Income and Health in African America:

Evidence from Union Army Pensions

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Abstract

We investigate the effect of income on African American mortality. This is the first study to address the role of income at the microeconomic level in historical health for African Americans. We use the cohort of African American Union Army veterans as it contains information on early life conditions, pension income, specific health status measures and cause of death. This allows us to present the fist descriptive analysis of the relationship between income and health status for African Americans in the late nineteenth and early twentieth centuries. Since veterans received pensions based on proof of disability at medical exams, estimates of the causal effect of income on mortality will be biased as ill veterans received larger pensions. To circumvent this endogeneity bias, we propose an exogenous source of variation in pension income that exploits the historical circumstances of pension determination: the term length of the examining surgeon who certified illness and disability. Examining surgeons are unrelated to health but directly related to pension amount as they determine health status ratings used to award pensions. We find a curious case of historical health disparities– black veterans who saw newly appointed doctors were awarded larger pensions. Using the instrument, we find that the causal effect of income on health for black veterans was large when correcting for endogenity.

1 Introduction

How much of the black-white mortality gap in the late 19th century and early 20th century U.S. can be explained by income differences between the races? In 1900, the black-white differential in life expectancy was approximately 10 years,[1] and city-level differentials in black-white death rates ranged from 13.8 per 1000 in New Orleans to 25.3 per 1000 in Annapolis.[2] While there is still a black-white gap in life-expectancy, the gap has narrowed significantly over the 20th century. According to U.S. Census estimates from 2000, the gap is approximately 5 years.[3] Concentration on the gap in mortality obscures the fact that mortality declines over the twentieth century were, inherently, larger for African Americans than for whites.

Given the recent literature on the mortality decline for both the black and white population in this period, it is clear that the two most important determinants of health status were socio-economic status and the introduction of public health interventions. Medicine, as such, had a relatively passive role.[4] Scholars such as Fogel and McKeown have emphasized the role of increases in standards of living, and in particular improvements in nutrition, in the decline in mortality prior to the introduction of modern medicine techniques and drugs such as antibiotics.[5] For those living in cities, public health interventions such as water purification and the construction of sewer systems reduced mortality by as much as 50%[6]. However, while the black-white gaps in education and income levels were large in this period, recent research by Troesken has shown that blacks and whites had similar access to clean water in cities.[7] Therefore, racial inequities in access to public goods such as clean water do not explain the black-white mortality gap in the period. After 1908, Troesken shows that equity in access to clean water leads to declining rates of typhoid and other infectious illnesses as well as a *convergence* of black and white mortality rates. However, several questions still remain unaddressed in the current literature: 1) What role did income play in the

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[1] See Troesken (2004), p. 2

[2] ibid., p. 6

[3] ibid., p. 2

[4] Eli (2010) contains a discussion of the efficacy of emerging medical treatments, which include the use of sulfa drugs. However, medicine remained largely ineffectual in this period.

[5] Fogel (2004)

[6] Scholars such as Cutler, Miller, Ferrie and Troesken have contributed to this literature. See Cutler (2005) and Ferrie (2005

[7] Troesken (2004

mortality of African Americans in the Post-Bellum era? 2) How did social circumstances such as segregation play a role in mortality, especially in rural areas where the majority of the African American population lived until the 1940s? 3) What explains the black-white mortality gap in cities prior to the large-scale public health interventions of the early twentieth century?

In this paper, we investigate the effect of income increases on black mortality by using evidence from pensions received by black veterans who served as Union Army soldiers during the American Civil War. The benefit of using the cohort of black Union Army veterans is that we have information on pension income, health status and cause of death.[8] Information on the health status of veterans is available since veterans were required to undergo medical exams by qualified surgeons and furnish the Pension Bureau with surgeons' reports in order to qualify for pensions. This, by itself, gives us some of the first information on individual African American health after the Civil War.

Identification of the causal effect of income on mortality is complicated, however. Since veterans received pensions based on proof of disability at medical exams, estimates of the effect of pension income on mortality will be biased upward. Therefore, it will seem as though increases in pension income lead to a higher risk of mortality. To circumvent this endogeneity bias, we propose an exogenous source of variation in pension income: the term length of examining surgeons. We hypothesize that the length of time in service to the pension bureau would have an effect on pension rating that is exogenous to the true health condition of the veteran. The medical literature at the time advanced the position that black bodies were inferior to white ones, which could lead to lower ratings of disability for African Americans.[9] Another advantage is that our measure of doctors comes from a time before and after the liberalization of the pension law, which occurred in 1890. Before 1890, pension legislation was tied to war-related illness and injury and less prone to doctor-specific bias or experience. After 1890 all disabilities qualified, and this gave larger room for doctor subjectivity.

We construct a proportional hazard model to estimate income effects on the probability of death from any cause and from specific causes. First, we present coefficient estimates on the effects

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[8]This information was kept by the Pension Bureau, which was a sub-division of the federal government's Department of the Interior. These records were digitized by the Center for Population Economics at the University of Chicago. In this study we use the new, larger sample of the black veterans records.

[9]Hoffman (2000)

of pension income and mortality without correcting for reverse causality. Despite the fact that coefficient estimates are biased, they are still informative. We find that the endogeneity bias for blacks is larger than that for whites when estimating the effect of pension income on mortality from any cause. Therefore, conditional on controlling for prior health status, the larger coefficient estimates for blacks relative to whites imply that unobserved health conditions (such as disease severity) have bigger effects on health status for blacks than for whites.

Besides estimating income effects on mortality, we also examine the determinants of pension income and present new evidence on the effect of birthplace on pension income. We find that being born in the Deep South lowered average monthly pension income by almost $2 relative to the pension income received by all other blacks. However, blacks born in other areas of the South or in Border states received average monthly pensions which were not significantly different from those of blacks born in the Midwest, Northeast or the West. These facts suggest that there was an added income penalty for blacks born in the Deep South. Citing narrative evidence, Shaffer (2004) argues that ex-slaves from the South were unlikely to be literate and therefore unable to advocate for themselves in the pension application process. However, this argument does completely fit with the quantitative evidence we present. Instead, we argue that blacks born in the Deep South were considerably different from those born elsewhere in the South.

To move to a causal estimate of income on health, we exploit the Pension Bureau's assignment of doctors to examine veterans. Immediately after the Civil War, veterans could receive pensions for war related injury and illness. In 1890, pensions were liberalized and any disability, whether war related or not, could qualify for a pension. In order to qualify, veterans had to be examined by local surgeons who certified illnesses and disabilities. Our identification strategy uses the experience of a surgeon as a exogenous source of variation in pension receipt. Surgeons can only influence health through eventual pension receipt and individual health cannot cause assignment to a particular surgeon. As such, the year that the surgeon begins service for the Pension Bureau is correlated with pension income.

We find that the year of service for a surgeon is related to the pension amount for African American veterans. African American veterans are assigned greater pension amounts. (In results

not reported, we also find that it influences the pensions of whites, but the effect for African American veterans is more than two times larger.) Using the instrument, we find that pension income has a large and negative effect on black mortality. Income appears to have played some role in the historical health disparity between African Americans and whites.

This paper is organized as follows. Section 3.2 contains an historical background of the war experience of black veterans of the Union Army and their experiences in trying to secure a pension after the Civil War. Section 3.2 also contains a synopsis of the evolution of scientific racism in the period, which could play a key role in how doctor experience would be related to their rating of black disability. Section 3.3 provides the econometric framework and justification of the proposed instrument. Section 3.4 describes the data and provides summary statistics. Section 3.5 contains the instrumental variable results, and section 3.6 concludes.

2 Historical Background

2.1 The War Experience of U.S. Colored Troops

The United States Colored Troops were comprised of 186,017 black soldiers, approximately 88,000 of which enlisted in Confederate states.[10] Another 46,000, enlisted in Border states, and of the remaining 46,000, some were likely born into slavery though free by the time of enlistment.[11] Of the 33,000 black soldiers who died during the war, 4,000 died from wounds and the remainder succumbed to disease.[12] The white battle mortality rate was significantly higher than that for blacks[13] owing to the fact that blacks were purposely kept out of battle whenever possible. Whites were sent into battle more commonly than blacks because the common belief was that blacks were less "courageous" than whites in combat. Accordingly, troops in black regiments were assigned garrison duty during the war.

While black soldiers were in part recruited for their perceived immunity to disease, they in fact

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[10]Humphreys (2008), p. 5.

[11](ibid.)

[12]Humphreys (2008), p. 5-6.

[13]As many as 90,000 (4.5%) of white soldiers died in batter in comparison with 1.8% of blacks. (Humphreys (2008), p. 10).

suffered from higher rates of diarrhea, dysentery, pneumonia, tuberculosis, smallpox and malaria. Approximately 9% of white recruits died from disease as opposed to a total of 16.7% of black recruits who succumbed to disease. Therefore, the black mortality rate during the war was higher despite the fact that whites saw significantly more battle. Furthermore, even though blacks suffered higher rates of morbidity and mortality from disease during the war, they had a greater difficulty gaining admission to army hospitals than their white counterparts during the conflict. Even when blacks were able to get care in hospitals, the condition of black hospital wards was hardly therapeutic. Black wards were often unsanitary and lacking in food, clean bedding, clothing and medicine for their patients.[14]

2.2 Race Differentials in Pension Receipt

While pension legislation did not differ for white and black veterans, blacks faced difficulty in securing pensions. Between 1861 and 1934, the application success rate for white veterans was 92.6% while the rate for blacks was 75.4%.[15] Furthermore, conditional on receiving a pension during the period between 1879 and 1900, the white/black ratio in pension awards climbed from 1.106 to 1.273.[16] The reasons for the black-white differentials stem from racial discrimination during and after the war.

First, the inability of sick and injured black veterans to gain admittance to hospitals during the war hindered their ability to claim pensions for war-related disabilities after the war. Even though receiving care in a hospital during the war was not necessarily beneficial to a black soldier's health since doctors did not have modern medicines and hospitals remained unsanitary and contagious environments, the inability of black soldiers to seek care in hospitals during the war was detrimental to their ability to claim their pensions after the war. Prior to 1890, veterans could claim a pension under the General Law of 1862 if they faced illnesses or disabilities attributable to the war experience. In order to prove disability, veterans first sent their applications to the Pension Bureau stating their illness or injury. Upon receipt of the application, the bureau assigned

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[14]Humphreys (2008), p. 79.
[15]Shaffer (2004), p. 209.
[16]Wilson (2007).

each veteran to an examining surgeon[17] in his local area who certified that the veteran did in fact suffer from the disabilities stated on his application. The examining surgeon then completed a Surgeon's Certificate outlining the disabilities and their relationship to the veteran's war experience. The surgeon's certificate was then sent directly from the surgeon's office to the Pension Bureau in Washington, D.C. Once the certificate was received at the bureau, it was compared to the medical records from the war. If a veteran claimed a war-related disability, such as malaria or a gun shot wound, but there was no record of his admission to a war hospital for the illness or injury, he was likely to be denied a pension. Therefore, because black veterans had difficulty gaining access to hospitals during the war, they were unable to secure pensions in as large numbers compared to white veterans after the war.

Second, many black veterans, especially ex-slaves, had difficulty proving that had fought in the Civil War because their post-war names did not match the name given to clerks at enlistment. There were three reasons for name changes: 1) Upon enlisting, slaves often submitted their masters' last names, which were changed once free; 2) Likely to be illiterate, slaves were unable to correct enlistment clerks when their names were misspelled; 3) Many slaves escaped and enlisted under false names to prevent their masters from finding and reclaiming them.[18] Uncertain of a black applicant's identity, pension clerks requested affidavits from members of the applicant's community to prove war service. However affidavits from other community members were often considered unreliable in the case files of black veterans,[19] and pensions were subsequently denied.

The third, and most common, reason for pension denial (or lowered pensions relative to whites) was the inability of black veterans to prove their disabilities. After the passage of the Invalid Pensions Act of 1890, both white and black veterans could claim pensions for disabilities they faced which were unrelated to the war experience. Disabilities deserving of pensions included those which were verifiable during an exam, such as hernias, and those which were diagnosed on the basis of symptoms stated by the veteran, such as chronic diarrhea.[20] Symptom lists from

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[17]After 1884, the veteran was likely required to see a board of examining surgeons as the Pension Bureau no longer hired single surgeons to perform exams.

[18]Shaffer (2004), p. 124.

[19]Shaffer (2004), p. 129.

[20]Wilson (2007) shows that the black/white approval ratio for pensions in which veterans claimed a hernia was 0.896 whereas the rate was 0.404 for diarrhea. For other unverifiable conditions, such as back pain and hearing loss,

white veterans were trusted by examining surgeons while lists from black veterans were considered suspect. Testimony from black veterans was considered to be "reliable" by examining surgeons if the veteran displayed appropriate behavior typical of middle-class whites.[21] The lack of trust between examining surgeons and many black veterans led surgeons to assign lower disability ratings to blacks as compared to whites. Because the surgeons' certificates for black veterans frequently had lower disability ratings, the medical examiners at the Pension Bureau were more likely to award lower pensions to black veterans.

After the passage of the Act of 1907, the pension bureau began awarding pensions to veterans based on their age instead of disability. Under the new act, veterans over the age of 62 were eligible to receive $12 per month, and those over age 65 were eligible for higher amounts.[22] However, even with the passage of the new act, black veterans continued to face difficulty when applying for pensions because many did not know their date of birth.[23] By the Acts of 1912 and 1918, the age-based pension rates were increased yet again. While racial discrimination in the Union Army pension prevented many black veterans from receiving payments, current estimates show that the Pension Bureau dispersed a total of $313 million to black veterans.[24]

3   Empirical Strategy

In this analysis, we use the sample of veterans who began collecting pensions by 1893.[25] We follow this sample until 1906, which was the last year before the passage of the age-based laws. After the passage of these laws, the Pension Bureau began dispersing pensions based on age, and thus the ratings of examining surgeons were not a factor in the majority of application decisions. Therefore, the proposed instrument is only valid between 1890 and 1906.

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the black-white approval rates were 0.397 and 0.216 respectively.

[21]Shaffer (2004), p. 130.

[22]See Appendix A for exact pension amounts paid by the laws of 1907, 1912 and 1918.

[23]Shaffer (2004), p. 129-130.

[24]Ibid, p. 133.

[25]The sample of veterans collecting pensions prior to 1890 is too small for regression analysis.

3.1 Identification

Prior to 1907, the Pension Bureau awarded payments to veterans based on the degree of their disabilities, which causes pension income to be endogenous with respect to health outcomes. Since an individual's health status determines pension income, we use an instrument for pension income to accurately estimate the effect on pension income on health status. The instrument we use is the number of years an examining surgeon or board has been in practice. Without using the instrument, and thus exploiting an exogenous source of variation in pension income, the effect of pension payments on mortality will be biased upwards causing it to appear as though increases in pensions cause higher rates of mortality.

Our instrument, the years a surgeon (or group of surgeons) was first hired by the Pension Bureau to administer exams *initialyear*, is constructed in the following way: 1) if the veteran sees a single surgeon, then *initalyear* is equal to the initial year in which the physician began serving as an pension examining surgeon prior to the date of the veteran's exam; 2) if the veteran sees a board of examining surgeons, then *initialyear* is equal to the initial year that all members of the board have been practicing together.

The Register of Boards of Examining Surgeons, 1862 - 1928, available at Archives I, contains annual rosters of examining surgeons for all years between 1862 and 1928 except for the period between 1887 and 1892 inclusive. The following information can be found in the ledgers: the town, county and state of exam sites; 2) the names of surgeons at each exam site; 3) the name of the congressman or senator who appointed each examining surgeon; 3) the reason for the removal of examining surgeons from their post or the organization of boards is provided. Common reasons for surgeon replacement include death, retirement or Congressional replacement of a previous surgeon. As was common during the patronage era, civil servants, examining surgeons included, were given their posts by newly elected or re-elected politicians as rewards for party loyalty.

In order to use *initialyear* as an instrument for pension income, the use of *initialyear* must satisfy the following exclusion restriction: Conditional on our other control variables, the initial year in which a single surgeon or board began serving for the Bureau cannot impact the health of a veteran through any other channel except through pensions. Several additional assumptions

must be made to fully validate the instrument. First, *initialyear* must have a relevant impact on pension income. Second, the health status of black veterans must be independent with respect to the initial year in which the physician began his service for the Bureau. Third, it cannot be the case that black veterans from counties in which examining surgeons have relatively low *initialyear* are more likely to apply for pensions than those from counties with a low *initialyear*, or vice versa.

A key for our empirical strategy is the fact that doctors examining the veterans were themselves of varying levels of experience in the pension system. To the extent that time in service to the Pension Bureau exposed black veterans to differences in the quality of their surgeon examination, it would lead to exogenous differences in the rating of their illness that were not related to their underlying health. That is, we suppose that doctors of differing length of service to the Pension Bureau would lead to exogenous differences in the pension receipt of the black veteran that would not be related to underlying health conditions.

Controls in this analysis include an indicator equal to 1 if the veteran was born a slave,[26] the veteran's birth year, an indicator equal to 1 if the veteran lived in one of the hundred most populated cities, the veteran's prior health status, prisoner-of-war status and battle wounds. Each of these variables has an impact on pension income. Including a control for slave status at birth is necessary because early-life disease environments, which differ between free and slave states, can affect late-life disease specific mortality rates. Since the age range of the cohort is wide, controlling for birth year is crucial as older veterans have higher mortality rates. Lastly, we control for whether the veteran lives in one of the hundred most populated cities as a proxy for the disease environment he faced once on the pension rolls.[27]

[]Details of disease conditions faced during life come from the surgeons' certificates.[28] To control for prior health status, I construct indicator variables equal to 1 if a veteran had a particular illness, which was described on a surgeon's certificate. I group morbidity conditions during life into the

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[26]The veteran is assumed to have been born a slave if his birth state was was a slave state in 1861. These states include Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Kentucky, Missouri, Arkansas, Mississippi, Louisiana, Oklahoma territory, Texas, the New Mexico Territory, and the Utah Territory.

[27]Since we do not observe the place of residence for veterans prior to their first receipt of pension income, we cannot control for the disease environment veterans faced between the end of the war and their first application date for a pension.

[28]See Eli (2010) Section 3.1.1. for a discussion concerning the accuracy of illnesses described on certificates.

following categories: respiratory, digestive, infectious, cardiovascular, endocrine, genitourinary.[29] Underneath the illness descriptions on surgeon's certificates, examining surgeons were required to rate the severity of the disability. While the surgeons' rating was uncorrelated with pension payments for white veterans,[30] the opposite was true for black veterans. Medical reviewers at the Pension Bureau relied heavily on the descriptions and ratings of examining surgeons in the cases of black veterans.[31]

3.2 Econometric Framework

Following the framework of Eli (2010), we use a Weibull proportional hazard model to estimate the effect of an extra dollar of monthly pension income[32] on the probability of death by cause. The dependent variable in the regressions is an indicator equal to 1 if a veteran died from a specific cause in year t.

We create a balanced panel, which spans from 1893 to 1906.[33] If a veteran died prior to 1907, all observations after his death are not included in the sample. Since pension income is a function of health status for all of the years contained in the sample, we use the number of years that a single surgeon or board of examining surgeons remains in his post as an instrument for pensions. However, since we use a non-linear proportional hazard model, we cannot use a two-stage least

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[29]Respiratory illness include abscess, adhesion, allergy, asthma, atelectasis, bronchiectasis, bronchitis, cavity, edema, effusion, emphysema, fibrosis, hemoptysis, pleuritis, pneumonia, pneumonitis, pneumothorax, tracheitis and tuberculosis. Digestive illnesses include constipation, diarrhea, dysentery, dyspepsia, dysphagia, enlarged liver, gallstones, gastro-enteritis, malassimilation (malabsorption) and nausea. Infectious illnesses include chancroid, cholera, dengue, diphtheria, gonorrhoea, hepatitis, influenza, malaria, meningitis, mumps, orchitis, parotiditis, pertussis, rickettsia, rubeola, salmonella, scarlet fever, septicaemia, streptococcus, syphilis, tetanus, typhomalaria, and variola. Cardiovascular illnesses include arteriosclerosis, cyanosis, dyspnea, enlarged heart, impaired circulation, murmur, cardiac edema, and palpitation. Endocrine illnesses include diabetes, goiter and enlarged spleen. Genito-urinary illnesses include cystitis, enlarged prostate, nephritis, urethral obstruction, and uremia.

[30]The most important predictors of pension payment for white veterans was the type of disability and the congressional district of the veteran. See Eli (2010) for further explanation.

[31]Shaffer (2004) presents compelling evidence that the medical reviewers at the Pension Bureau held black applications for pensions to a higher standard than those of whites. For example, Shaffer shows that blacks were twice as likely as whites to have their pension application sent to "special examiners" for re-investigation. (p. 129)

[32]Wage rates for blacks in the U.S. do not exist prior to 1940. However, the average monthly income for a farmer (black or white) was $24 in 1900. Therefore, an extra dollar of pension income was equivalent to 4% of monthly income. Pensions likely replaced a higher percentage of monthly income for blacks than whites.

[33]Wherever missing, we impute pension income by setting pensions equal to rates awarded in the last application. In the same way, whenever disease conditions are missing for year t, we assume that a veteran suffers from the same disease conditions claimed in a prior exam if a veteran has not undergone a new exam in year t.

squares approach to estimate the coefficients.[34] Therefore, we use the control function approach in which we include pension income, control variable and a residual from the first stage in the hazard regression. The functional form of the first stage is represented in the following way:

$$pen_{it} = \gamma_0 + \gamma_1 initialyear_{it} + \Gamma C_{it} + u_{it} \tag{1}$$

where pen = monthly pension income, $initialyear$ = the term length of a single surgeon or board of surgeons, i = individual, t = year, and C = set of demographic and socio-economic controls. Controls include birth year, battle wounds, previous health conditions, prisoner-of-war status, slave status at birth and population size of the veteran's current city of residence. The associated residual has the following form:

$$\hat{u}_{it} = pen_{it} - \hat{\gamma}_0 - \hat{\gamma}_1 initialyear_{it} - \hat{\Gamma} C_{it} \tag{2}$$

In the second-stage, choose

$$\theta = \{\beta, \alpha, \phi\}$$

to maximize the likelihood function

$$\sum_{i=1}^{N} \sum_{b=1893}^{1906} \left\{ d_{it} log[e^{k_{it}\beta} \alpha t^{\alpha-1}] + (1 - d_{it})(-t^\alpha e^{k_{it}\beta}) \right\} \tag{3}$$

where

$$k_{it}\beta = \beta_0 pen_{it} + \sum_{j=1}^{N} \beta_j (C_j)_{it} + \phi_1 \hat{u}_{it} + \epsilon_{it} \tag{4}$$

We censor on death, d_{it}, which is an indicator equal to 1 if the veteran is alive in year t or if t=1907. Therefore, veterans do not contribute to the likelihood of death from a particular after their death. However, a key assumption of the model is that veterans still face a risk of dying from a particular illness even after dying from a different illnesses.[35] Said differently, the risk of dying for disease A is interrupted by death from disease B.

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[34]We follow Eli (2010). For an in-depth discussion of the control function approach, see Imbens and Wooldridge (2007).

[35]The model assumes that the true time to failure (death from a particular illness) is not dependent on the censoring event (death from any illness).

Since we estimate a proportional hazard model, coefficient are semi-elasticities representing the effects of varying income on the hazard rate. If the coefficient on pension income is negative, then the probability of death from a particular cause decreases as income increases.

4 Data

4.1 United States Colored Troops

We study these issues using the United States Colored Troops sample compiled by the Center for Population Economics. Information in the dataset comes from three sources: the military, pension and medical records; surgeons' certificates; and census records. The military, pension and medical records contain socioeconomic and demographic data. These records are of particular importance because they contain information regarding the recruit's town and state of enlistment as well as his place of birth, which taken together are used to determine the slave status of the recruit.[36] The surgeons' certificates provide individual-level descriptions composed by examining surgeons of a black veteran's health status at the time of each exam. Lastly, the census records contain all individual-level data on black recruits collected by enumerators in the census years from 1850 and 1930 inclusive.

Unlike the white Union Army veterans, it is unclear whether black veterans were representative of the average black male in the U.S. after the war. While 1 in 3 white men was rejected from enlisting in the Union Army during the war,[37] the sample of veterans contained in the Union Army sample is representative of the sample of white men found in the 1900 Census. For example, the mortality rate of white veterans in 1900 are similar to those of white men in the 1900 Census.[38]

However, no other individual-level data for blacks in the late 19th century exists and so analysis of the mortality of black veterans at this juncture provide the first insights into factors causing high black mortality and the black-white health gap in the period.

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[36] Black veterans who enlisted in slave states are counted as having been slaves at enlistment in the dataset. Efforts by the Fogel group to link black veterans, for whom a master's name was listed, to the Slaves Schedules were unsuccessful because of a lack of necessary identifiers to be certain that accurate linkages have been made.

[37] The statistic for black men: 1 in 4 men was rejected (Humphreys (2008), p. 9).

[38] Costa (2008), p. 2-3.

Of the soldiers who fought for the Union Army, the Fogel group collected records for 6,187 veterans spanning 52 companies of the USCT. In 1873, only 167 of black veterans who survived the war collected pensions. In 1893, this number grew to 1,035 veterans (approximately 16.5% of all recruits). In this analysis, I use only the subsample of veterans who were on the pension rolls by 1893.[39]

Despite being subject to the same laws, whites were able to secure higher pensions than blacks. Of veterans who survived to 1893, black veterans received an average monthly pension of $9.64 while whites received $11.92. Black veterans were also less likely to undergo exams. The average black veteran underwent approximately 4 exams while the average white veteran had 5 exams.

Table 1 contains summary statistics on cause of death, state of residence and occupation for black veterans, who were on the pension rolls by 1893. We divide the sample of black veterans into two subsamples: those born free and those born into slavery. Despite the fact that approximately three-quarters of black recruits were slaves at enlistment, just over half of them collected pensions in 1893. This finding coincides with the arguments of Shaffer (2004), who uses narrative evidence to show that ex-slaves faced great difficulties in trying to secure a pension relative to free blacks. Of those who were already on the pension rolls in 1893, the majority lived in Maryland and Kentucky. The largest ex-slaves populations of USCT veterans lived in Tennessee (13.49%) and Missouri (9.63%). Therefore, unlike white veterans, most of whom lived in Ohio, New York and Illinois in 1893, black veterans lived in the South and former Border states. In addition, most ex-slave veterans remained in the South after the war. Blacks, who were slaves at birth, were more likely to die from digestive illnesses than those born free. For the remaining causes of death, which include respiratory, cardiovascular and infectious diseases, the rates for ex-slaves and born-free blacks appear to be similar. Lastly, similar to white veterans, the majority of black veterans, both ex-slave and born-free, were farmers in 1900.[40] In addition to being farmers, many black veterans

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[39]Sample selection bias restricts me from including veterans who did not collect pensions by the baseline years 1873 or 1893. For an explanation of the selection bias, see Eli (2010). As in Eli (2010), dividing the analysis into two subsamples – those who collected pensions in 1873 and those who collected in 1893 – would overcome issues of selection bias. However, since only 167 black veterans collected pension in 1873, the sample size is not large enough for regression analysis.

[40]Veterans were asked to provide occupational information during exams. However, on the surgeons' certificate, occupations fields are left black for 94% of black veterans. However, the Fogel group has matched each individual in the sample of black veterans to census data. Therefore, we take occupational information as reported by black

were day laborers and farm laborers.

Table 2 contains estimates from probit regressions in which we use wartime and demographic indicators to predict entry onto the pension rolls in both 1873 and 1893 for the sample of black veterans. We find that veterans with wartime injuries were 17% more likely to be on the pensions in 1873 and 7% more likely in 1893. However, only .62% of black veterans in 1893 had wartime injuries as opposed to 34.12% of whites, which quantitatively emphasizes that black saw fewer battles during the war than whites. As expected, POW status and evidence of wartime illnesses[41] increased the likelihood of entry onto the pension rolls by 1893. However, the most important predictor of entry onto the pension rolls by 1893 was whether or not a black veteran was born in the Deep South. Black veterans born in the Deep South were 33% less likely to be on the pension rolls by 1893 which quantitatively confirms assertions made by Shaffer (2004) concerning the frequent inability of ex-slaves to claim pensions.

Figure 1 shows the number of exams per year for all black veterans. While many veterans did undergo exams during the 1880s, the overwhelming majority of veterans underwent exams during the early 1890s. The spike in the graph near 1891 coincides with the passage of the Act of 1890, which allowed veterans to claim pensions for disabilities unrelated to the war experience. Figure 2 shows the number of first exams per year for black veterans. The spike in this graph near 1890 shows that the majority of veterans did not apply for pensions prior to the passage of the Act of 1890.

4.2 Examining Surgeons dataset

In order to determine the number of years a board of surgeons or single surgeon had been practicing prior to a particular veteran's exam, it was first necessary to collect the Pension Bureau's rosters of examining surgeons for each year between 1866 and 1907.[42] Annual rosters contain the

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veterans in the Census of 1900.

[41]Pensionable wartime illnesses include smallpox, hepatitis, tuberculosis, scurvy, measles, malaria, typhoid, cholera, diarrhea, fever and pneumonia.

[42]The surgeons' roster for 1866 can be found in *Report of the Secretary of the Interior, 1866* on page 434. The roster for 1872 can be found in *Roster of Examining Surgeons, 1872* on Google Books. The roster for 1875 can be found in *Roster of Examining Surgeons, 1875* found at the National Library of Medicine. Rosters for 1880 - 82, 1885, 1889, 1890, 1894, 1898, and 1902 are found on microfilm at Northwestern University Library. The roster for 1906 can be found in the *American Medical Directory, 1906* on pages 12 25 from Google Books. Since annual rosters are

name of surgeon(s), the location of the exam (town, county and state) and the reason for surgeon removal (death, resignation, or Congressional removal). Combining the information for all years, we compute the number of years that each examining surgeon held his post.[43] We then match the surgeon(s) to veterans for each exam by linking the surgeon(s) address from the rosters to the address found on each surgeons' certificate in the USCT dataset.[44]

4.3 City and County-Level data

To determine the population size of each veteran's town of residence, we use population estimates from the U.S. Census Bureau.[45] Exact street addresses for veterans come from the surgeons' certificates, and the town of residence for each veteran is linked to Census population estimates for the associated year. Since the Census Bureau collected population counts decennially, we link population counts to the nearest census year.[46]

5 Results

5.1 Descriptive Results

In Table 3, we present coefficient estimates of key determinants of monthly pension income, the year of first application and the year of first pension receipt. On average, older veterans receive higher pension payments, apply earlier and receive their first pensions earlier than younger veterans. In particular, being one year older increases monthly pension income by an average of 10 cents. Due to legislated increases in pension amounts, pension payments increase over time in the period

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missing for some of the years, we have begun digitizing *The Register of Boards of Examining Surgeons, 1862 - 1928* found at Archives I, which will be completed in early 2012.

[43]Collecting this information from the *Register of Boards of Examining Surgeons, 1862 - 1928* available at Archives I would be ideal since this record contains the exact start and end dates for each surgeons' term. The annual rosters published by the Pension Bureau that we use in this analysis contain the starting and ending year (but not the month and day) of each surgeons' term.

[44]It is not possible to match veterans to surgeons by linking the surgeons' names from the surgeons' certificate to names in the roster because the Fogel group did not collect the surgeons' names from the surgeons' certificates. For this reason, we create linkages using addresses.

[45]The U.S. Census Bureau's Population of 100 Largest Cities and Other Urban Places in the United States: 1790 to 1990 is available at http://www.census.gov/population/www.

[46]For years ending in the number 5, we link to the following census year. For example, population estimates for 1895 are taken from the estimates reported in 1900.

between 1893 and 1907. Accordingly, the coefficient on the time trend is positive and significant for the regressions in which monthly pension income and first application year are the dependent variables. As expected, war injuries are significant predictors in all three regressions. Relative to a veteran who did not sustain an injury during the war, those who did received an extra $1.29 in monthly pension income on average. In addition, they first applied for a pension 5.7 years earlier than those who were not injured.

Table 3 also shows coefficient estimates for birthplace indicators. Relative to black veterans born in the West, those born in the Deep South received an average of $1.57 less monthly pension income. Given that all blacks in the sample received an average of $9.64 (almost $2 less than whites), veterans born in the Deep South received an average of $8.07. Therefore, even when successful at gaining entry onto the pension rolls, those born in the Deep South received nearly $3 less than whites on average. The pension differential between these two groups is equivalent to 12.5% of a white farmer's income in 1900. Additionally, those born in the Deep South first applied over two years after those born in the West and were admitted onto the pension rolls over three years after those born in the West. As outlined in the historical background section of this paper, those born as slaves often could not prove their identities after the war and were more likely to be illiterate and thus less able to advocate for themselves during the pension application process.[47] The effect of slave status at birth on pension receipt however is stark. Figure 3 shows the average monthly pension income per year for veterans already on the pension rolls in a given year. In every year after 1870, those born in the Deep South received lower pensions than those born elsewhere (even compared to those born in other parts of the South or in Border States).

To determine the effect of pension income on cause-specific mortality and all-cause mortality from any cause, we estimate a hazard model of mortality and compare coefficient estimates in Table 4. While the coefficient estimates presented are biased due to the fact that we did not instrument for pension income, the results are still informative. First, hazard rates for respiratory and infectious illnesses in the white and black veteran population are identical. In addition, blacks have lower rates of death from digestive and cardiovascular illnesses. However, the hazard rate

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[47]Shaffer (2004)

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of death from any cause for the black veteran population is 50% higher than that of the white population. These facts taken together suggest that the specific causes of death from cardiovascular and digestive illnesses may be underreported for black veterans.

Table 4 shows that the estimated effects of monthly pension income on the hazard rate of death from any cause is positive for both blacks and whites. Since there is no correction for reverse causality, these estimates are biased. However, a comparison of the black-white differentials in coefficient estimates is revealing. The black-white differential of the coefficient estimate in the hazard regression for mortality from any cause is positive (.006) suggesting that the coefficient estimates for blacks are even more biased than for whites. Said differently, the unobserved severity of health conditions was a stronger predictor of pensions for blacks than whites.

Coefficient estimates on monthly pension income for cause-specific mortality are also presented in Table 4. Coefficient estimates for respiratory illnesses are similar for blacks and whites, however the estimate is not significant for the black sample. Interestingly, when the dependent variable is death from cardiovascular illness, the coefficient estimate is positive and significant. The black-white differential in coefficient estimates is positive and large (.029) suggesting that the endogeneity bias is larger for the black sample than the white sample.

5.2 Instrumental Variable Estimates

Table 5 reports the instrumental variable estimates. In the first stage (panel A), we regress pension income on the controls in Table 3 in addition to the *initialyear* instrument. The results of panel A confirm that the instrument is well correlated with pension amount. For each year that the doctor has served on the board, the pension of a black veteran increases by more than one dollar per month. The same effect for whites is less than fifty cents. This suggest that the assignment of doctors to black veterans was more related to their pension income than it was for whites.

If the argument for the exclusion restriction holds, the results of Panel A suggest that assignment to a doctor of longer tenure on the pension board resulted in substantially more pension income for black veterans. As we argued earlier, the effects on pension income would work primarily through the doctor, and therefore income, and not health. Including doctor fixed effects increases the impact

of year of assignment even further. We take this as suggestive evidence that the impact on pension income is consistent with the exclusion restriction.

In panel B of Table 5 we present the second stage results. The effect of pension income on mortality increases significantly once the instrument is used. The effect of pension income is more than four times greater once controlling for the endogeneity of pension income. Increases in pension income lead to a substantial decline in the all-cause mortality hazard rate for the black veterans. Even more, the results are robust to whether the control function approach is used or not. The results suggest that mortality for African Americans was quite sensitive to income, and that the effect was many times larger once the endogenity is controlled for.

6 Conclusion

In this research, we set out to investigate the effect of pension income on the black-white gap in mortality rates at the end of the 19th and early 20th century. Because pension income depends partly on health status, pension income is endogenous with respect to mortality. We show empirically that coefficients on monthly pension income are more biased in hazard regressions of the black sample relative to those of the white sample. Taken together, these estimates suggest that on average, black pensioners were sicker than white veterans.

The estimates from our hazard regression also call attention to the need for an exogenous source of variation in pension income. The instrument used in Eli (2010) – the Republican Congressional vote share in a veteran's district – cannot be used in any analysis using the sample of black veterans because the majority of black veterans in lived in the South and were thus unable to vote. Therefore, we proposed a new instrument which is applicable to the black sample of veterans: the initial year in which a single surgeon or board of examining surgeons began practicing as an examining surgeon for the Pension Bureau. Single surgeons or boards hired later in the period were more likely to be younger and to have graduated from medical school after surgeons who began were appointed as examining surgeons earlier in the period. Therefore, we argue that racial attitudes towards the black body evolved so that, controlling for the year of the exam, surgeons or boards appointed later in the period were related to pension income.

While Wilson (2007) shows the difficulty black veterans faced when trying to claim pensions for the first time, we document the black-white differential in pension income as well as the origins in the income differential between blacks who were born in the Deep South as opposed to those who were born elsewhere. We show that being born in the Deep South was the greatest hindrance to securing a pension equal to that of blacks born in other states in the South. Shaffer (2004) argues that ex-slaves (identified as blacks born anywhere in the South) were frequently unable to prove that they did in fact serve in the war because of name changes after the war or misspellings made my clerks during enlistment. However, we find that blacks born in the South, but outside of the Deep South, did not face any additional difficulty in securing a pension equal to that of blacks from the Midwest, Northeast, Border States or the West. Therefore, Shaffer's arguments do not fully explain pension differentials. Logan (2009) finds that ex-slaves were less likely to migrate than free blacks and that 35% of this difference can be attributed to differences in human capital. Since a veteran's ability to read affects the likelihood of pension application and the success rate, future work must include an analysis of the role of literacy on pensions stratified by the location of black veterans.

The question remains then whether pension income had a greater effect on mortality for blacks than whites. Given that black veterans were sicker than white veterans on average, as shown in Costa (2007), it may be that income had little effect on mortality rates. However, Costa (2010) shows that increases in pension income had greater effects on retirement for blacks than whites, which suggests that the effect of income on mortality risk may also be greater for blacks than whites. Costa (2007) shows that black veterans were at a higher risk of mortality from cardiovascular conditions relative to whites due to higher rates of acute infections in childhood. The question then remains whether increased income could help black veterans overcome early-life penalties or whether pension income would be ineffectual due to the permanent shocks to health status. Furthermore, if income is effectual, which diseases are most income sensitive for blacks veterans and how do they compare to findings in Eli (2010) for white veterans?

We find that the year of initial service for the examining surgeon was indeed well correlated with pension income for black veterans. Correcting for this endogenity reveals that income played

a large role in the health of African American veterans. The marginal effect of pension income is more than three times greater in the IV estimates than the OLS estimates. Increases in income had a large effect on all-cause mortality of African Americans.
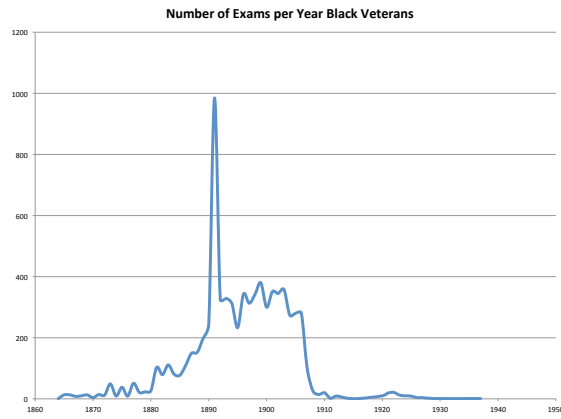
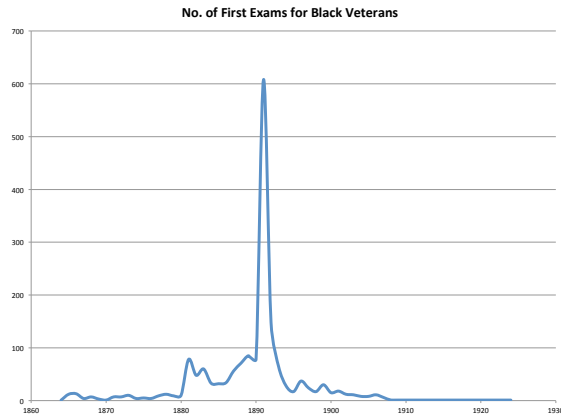Figure 1: Number of Exams per Year for Black Veterans

Figure 2: Number of First Exams per Year for Black Veterans

Table 1: Summary Statistics for Black Union Army Veterans

	Mean (%) in 1893 for veterans on pension rolls	
	All	Slave at Birth
Causes of Death		
Respiratory	9.30	9.40
Digestive	2.55	1.80
Cardiovascular	11.36	11.03
Infectious	2.84	2.71
State of Residence in 1893		
Alabama	4.44	8.09
Arkansas	4.44	6.94
District of Columbia	5.27	5.59
Kansas	4.75	5.39
Kentucky	11.16	2.89
Maryland	15.91	3.28
Missouri	7.44	9.63
Ohio	5.86	4.62
Tennessee	8.16	13.49
Virginia	4.96	8.48
All Other	27.61	31.6
Occupation in 1900		
Barber	1.15	2.62
Carpenter	1.84	1.46
Day Laborer	16.92	10.50
Farm Laborer	5.98	1.75
Farmer	28.31	46.94
All Other	45.20	36.73
No. of Veterans	1021	553

Table 2: Probit Regression - Predicting Veteran's Entry onto Pension Rolls

| | Date of Entry onto the Pension Rolls | | | |
| | 1873 | | 1893 | |
	Coefficient	Mean (%)	Coefficient	Mean (%)
War Injury	.170***	17.20	.073**	0.62
	(10.83)		(2.09)	
War Illness	.016*	59.81	.081***	59.85
	(1.91)		(2.98)	
POW	.055	3.74	.225***	3.87
	(1.63)		(3.68)	
Birth Year	-.001**	1838	-.016***	1839
	(-2.09)		(-8.43)	
Born in Northeast	.026	3.05	-.045	7.30
	(1.09)		(-0.59)	
Born in Midwest	-.010	7.53	-.051	7.68
	(-0.47)		(-.059)	
Born in Border	.011	64.05	.010	64.30
	(0.59)		(0.14)	
Born in Deep South	-.042***	19.46	-.330***	20.53
	(-2.64)		(-4.24)	
Born in South	-.016	29.13	-.108	28.00
	(.355)		(-1.40)	
Fair Skinned	.027*	9.47	-.040	9.49
	(1.90)		(-0.91)	
No. of Veterans on rolls	167		1035	
Total no. on veterans	1953		1549	

t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
The omitted birth category is the West.

Table 3: OLS Estimates of Pension Receipt for Blacks on Rolls by 1893

	Mo. Pension ($)	1st Application Year	Year of 1st Receipt
Birth Year	-.102***	.033***	.035***
	(-14.17)	(3.90)	(5.04)
Time Trend	.153***	.027*	.017
	(10.87)	(1.66)	(1.25)
War Injury	1.29***	-5.685***	-5.168***
	(8.20)	(-31.22)	(-34.64)
War Illness	.145	-.193	-.060
	(0.97)	(-1.11)	(-0.42)
Birthplace:			
Deep South	-1.571***	2.263***	2.764***
	(-4.70)	(5.88)	(8.78)
South	-.319	1.070***	1.706***
	(-1.04)	(3.02)	(5.87)
Mean	$9.64	1888	1888

Note: No. of veterans: 903. Restricted to observations in years after 1892 and before 1907, Controls include birthplace, POW status and size of enlistment city. Standard errors in (). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
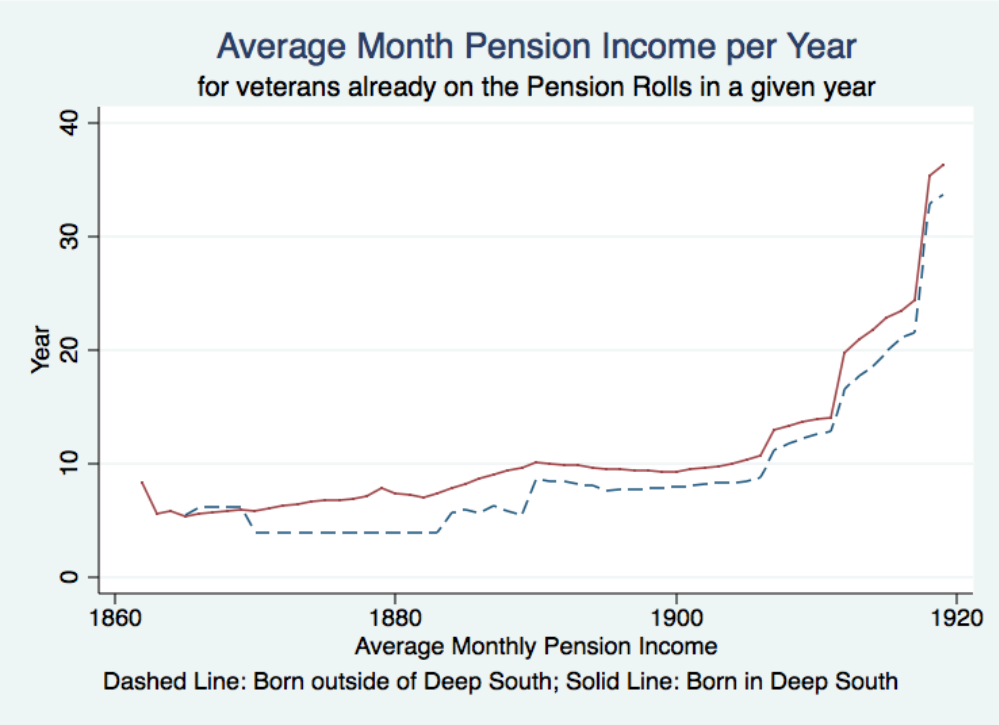The reference birthplace is the West.

Figure 3: Average Monthly Pension for Black Veterans

Table 4: Hazard Estimates for Mortality for Black and White Veterans on Pension Rolls by 1893

Sample:	Coeff. on Monthly Pension		Hazard Rate	
	Blacks	Whites	Blacks	Whites
All-cause Mortality	.016**	.010***	.042	.028
	(.020)	(.001)		
Respiratory Illnesses	.015	.014***	.005	.005
	(0.48)	(.003)		
Infectious Illnesses	.045***	.008	.002	.002
	(.004)	(.005)		
Digestive Illnesses	-.011	.0143	.001	.007
	(.869)	(.002)		
Cardiovascular Illnesses	.038***	.009***	.004	.013
	(.003)	(.001)		
No. of veterans	903	13011	903	13011

Note: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Controls: Top 100 city (in population size), time trend, birth year and place, rank in the army, prisoner-of-war status, war wounds and previous illnesses.

Table 5: Instrumental Variable Estimates for Mortality for Black Veterans on Pension Rolls by 1893

Panel A: First Stage Results for Hazard Model Specification

	Dependent Variable: *Monthly Pension*	
Initial Year	1.11***	1.51***
	(0.007)	(.0132)
Controls	YES	YES
Doctor Fixed Effects	NO	YES (F-stat)=6.985

Note: Standard errors in parentheses. No. of veterans: 593

Controls: Top 100 city (in population size), time trend, birth year and place, rank in the army, prisoner-of-war, war wounds and previous illnesses.

Panel B: Second Stage Hazard Regression Estimates for Mortality

	Coeff. On Monthly Pension	% Decline in Hazard		Unconditional Hazard Rate
All-cause Mortality	.051***	-0.05	-0.06	0.034
	(.005)	(.005)	(.009)	
C.F. Approach	NO	NO	YES	
	YES			

Note: Standard errors in parentheses. No. of veterans: 593

Monthly pension instrumented by first stage regression noted in Panel A.

Controls: Top 100 city (in population size), time trend, birth year and place, rank in the army, prisoner-of-war, war wounds and previous illnesses.