality levels and the mortality transition in the United States, see Michael R. Haines, "The Urban Mortality Transition in the United States, 1800–1950," *Annales de Démographie Historique* 1 (2001): 33–64; Robert Higgs, "Mortality in Rural America," *Explorations in Economic History* 10.2 (1973): 177–95.

40. Ella Lonn, *Foreigners in the Union Army and Navy* (Baton Rouge: Louisiana State Univ. Press, 1951).

indicated that the foreign born were somewhat underrepresented in the Union army. McPherson's analysis of Benjamin A. Gould's U.S. Sanitary Commission study indicated that 26 percent of white males in the Union army were foreign born, compared to 31 percent of the northern white military age population. McPherson hypothesized that the slightly lower participation rates implied by the estimates reflected greater opposition to the war from Irish and German Catholic immigrants or by the fact that non-declarant aliens were not subject to the draft.[41]

More recently, however, Dora Costa has shown that Gould's U.S. Sanitary Commission sample was biased toward the native-born population.[42] Although not perfectly representative, a random sample of over three hundred Union army companies collected at the University of Chicago under the direction of Robert Fogel indicates the Union army recruits were representative of the northern population in terms of foreign birth.[43] A sophisticated demographic analysis by Daniel Scott Smith that relied on an analysis of published aggregate data and a preliminary version of the 1860 IPUMS sample also indicated equal participation by nativity.[44] Foreign-born soldiers appear to have been slightly overrepresented in the Confederate army. According to McPherson, between 9 and 10 percent of Confederate soldiers were foreign born, slightly more than their 7.5 percentage in the southern white male population of military age.[45]

There is very little research on the impact of nativity on the risk of death during the war. Chulhee Lee's analysis of disease mortality in the Union army—which represented approximately two-thirds of all Union deaths—suggests little difference, however. Using a sample of over 28,000 recruits from eighteen different states in the Northeast, Midwest, and upper South, Lee showed that while foreign-born recruits suffered lower incidence rates

41. McPherson, *Ordeal by Fire,* 356–57.

42. Dora L. Costa, "The Measure of Man and Older Age Mortality: Evidence from the Gould Sample," *Journal of Economic History* 64.1 (2004): 1–23.

43. Robert William Fogel, "New Sources and New Techniques for the Study of Secular Trends in Nutritional Status, Health, Mortality, and the Process of Aging," *Historical Methods* 26.1 (1993): 5–43.

44. Daniel Scott Smith, "Who Fought for the Union Army?" paper presented at the annual meeting of the American Historical Association, Jan. 6, 2000, Chicago, Illinois. Smith showed that it is important to consider that the foreign-born population was more concentrated in military ages—although not in the peak age 18–25 group—and were overrepresented in the Union navy.

45. McPherson, *Ordeal by Fire,* 357.

Table 6. Implied number of excess white male deaths in the 1860–70 period for the white population (native and foreign born) by assumed census undercount

	No net undercount of census		6.0 percent net undercount of census	
Age group (at 1860 census)	1860 population (total white males)	Excess male deaths	"True" 1860 population (total white males)	Excess male deaths
10–14	1,570,072	92,226	1,670,289	98,113
15–19	1,405,846	194,852	1,495,581	207,289
20–24	1,318,479	122,040	1,402,637	129,830
25–29	1,182,724	144,321	1,258,217	153,533
30–34	1,015,452	73,662	1,080,268	78,364
35–39	844,379	39,155	898,276	41,654
40–44	680,430	6,372	723,862	6,779
Total		672,628		715,562

Note: The "true" 1860 population is obtained by adjusting the enumerated population by the assumed net undercount of the 1860 census.

of disease per year of service than native born soldiers, they suffered higher case fatality rates. The net result was an approximately equal risk of death from disease between native-born and foreign-born recruits.[46] Smith's regression analysis of company-level mortality also showed that the percentage of foreign-born men in a company was not a significant predictor of its number of deaths per average length of service.[47] Given evidence of approximately equal participation rates and equal mortality risks by nativity, the assumption that foreign-born white males experienced the same rate of excess mortality as native-born white men appears justified.

The second and third columns of table 6 repeat the estimation of excess male deaths shown in table 5 for the overall white male population (native and foreign born) enumerated in the 1860 census using the average sex differentials in survival from the 1850s and 1870s as a reference. It thus assumes equal excess mortality rates by nativity and no net undercount by the 1860 census. Including foreign-born men raises the preferred estimate of excess male mortality to about 673,000.

46. Lee, "Prior Exposure to Disease and Later Health and Mortality."

47. Smith, "Who Fought for the Union Army?" Smith relied on Fox's *Regimental Losses* for mortality data.

Assumption 6: The net census undercount of white men age 10–44 in the 1860 Census was between 3.7 and 6.9 percent, with a preferred estimate of 6.0 percent.

The estimates of excess male mortality shown in table 5 and the second and third columns of table 6 assume no net census undercount of white males in the 1860 census. Census historians are far less sanguine. In 1991, a special issue of the journal *Social Science History* dedicated to the question of coverage errors in the 1850–80 U.S. censuses detailed many obstacles to achieving a complete count in the late nineteenth century, including a weak bureaucratic census apparatus with limited oversight, untrained enumerators, and the inherent difficulties counting a widely dispersed, diverse, and rapidly growing population. In a useful summary of existing studies, Richard Steckel observed that undercount estimates for the 1850–80 censuses conducted for selected local areas range from 9.2 to 34.9 percent.[48] These estimates, which rely on the rate of failure in making links between individuals recorded by the censuses and other nominal listings such as city directories and tax records—are clearly too high. Illegible handwriting or poorly transcribed names result in link failures, inflating undercount estimates. Individuals moving or dying between the nominal listing and the census may also appear as undercounts. Estimates based on demographic analysis, which combine the undercount and overcount to yield the net undercount, are much lower. In a review of the various sources and methods used to estimate census undercounts, Miriam King and Diana Magnuson concluded that while linkage studies are valuable for identifying subpopulations most likely to be missed by the census, demographic analysis provides the best estimate of the level of the undercount.[49]

Demographic analysis of the 1850–1930 IPUMS samples suggests that the net census undercount for white males age 10–44 ranged from a low of 3.7 percent in the 1880 census to high of 6.9 percent in the 1870 census. The net undercount in the 1860 census for white males age 10–44 was 6.0 percent.[50] Based on these estimates, a 6.0 percent net census undercount was assumed to construct a preferred estimate. The impact of the estimate is shown in the last two columns of table 6. When the 1860 white population is inflated to

48. Richard H. Steckel, "The Quality of Census Data for Historical Inquiry: A Research Agenda," *Social Science History* 15.4 (1991): 579–99.

49. Miriam L. King and Diana L. Magnuson, "Perspectives of Historical U.S. Census Undercounts," *Social Science History* 19.4 (1995): 455–66.

50. These estimates are weighted averages for native-born white men between ages 10 and 44 shown in Hacker, "New Estimates of Census Coverage."

account for the suspected undercount, the estimated number of excess white male deaths in the 1860s is increased from 673,000 to 716,000.

Although demographic analysis is the preferred method of estimating census undercounts, all methods are fallible. The lack of a vital registration system in the nineteenth-century United States requires the construction of a birth series from multiple censuses and life tables of unknown accuracy. As a result, the 6.0 percent undercount estimate used in table 6 to construct the preferred death toll estimate has an unknown margin of error. Because the method is based on multiple census years, the census-to-census change in the net undercount is fairly reliable, however. Given the small range in the estimates for the 1850–1930 period, it is probably safe to assume that the true net undercount of the 1860 census fell within the 3.7–6.9 percent range estimated for the other censuses. The potential impact of using the upper and lower bound estimates on estimated deaths is explored in the conclusion below.

Assumption 7: 36,000 black men died in the war.

The two-census approach described above cannot be used to estimate excess male deaths in the black population. One reason is that black civilian deaths, rather than being a negligible part of the total excess number of black deaths, likely approached or exceeded the number of military deaths. High mortality rates among both black males and females in contraband camps during the war, high mortality associated with the postwar migration of blacks from rural to urban areas, the transition from slave to free labor, and postwar violence directed at the black population strongly suggests a high number of civilian deaths. Because black women also suffered elevated mortality, excess male deaths cannot be inferred from the age pattern of sex differentials in survival. Even if excess black mortality in the 1860s could be estimated, it is unclear what proportion should be attributed to the Civil War.

Given these difficulties, the direct estimate of 36,000 deaths among the Union army's 179,000 black soldiers made by the War Department and commonly cited by historians is preferred.[51] Adding this estimate to the preferred estimate of excess white deaths increases the total number of excess male deaths to approximately 752,000.

51. Ira Berlin, Joseph P. Reidy, and Leslie S. Rowland, eds., *Freedom: A Documentary History of Emancipation, 1861–1867,* ser. 2, *The Black Military Experience* (New York: Cambridge Univ. Press, 1982), 633.

Assumption 8: Excess male mortality in the 1860s was due entirely to the American Civil War. This article assumes that the large excess male mortality observed in the 1860s was the result of the American Civil War. Although there is little doubt that the war was the primary cause of the observed sex differential in mortality, there is no way to be certain that it was the sole cause. The indirect methods used here simply indicate an excess level of mortality experienced by white men in the 1860s relative to sex differentials in mortality observed in the surrounding decades; they do not explain why men experienced higher than expected mortality. Other factors that may have affected sex differentials in mortality, such as a changing disease environment, potentially biases the estimate of excess male mortality due to the war. The direction of the bias may have been upwards or downwards. The deficit of approximately one million white births in the war years, for example, may have reduced the risk of death in childbirth among women of childbearing ages relative to women in the 1850s.[52] If the effect was significant, the estimate of excess male deaths in the 1860s would be too low.

The preferred estimate suggested above—approximately 752,000 male deaths—is about 20 percent higher than that the commonly cited estimate of 620,000 deaths. As discussed earlier, however, early estimates likely undercounted deaths during the war. Prior estimates also failed to consider the heightened risk of death faced by veterans in the immediate years after the war and the heightened risk of death from guerilla warfare and irregular violence that went unrecorded in military records. Arguably, the postwar deaths of soldiers mustered out of service with diseases contracted while in camp, the deaths of men from complications related to unhealed battle wounds, and the postwar suicide of men with post-traumatic stress disorder should be attributed to the war.[53] Even if the existing estimate of approximately

52. For an estimation of the war-related birth deficit, see James David Hacker, "The Human Cost of War: White Population in the United States, 1850–1880" (PhD diss., Univ. of Minnesota, 1999), 103–4.

53. Francis Amasa Walker, superintendent of the 1870 census, contended that approximately 200,000 men died between their discharge from the Union army and the 1870 census. Walker assumed that approximately one-third of the 285,000 discharged on account of disability died within a few years of their discharge and that the remainder of the accelerated deaths were incurred among the remaining two million men discharged from the service "who carried out with them the seeds of diseases contracted under the hardships and exposures of the campaign, or returned to civil life with shattered constitutions." When added to the 304,000 Union deaths then estimated by the Surgeon General's Office, he concluded, "500,000 will surely be a moderate estimate for

620,000 military deaths was accurate, it is clear that war-related deaths are the overwhelming explanation for excess male mortality in the 1860s.

Excess Death Estimates by Region of Birth

If the preferred estimate of 752,000 excess deaths is approximately correct, then one or more of the following potential explanations must be true: the traditional estimate of 360,000 Union deaths is too low; the traditional estimate of 258,000 Confederate deaths is too low; a large number of men discharged from the armed forces died from war-related causes between the end of their service and the 1870 census; a large number of non-enlisted men died as a result of guerilla warfare or other war-related causes.[54]

Unfortunately, the estimation methods, which rely on place of birth reported in the census, cannot be used to estimate excess male deaths in the Union or Confederate forces. Census-based methods, however, can be used to construct excess male death estimates by region of birth for native-born white males. Table 7 shows the results of the application of the procedures outlined above to the white population born in the free states and territories, the border slave states, and the southern slave states.[55] Excess mortality

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the direct losses among the Union armies." Walker also assumed 350,000 Confederate deaths, bringing the total number of excess deaths to 850,000. Francis Amasa Walker, "Report of the Superintendent of the Ninth Census," in U.S. Census Office, *Ninth Census,* vol. 1, *The Statistics of the Population of the United States* (Washington, D.C.: GPO, 1872), xviii–xi.

54. At first glance, the Life-Cycle Data on the Aging of Veterans of the Union Army—a random sample of approximately 40,000 Union army recruits with longitudinal data covering much of their subsequent life histories collected under the direction of Robert W. Fogel at the University of Chicago—would provide a way to estimate whether soldiers suffered an elevated risk of death between their discharge from the service in the 1870 census. Most recruits, however, were not under observation between their discharge from the service and their acceptance into the federal pension system in the late nineteenth century. Their deaths between the end of the war and the 1870 census are thus underreported in the dataset. The Union army dataset is available at http://www.cpe.uchicago.edu.

55. The border slave states are here defined as Missouri, Kentucky, Maryland, Delaware, and the District of Columbia. The southern slave states are the states that declared their secession from the Union. The northern and western states included all other states and territories. West Virginia, formed from western counties of Virginia with majority support for remaining with the Union, became a state in 1863 and is traditionally counted among the border states. Unfortunately, birthplace data in the census does not distinguish between West Virginia– and Virginia-born individuals until the 1870 census. By necessity, West Virginia had to be included among the southern states.

Table 7. Implied number of excess white male deaths in the 1860–70 period by region of birth and comparative standard

Age group (1860 census)	1860 population (white males)	Excess male deaths by comparative standard			Percentage dying
		1850–60	1870–80	average	
		White population born in northern and western states and territories			
10–14	984,111	8,853	46,168	27,510	2.8
15–19	868,128	98,047	127,713	112,880	13.0
20–24	726,992	24,834	35,775	30,305	4.2
25–29	593,492	59,036	58,736	58,886	9.9
30–34	465,379	15,174	32,738	23,956	5.1
35–39	394,477	4,581	7,556	6,068	1.5
40–44	324,752	(5,867)	14,794	4,463	1.4
Total	4,357,330	204,658	323,480	264,069	6.1
		White population born in border slave states			
10–14	126,909	28,069	15,406	21,738	17.1
15–19	103,962	30,187	16,597	23,392	22.5
20–24	76,275	(2,671)	6,310	1,820	2.4
25–29	64,311	16,659	17,068	16,863	26.2
30–34	50,309	(6,050)	(1,299)	(3,675)	–7.3
35–39	48,263	8,866	5,401	7,134	14.8
40–44	35,552	(6,811)	1,027	(2,892)	–8.1
Total	505,582	68,248	60,511	64,380	12.7
		White population born in southern slave states			
10–14	432,328	36,280	45,721	41,001	9.5
15–19	344,537	41,048	45,926	43,487	12.6
20–24	323,301	57,564	88,436	73,000	22.6
25–29	255,435	35,706	44,632	40,169	15.7
30–34	208,247	22,577	42,977	32,777	15.7
35–39	181,308	20,334	8,192	14,263	7.9
40–44	143,074	355	4,904	2,630	1.8
Total	1,888,230	213,864	280,789	247,327	13.1

Notes: The 1860 population is estimated by weighting the IPUMS samples with the person weight variable, cross-tabulating by age group and birth region, and adjusting the resulting counts for census undercount using the weighted average age 10–44 sectional estimates in Hacker, "New Estimates of Census Coverage" (forthcoming). Border slave states include Missouri, Kentucky, Maryland, Delaware and the District of Columbia. Southern slave states include the states seceding from the Union. Northern and western states and territories include all other states and territories.

The percentage dying in each age group is calculated from the preferred number of excess deaths shown in the fifth column, which are in turn based on the average sex differentials in survival observed in the 1850–60 and 1870–80 intervals (not shown).

estimates based on the preferred average of the male-female differentials in survival observed in the 1850–60 and 1870–80 intercensal intervals (the fifth column in table 7), indicates that the excess number of war-related deaths among white men born in the free states and territories (264,000) was approximately equal to the excess number of deaths among white men born in the southern slave states (247,000). If the estimated mortality from the border slave states is included, the total number of excess deaths was higher among men born in the slave states (311,000). As a proportion of the population, it was much higher. 13.0 percent of white men of military age born in the slave states died as a result of the war; among men born in the free states and territories the percentage dying was 6.1 percent.[56]

It is likely that the majority of men born in the border states fought for the Union, however. James McPherson has estimated that approximately 2 out of 3 men in the border states of Missouri, Kentucky, Maryland, and Delaware fought for the Union army.[57] Unfortunately, McPherson's estimates cannot be used to divide the estimated 64,000 excess deaths among men who were born in border states. Even if we made the questionable assumption that estimates of Union and Confederate enlistment proportions in border states approximated the enlistment proportions of the men born in those states, we do not know whether men who enlisted in the Union and Confederate armies served equivalent lengths of service or how much the relative risk of death associated with their participation may have differed.[58] Presumably,

56. If we assume 9,000 female civilian deaths and further assume that those deaths occurred among women born in the South, the percentage of white men born in southern slave states dying as a result of the war rises to 13.4 percent. Although the northern percentage dying is approximately equal to the Union percentage dying estimated by Vinovskis (6 percent), the percentage of southern men dying is lower than his estimated percentage of Confederate men dying (18 percent). This is not a valid comparison, however. The denominators in Vinovskis's percentages are the number of white men age 13–42 living in the North and South; the denominators used in table 7 are white men age 10–44 *born* in the respective regions, including the western states and territories. Vinovskis also excluded parts of the population of Tennessee and the border states from the Confederate population denominator, included those populations as part of the Union population, and excluded the population living in the West. As a result, his Union percentages will be lower and his Confederate percentages higher than the percentages shown in table 7. Unfortunately, Vinovskis's assumptions, which are valid for the resident population, are not valid for state of birth populations and cannot be applied without significant error. Vinovskis, "Have Social Historians Lost the Civil War?"

57. McPherson estimates 170,000 men fought for the Union army and 86,000 for the Confederate army. McPherson, *Ordeal by Fire,* 156–62.

58. Analysis of the 1860 IPUMS sample indicates that approximately 9 percent of white men

men who enlisted in the Confederate army faced a higher risk of death. In conclusion, there is no way to estimate Union and Confederate deaths among men born in the border states without making several questionable assumptions, including an a priori assumption of differential mortality.

There are additional problems estimating Union and Confederate deaths with the census. Although the difficulty of dividing excess death estimates into sectional subtotals is most acute for individuals born in border states, internal migration, while largely along an East-West axis, was substantial enough across sectional boundaries to matter. North-South migration and individual choice meant that both sides included men from every state. Virginia, treated in this analysis as a non-border slave state, and Tennessee are a special cases. Many of the men born in Virginia, especially those who were living in the western counties that became West Virginia, fought for the Union side. Tennessee, a southern state but with substantial Union sentiment in the eastern mountain regions, also provided many men for the other side. Possible regional differentials in foreign-born participation relative to their proportion in the population and regional differentials in census coverage add to the potential error. Finally, the error inherent in the census-based estimation method argues against attempting to construct and compare Union and Confederate estimates. As shown in table 7, the choice of the expected normal pattern of male-female differentials in survival suggests the possibility that the number of excess deaths among white males born in the South may have been 43,000 more than the number among white men born in the free states and territories or as many as 50,000 deaths fewer. Given this wide range, the difficulties in dividing border state deaths, and other potential errors, it is impossible to determine whether the undercount in the traditional estimate was primarily the result of undercounted Union deaths, undercounted Confederate deaths, or other factors, such as the postwar deaths of military men and the war-related deaths of men not in the Union or Confederate forces.[59]

age 10–44 living in the border states in 1860 were born in the North, 6 percent were born in the South, and 13 percent were foreign born. Among the white men age 10–44 born in one of the border states, only 80 percent were still living in one in 1860; 15 percent were living in a free state or territory and 5 percent were living in a non-border slave state.

59. The results shown in table 7 illustrate a few other shortcomings of the census-based method. Excess mortality estimates for the border slave states vary erratically by age group and are even negative for some age groups, suggesting inconsistent age-reporting, census coverage errors, or other problems in the data. In contrast to the northern-born and southern-born

Summing Up: How Confident Can We Be in a Census-Based Estimate?

Each step in the calculation of excess male deaths in the 1860s introduces potential error. For the final estimate to be useful, some sense of its robustness to alternative assumptions is needed.

The most critical assumptions are the net census undercount of the 1860 census and the assumed "normal" male-female differential in ten-year cohort survival ratios in the 1860s. Table 8 shows alternative excess death estimates using maximum, minimum, and preferred estimates of each. Based on the demographic analysis of the 1850–1930 censuses, the preferred net census undercount of white males age 10–44 is assumed to be 6.0 percent. The minimum and maximum estimates are assumed to be 3.7 percent and 6.9 percent, suggested by the lowest and highest values estimated in the series. The unknown true net undercount can be safely assumed to be between the minimum and maximum estimates.

The preferred normal sex differential in survival for the 1860s is assumed to be the average of the of the sex differentials observed in the 1850s and 1870s. The "minimum" assumption—which results in the lowest estimate of excess male deaths—is based on the sex differentials in cohort survival observed in the 1850–60 intercensal interval. The "maximum" assumption is based on the sex differentials in the 1870–80 interval. Again, the unknown true sex differentials in survival can safely be assumed to be between the minimum and maximum estimates.

The table suggests a wide range of possible estimates. Using the minimum census undercount and the minimum standard for assumed sex differentials in survival, the number of excess male deaths in the 1860s is 618,000—approximately equal to the conventionally cited figure. Using the maximum assumptions, the number of excess male deaths is 879,000; one-quarter

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regions, the use of the 1850–60 comparative standard for the normal pattern of male-female survival ratios resulted in larger excess male mortality estimates among white men born in the border states than the use of the 1870–80 standard. The inconsistent results may simply reflect the smaller area studied. The 1850, 1860, 1870, and 1880 IPUMS samples, which have a 1 percent sample density in most census years, do not provide enough white men and women in each age group to reliably construct excess mortality estimates for small areas. For this reason, state-level estimates based on the current IPUMS samples would be subject to significant potential error. A complete database of the 1850 census is now under construction at the Minnesota Population Center at the University of Minnesota. If higher density samples of the 1860 and 1870 censuses are constructed at a future date, state-level estimates may become viable.

Table 8. Implied excess male deaths by assumed census undercount and comparative standard

Minimum undercount		Male-female differential survival ratios used as comparative standard		
Age group (1860 census)	1860 population with assumed 3.7 percent census undercount	"Minimum" observed differentials in 1850–60 interval	"Preferred" average of 1850–60 and 1870–80 differentials	"Maximum" observed differentials in 1870–80 interval
10–14	1,630,397	74,231	95,769	117,308
15–19	1,459,861	184,030	202,338	220,646
20–24	1,369,137	96,408	126,729	157,049
25–29	1,228,166	147,360	149,866	152,373
30–34	1,054,467	45,715	76,492	107,270
35–39	876,821	48,984	40,659	32,334
40–44	706,573	(14,852)	6,617	28,086
Total white deaths		581,877	698,472	815,066
Assumed total black deaths		36,000	36,000	36,000
Total excess deaths		617,877	734,472	851,066

Preferred undercount		Male-female differential survival ratios used as comparative standard		
Age group (1860 census)	1860 population with assumed 6.0 percent census undercount	"Minimum" observed differentials in 1850–60 interval	"Preferred" average of 1850–60 and 1870–80 differentials	"Maximum" observed differentials in 1870–80 interval
10–14	1,670,289	76,047	98,113	120,178
15–19	1,495,581	188,533	207,289	226,045
20–24	1,402,637	98,767	129,830	160,892
25–29	1,258,217	150,966	153,533	156,101
30–34	1,080,268	46,833	78,364	109,895
35–39	898,276	50,183	41,654	33,126
40–44	723,862	(15,215)	6,779	28,773
Total white deaths		596,115	715,562	835,009
Assumed total black deaths		36,000	36,000	36,000
Total excess deaths		632,115	751,562	871,009

Maximum undercount		Male–female differential survival ratios used as comparative standard		
Age group (1860 census)	1860 population with assumed 6.9 percent census undercount	"Minimum" observed differentials in 1850–60 interval	"Preferred" average of 1850–60 and 1870–80 differentials	"Maximum" observed differentials in 1870–1880 interval
10–14	1,686,436	76,782	99,061	121,340
15–19	1,510,039	190,356	209,293	228,230
20–24	1,416,197	99,722	131,085	162,447
25–29	1,270,380	152,425	155,018	157,610
30–34	1,090,711	47,286	79,122	110,957
35–39	906,959	50,668	42,057	33,446
40–44	730,859	(15,362)	6,844	29,051
Total white deaths		601,877	722,479	843,081
Assumed total black deaths		36,000	36,000	36,000
Total excess deaths		637,877	758,479	879,081

million deaths more than the minimum estimate and more than 40 percent higher than existing estimates. The preferred estimate, 752,000 excess deaths, is more than 20 percent higher than commonly cited estimates. The possible range could be further extended by including the unknown error in assuming equal excess mortality among native-born and foreign-born males, in using existing estimates of black mortality, and in estimating the number of civilian deaths among white females age 10–44. The latter will increase the minimum, preferred, and maximum estimates shown in table 7 modestly. Using the suggested figure of 9,000 female deaths discussed above, the minimum and maximum figures would increase to about 627,000 and 888,000 excess deaths and the preferred estimate to about 761,000.

The wide range of estimates highlights the potential error in using census data to estimate war deaths. It is very unlikely, however, that the true number of excess male deaths fell at or near one of the two extremes suggested in table 7. Both the net census undercount and normal pattern of sex differentials in survival were likely closer to the preferred estimate than the minimums or maximums suggested. A more realistic probable range, rounded to the nearest 50,000 deaths, might be from 650,000 to 850,000 excess deaths, with a preferred estimate of 750,000.

Existing estimates, particularly estimates of deaths in the Confederate forces, also have a large margin of error and likely undercount deaths. Veterans mustered out of the Union and Confederate armies with diseases or mental disorders related to their service no doubt faced a significantly elevated risk of death in the years immediately after the war. Guerilla warfare and irregular fighting also contributed to excess male mortality. Any assessment of the war's ultimate death toll should include these war-related deaths. Despite its many shortcomings and wide margin of possible error, a census-based count of Civil War deaths is preferable to the existing, century-old estimate of 620,000 deaths. The human cost of the Civil War was greater than historians have long believed.