Selected, Scarred and Strengthened
The Postwar Survival of World War I Prisoners of War

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Introduction: We provide new historical evidence on the health and mortality effects of surviving traumatic events and periods of extended stress by examining the post-war survival of a cohort of World War I prisoners of war (POW). We constructed an original dataset of the complete population of POWs from New Zealand that includes measures of socioeconomic and health status at enlistment, military service and imprisonment. We obtained death dates for 98% of men who survived the war.

On average men who survived imprisonment lived to 69.5 years, less than a year shorter than life expectancy for the average cohort from which the men were drawn. Using survival time models, we examine the determinants of survival in prison. For men who survived the war, we then examine how wartime experiences including wounding, illness, and the duration of imprisonment affected life expectancy after being released.

We find that men imprisoned on the Western Front were more likely to survive imprisonment than men imprisoned in Turkey. Upon return to civilian life, men imprisoned for longer had a lower life expectancy. However, the small number of men imprisoned in Turkey survived longer. Our results show that populations who have survived stressful events with high mortality are both selected and scarred by the experience.

Background: Social scientists have devoted considerable attention in recent decades to understanding the long-term consequences of traumatic events and extended periods of stress. Recognizing that these effects vary across different situations, this line of research has examined a range of different contexts. One important line of research has been to examine the regular stresses of life experienced by everyone in modern society. Employment or its absence, patterns of residence, and interpersonal relationships are experienced by all, yet their characteristics and stressors vary across people, and change over time for individuals. A key distinction in this literature introduced by Pearlin is between "life events", such as divorce, marriage and job loss, and chronic strains persisting over time as individuals adjust themselves to the peculiarities of their social situation (Pearlin, 1989). Studies of the everyday stressors of the population are generalizable under reasonable conditions of representative samples and similar social context. Yet an important challenge to this research design is that in everyday life people choose their chronic strains through their choice of jobs, romantic partners, and residences. Taken together with the intrinsic interest of understanding how people fare when bad things happen to them, another important strand of research examines short- and long-term consequences of stressful events plausibly outside of an individual's control.

Becoming a POW is a life event largely outside of an individual's control, and highly unlikely to be sought out as an experience. The trauma and stress experienced during capture and imprisonment can be reasonably supposed to be independent of the individual's actions, and in effect randomly assigned to them. There have been numerous studies of the long-term

consequences of being a POW in World War II (Creasey et al., 1999; Dent et al., 1989; Gale et al., 1999; Page & Brass, 2001; Page & Ostfeld, 1994), Korea (Keehn, 1980), and Vietnam (Eberly & Engdahl, 1991). Reviewing this work does not yield a single estimate of the long-term effects of captivity because conditions varied (Ursano & Benedek, 2003). The study of random shocks to people's lives provides statistical independence of the treatment and the population, but no single context provides definitive evidence.

Our study: Following in this tradition of examining stressful and traumatic events imposed on people, we examine the life-long mortality consequences of being a prisoner of war (POW). Specifically, we examine the experience of the entire population of World War I POWs from New Zealand. This population offers several analytic advantages. We are able to identify and collect data on the entire population of interest, including information on pre-war social and health status. Because of the high quality civil registration system in New Zealand, we are able to trace more than 98% of POW survivors to post-war mortality records, matching data linkage rates obtained in previous studies (Roberts & Wood, 2014). We find that POWs who survived lived only slightly shorter lives than the average man in their birth cohort. However, the experience of being a POW had a significant impact on men's lives and life expectancy. Relative to their birth cohort, fewer of the POW survivors were married within 17 years of the end of the war, indicating that survivors may have had social difficulties with re-adjustment to civilian life. Yet compared to their birth cohort, and other veterans, POW survivors had a significantly lower risk of suicide. Our estimates show that the duration of imprisonment had a negative effect on life expectancy, with each additional week of imprisonment taking more than a week off men's lives.

Data: Our sample comes from the New Zealand military records of soldiers enlisted between 1914-1918. During World War I, approximately 100,000 New Zealand men enlisted between the years of 1914 and 1919. Men enlisting from 1914 and 1915 were more likely to serve on the Gallipoli theater whereas men enlisting between 1915-1919 typically served on the Western Front. These theaters were both distinct in many ways. Controlling for other factors, we found that POWs on the Gallipoli front had a significantly higher mortality rate than did the Western Front (p=.009) despite their small sample size, which suggests that the only thing impacting survival during captivity is theater. In addition, because they were captured so early in the war, POWs at Gallipoli were typically imprisoned for significantly longer periods of time. To address the distinct, unique experiences of each of these theaters, we split our sample into two, accordingly, our sample includes 36 POWs from the Gallipoli front and 419 POWs from the Western Front. The number of POWs from the Gallipoli front may seem small in comparison to the number of POWs from the Western Front, however our dataset includes the entire Gallipoli POW population, which only consisted of 36 soldiers.

The military records of New Zealand men from both fronts, and from non-POWs were recorded and stored as hard copies by the New Zealand Defense Force. In 2005, a team began transferring these hard records into digital records. By 2014, all personnel files of all men who had served in World War I had been transferred into digital records. Upon finishing, there were about 110,000 files, a majority of which contain detailed information such as an enlistment details, medical examinations, service history, and other documents. Additionally, approximately 16.4 years after the end of WW1, the New Zealand Defense Force followed up and conducted interviews with over 400 POWs regarding their experiences.

These records are structured longitudinally, meaning that information and details regarding each of the soldiers was continuously added throughout their term of service. Upon enlistment,

each soldier filled out a Medical History Sheet containing information regarding weight, height, appearance, and underlying conditions; and an Attestation form including DOB, parents' names, children's names, marital status, and other questions pertinent to service (e.g. "Have you ever served under the crown before?"). In addition, to the initial enlistment documents, further documentation included in all records were a History Sheet detailing full name, NOK, date, rank, occupation, wounds, illnesses, period of engagement, time spent overseas, reason for discharge, and information regarding POW status; a Statement of Services including misconduct incidents; and a Military History Sheet describing changes in rank, location, and enlistments. Finally, in certain cases, other information included telegraphs, letters, train tickets, notifications of death, casualty reports, more detailed medical records, etc. Although all New Zealand soldiers filled out these forms, some of this information is missing from a small number of files as it may have been lost over the years or it may not have been digitized due to human error.

The range of detailed information listed in these military records was not unique to New Zealand. The military records kept by other countries are similar in scope, however tend to be less comprehensive due to the destruction of many of these records prior to the capture of the soldiers (Dent et al., 1989; Inwood & Ross, 2016). These records included information regarding soldiers' health status at the time of enlistment, their age distribution, and the method of selection for service. However, New Zealand's military records have been exceptionally well maintained and meticulously updated by the New Zealand government. Further, these records were copied into an online database from their original paper copies in 2000.

Analysis: Our analysis focuses first on measuring the risk of mortality in POW camps and the survival curve for men in prison. Although the annualized risk of mortality in both Turkish and German POW camps was high, the majority of POWs survived the war. Thus, the majority of our analysis is devoted to understanding the risk of mortality after imprisonment, and how pre-war characteristics and the length of time spent in prison affected survival.

Specifically, after grouping the POWs by theater, we analyzed the following factors: DOB, hometown, marital status at time of enlistment, date of enlistment, duration of all service prior to capture, date of capture, duration of imprisonment, date of death. We performed Cox proportional hazards models, and estimated distributions illustrating the differences in survival within theater.

Results: NZ POWs were observationally similar to men of their birth cohort, and to men serving with them at the same time. Approximately 40% of men who were taken prisoner on the Western Front came from the Entrenching Battalion, a unit whose responsibility was to dig tunnels and trenches, often in advance of attacks. Thus, the risk of being captured was not uniform across units within the NZ Expeditionary Force. However, on important characteristics such as occupation, height, weight, mean age, length of service, and fitness grade before the war POWs were similar to the entire cohort. Thus, we have few concerns about selection into the sample of men experiencing this event.

Survival in prison was most strongly influenced by theater of capture, and then by duration of imprisonment. Men captured in Turkey were significantly more likely to die in captivity, with 27% of prisoners dying in captivity. However, this risk was largely explained by the greater

length of captivity after capture at Gallipoli. The risk of death for prisoners in Turkey was 126/1000 life years, compared to 112/1000 life years lived in prison for men in Germany.

Upon their return to New Zealand we follow men until death. Censoring is not an issue, as all men in the birth cohort are now deceased, allowing our analysis to use linear regression as well as survival time models. We identify death dates for 98.5% of men who survived the war, and were discharged. The majority of the men returned to, lived in, and passed away in New Zealand, and were identified in New Zealand death records. For a dozen men who indicated ties to England or Australia, we used English and Australian death indices to find death dates.

Men who had been prisoner in Turkey (average age at death =71) lived two years longer than men imprisoned on the Western Front (average age at death =69), a result largely explained by the greater mortality selection operating over extended periods of captivity. Adjusting for covariates related to pre-enlistment characteristics, and duration of imprisonment widened the contrast. At enlistment the two groups were of similar health status, however the extended period of captivity took a greater toll on prisoners in Turkey.

Although men imprisoned for longer in Turkey lived longer, the impact of imprisonment duration on post-war life expectancy was negative. A day in prison took approximately 1.5 days off men's lives. Our estimate of how duration affected life expectancy changes slightly with different functional forms, and specification of the sample. Notably excluding men who died within five years of discharge *strengthens* the estimate of how duration affected life expectancy.

We are able to use completely maintained coronial records for New Zealand to identify whether POWs committed suicide, or died of external causes. Significantly we find that suicide rates were lower in POW returnees. Among the complete population of POW survivors, there were just 2 suicides in a lifetime of follow-up: a rate of 11/100,000 life years. In a general sample of NZ WWI veterans suicide rates over a lifetime were four times higher. Taken together our results show that the prisoner of war experience was *selective*: Men returning from Turkey lived longer; *scarring*: Longer terms in prison reduced survival; and *strengthening:* Suicide risk was lower than among veterans in general.

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