

# The Journal of Civil War Medicine

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This publication is dedicated to the Surgeons, North and South, who robbed war of many of its horrors, and, in doing so, added a brilliant page to the record of the humane character of the medical profession.

33<sup>rd</sup> Anniversary Year of the Society

“A Study of the History of Medicine and Surgery of the Civil War Era.”



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patient by bleeding at the orifices of the wounds, by the great dyspnea, by his coughing up large arterial mouthfuls which are frothy.

Time prevents my saying more than I already have, and the above remarks are therefore respectively submitted.

P.J. HORWITZ

Submitted Jan. 1862

**NOTE:** Dr. Horwitz was profiled in Volume 14, No. 2 of this publication in the section "Who Where They? Surgeons of the Civil War."

## **Was Measles a Powerful Killer, as Widely Believed, During the Civil War?**

By William Meacham

In the War Between the States, it is well known that disease in the army camps on both sides killed many more men than combat, twice as many by most estimates. The soldiers were ravaged by all sorts of diseases, and able-bodied young men died in large numbers. Many diseases are cited, including typhoid, smallpox, dysentery, cholera, measles, yellow fever, and malaria.

I have been studying the case of a Confederate camp in Hopkinsville, Kentucky that had horrendous fatalities (303 out of ca. 2000) during the winter of 1861-62. The epidemic there was said to be 'black measles.' The pattern of deaths that occurred in each unit stationed there indicated that a fast-acting and clearly very lethal disease was involved.

There are military and civilian descriptions of conditions that prevailed there, letters from men in the camp, and accurate records of the dates of deaths that occurred in each regiment. From the details in these accounts it would seem that the deadly disease there had little to do with ordinary measles. Furthermore, it is unlikely that typhoid, dysentery or other possible culprits could kill as fast and efficiently as the data indicates. There are no reports of the disease spreading into the civilian population, so regular and close contact must have been the mode of transmission.

Having spent several years researching

genealogy in Kentucky, I had seen records of infants and children who died of measles, but never an adult. It struck me as extremely unlikely that in 19th century America, an endemic disease like measles could cut down several hundred able-bodied men, as it did at Hopkinsville, or several thousand on both sides as claimed during the four years of war. The conventional explanation – that these 'farm boys' were from large isolated pools of rural folk never exposed to the measles virus – seems to be contradicted by evidence I shall present in detail below. Even if there were such large, immunologically isolated areas, one does not find serious outbreaks killing many adults in small rural communities when the virus was introduced and many were infected. In mid-19th century America (excluding Indian tribes), there is ample evidence that it was children and the non-immune elderly who were mainly at risk of death from measles. A similar situation has been demonstrated for the same period in England.[1] By contrast, the disease caused great adult mortality in native American and other aboriginal contexts.

### **Measles as a camp epidemic during the Civil War**

There are literally hundreds of reports of measles outbreaks in military camps on both sides. Most doctors at that time would have correctly diagnosed measles, although some may have mistaken it for scarlet fever or diphtheria. Measles is of course highly contagious, and often brings on serious symptoms, but was it really the deadly scourge of soldiers that conventional wisdom of that era, and most historians since, believed?

The then Assistant Surgeon-General of the US, Joseph Woodward, described the impact of measles in his major study of camp diseases in the Union army: "Frequently from one-third to one-half of the effective [troop] strength was attacked [by measles] ... The duration of the epidemic in a regiment was usually from one to two months." [2] The classic account of measles in the military by Smallman-Raynor and Cliff paints a detailed picture of the devastation believed to

have been wrought by measles.[3] They describe the ‘exceptionally bad health record’ of the Missouri 65th Regiment (Union): it recorded 772 deaths out of 1800 men due to disease and infection following camp injury. While only 21 deaths were directly attributed to measles, complications reportedly from it included pneumonia, chronic diarrhea and other sequelae. Cunningham noted that over 8000 cases of measles were reported in the Army of the Potomac from July through September of 1861. [4] Steiner described similar massive impacts of measles in four other Union regiments from Indiana, Maine and two from Illinois. [5] Almost all of these measles outbreaks occurred as the soldiers were mustered into military units for training.

Woodward cited a figure of 21,676 cases of measles on the Union side in the first year of the war, with 551 deaths. The official record for the entire war gave a total of 76,318 measles infections among Union soldiers, with 5,177 deaths. The difference in mortality rates in these two reports is significant: 2.5% vs 6.7%. Clearly different criteria were used, and in any event the main killer from measles is pneumonia, with diarrhea/dehydration also significant. [6]

The situation was even worse in the Confederate Army. A few examples suffice to convey how the impact of measles was felt: hundreds of new recruits reportedly died from a ‘plague of measles’ at Camp Moore (Louisiana) and as did many more after being sent to Tennessee and Kentucky. [7] In July 1861, the 19th Tennessee was sent to guard the pass at Cumberland Gap “but was soon stricken with an epidemic of measles and mumps that nearly incapacitated the entire command.” [8] In a letter to Jefferson Davis, the commander of the 4th Brigade, Army of the Mississippi, wrote: “These troops, numbering some 1,800, are now [October 1861] just recovering from measles. At least two-thirds of the brigade have had them, and to send them in their present condition [to Kentucky] would lose one-half of them in a very short time.” [9] New recruits from Georgia also suffered heavily on their first assignment:

“In October 1861, the 14th Georgia left the

state with over 800 men. Soon after they arrived in camp in West Virginia the measles broke out among them and on account of their exposed condition many took cold and died. After others had partially recovered from the measles they were attacked by pneumonia and Typhoid fever. At that point there were only about 150 men in the Regiment that were fit for duty.” [10]

Most reports of these camp epidemics mention other diseases that were also present, and it is unclear what proportion of the deaths was due to measles, but since it produced the worst symptoms, it seems to have received the lion’s share of the blame. Mumps and whooping cough are frequently noted, but were seldom deadly. From accounts of the camps, it is clear that pneumonia and ‘fever’ were the main direct cause of death, with diarrhea/dehydration also a significant contributor. Fever was at that time considered by some physicians as a disease in itself rather than a symptom. Many reports mention exposure to wet and cold as an important trigger.

Even worse than ordinary measles, the scourge of ‘black measles’ was arguably the most deadly of all camp diseases; its mortality rates were extremely high and it acted very fast. A few examples serve to paint the grim picture:

“During the cold wet winter of 1862-63....this battle was against disease – against typhoid and the dreaded black measles with its raging fever, bilious eruptions and debilitating diarrhea ... more than 1,500 men at Camp Nelson [Arkansas] would succumb” [11]

“A regiment of Union soldiers from Massachusetts was marching home from duty in the South. Either they stopped in Salisbury (Maryland) because of an outbreak of either typhoid fever or black measles in their ranks, or they contracted the disease while bivouacking here. In any case, a total of 51 or 52 soldiers died as a result.” [12]

“[Second Michigan Infantry, 1862, in Virginia] is generally healthy and all of the regiments ... except the Fifth. They have a funeral every day. One day they buried six.

They call it black measles and they blame their doctor. He is under arrest. They sent thirty five to the general hospital from one company.” [13]

A more detailed account and discussion of the much feared malady was provided in this account written in 1867:

“A scourge broke out among the troops [Confederate, in 1861] collected at Pocahontas [on the Missouri-Arkansas border] which confounded all, at least of the non-medical observers. This was nothing more than measles, but in an intensely aggravated and very dangerous form. It was hard to believe that there was such a proportion of adult men who had escaped a malady generally thought one of the affections of childhood. It was so virulent, at the time and place of which I write, and in so many instances fatal, that many confidently believed it to be a different disease from the ordinary measles, although the Surgeons pronounced it the same. It was called ‘black measles,’ and was certainly a most malignant type of the disease. I have been since informed that it raged with equal fury and with the same characteristics among the volunteers just called into the field in many other localities. [14]

The situation was equally bleak at Hopkinsville, where years after the war an eyewitness recalled it thus:

“The plague of the camps here, ‘Black Measles,’ [was] one of the most pathetic stories of the civil war. ... The mortality was more than that of all the epidemics which have visited the town since its foundation. It was no wonder, when soldiers ... were sent to stand guard in the chilly rains and snows of winter nights, coughing pitifully as they shivered in ragged clothes and almost unshod feet. ... Two soldiers were sent one morning to purchase shrouds ... On their way back one of them dropped dead on the street, and the other died

a few minutes after ...” [15]

The epidemic hit just one week after troops from Mississippi (1st and 23rd Infantry) arrived on October 1, 1861 to occupy the town. Their commander, General Alcorn, in a letter to his wife dated September 26 while moving into western Kentucky, expressed confidence about the readiness of his 950 men to repel any attack. Perhaps there were already one or two dozen sick, but any number approaching 5% of his troops would have caused concern. By October 8, the epidemic had exploded. He wrote that he had “400 men in hospital with measles.” [16] On October 19, he reported to headquarters: “My command, after furnishing nurses for the sick, is reduced to a battalion [ca 400-500 men]. It appears that every man in my camp will directly be down with measles. The thought of a movement in my present condition is idle.” [17]

Such numbers are staggering and raise major questions regarding measles. Could it have infected so many so seriously in such a short time, and just as they arrived at Hopkinsville? Could so many men not have had the disease in childhood? One of Alcorn’s companies was recruited from Panola county, which according to a newspaper report (cited below) had seen a widespread measles outbreak in 1858. And all of the companies had been organized into service during the summer; measles would have been expected in the training camps at first muster. These issues are examined in detail below.

The camp at Hopkinsville was engaged in recruiting from Kentucky. By the 29th of October, Gen. Alcorn had been replaced by Gen. Tilghman, who reported the following:

“... the camp being merely one large hospital, with scarce men enough on duty to care for the sick and maintain a feeble guard around them, with insufficient pickets at prominent points. Over one-half the entire command are on the sick list, with very grave types of different diseases. ... The Kentucky Battalion of Infantry, numbering 547, have only 45 cases reported sick. The measles have made their appearance, and the battalion will

average 20 new cases per day, judging from to-day's report. The morning brigade report, herewith inclosed, shows only 716 for duty out of a total of 2237." [18]

Measles was only one of 'very grave types of different diseases' afflicting the men. The rates of morbidity and mortality suggest that a very efficient and rapid killer had invaded the camp and was exacting a terrible toll. By the end of October, 35 of the Mississippi troops had died.

With the arrival of the Texas 7th Infantry Regiment the invisible enemy was to achieve its worst damage, aided by maladies the regiment brought with them. Its commanding officer wrote: "Our nine companies are all here [Hopkinsville]. Five of our number died on the way. From exposure to cold and wet on our journey, we have more coughs and colds than I ever saw among the same number of men." [19] The second-in-command wrote: "... after we arrived here one half of our men or more were obligated to make a forced march to Princeton, that on their return they were caught in a cold rain and encamped one night on wet blankets without food or fire. Close on the heels of this march they were attacked with the measles." [20] Was the measles outbreak coincidental, when they were also attacked by the deadly pathogen already wreaking havoc in the camp, and fueled by exposure?

The death rates are seen dramatically in the graphs on the following page, beginning soon after the arrival of each new unit. All troops except the very sick left the city on February 12, 1862.

Such an extremely fast-spreading and quickly lethal disease was also seen in the flu pandemic of 1918: "Camp Devens, a U.S. Army camp [near Boston] housed 45,000 men on September 18, 1918. Thirty-six cases of influenza were reported [on that day], but by the end of September **over 6000 had been infected**, with 60 to 90 dying per day." [21]

### **'Black Measles' in 19th and early 20th century medical texts**

Among the accounts from the Civil War and other 19th century sources, there are very few details

of the symptoms of black measles. There are descriptions in medical texts of the period, and these repeatedly stress the dangerous, lethal nature of the disease, as compared to ordinary measles.

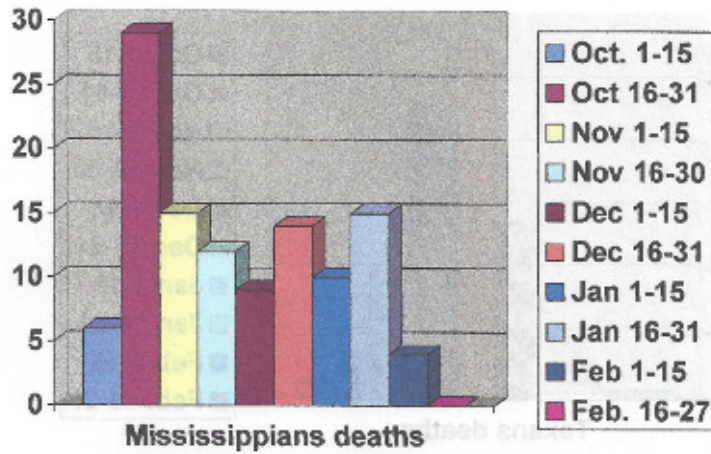
*A Handbook of Hygiene and Sanitary Science.* 1889: "In the severe type of the disease, known as black measles, there is generally haemorrhage from the mucous surfaces, and **death may occur before the rash is thrown out.**" [emphases here and below, added in bold]

*The Medical and Surgical Reporter.* 1890: "During an attack of measles, if at the latter period the respiration should become accelerated, the temperature rise, and especially if there should be some blueness around the finger or toe nails, the greatest apprehension may be warranted. **The aspect of the patient when the blueness has spread to the face and other parts of the body has given the name 'black measles' to this severe form of the disease. As everyone knows, black measles is extremely fatal.**"

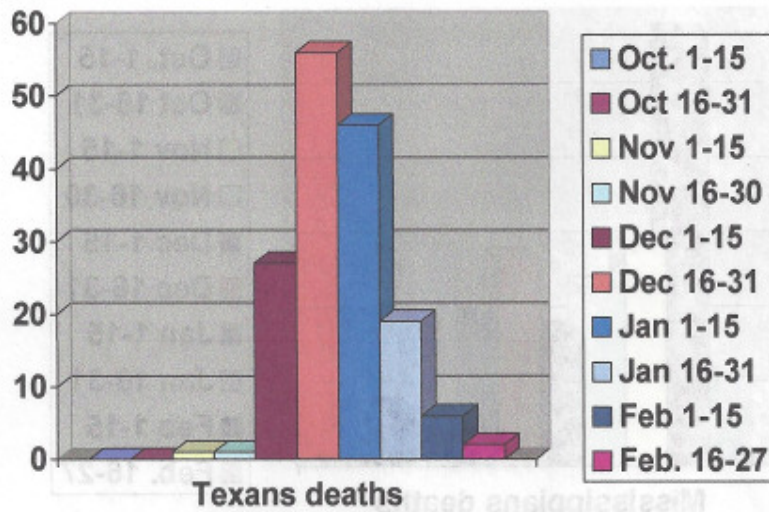
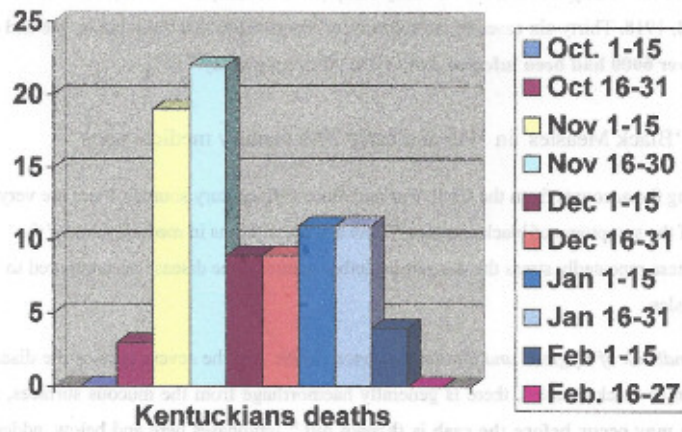
*A Text-book of practical medicine: Designed for the Use of Students and Practitioners of Medicine.* By Alfred Lebbeus Loomis. 1895: "There are two forms of black measles – one in which the eruption consists of petechial spots scattered over the surface, and dependent upon a hemorrhagic tendency; **in the other form the eruption assumes a dark appearance on account of changes which have occurred in the blood, the result of a very high temperature at an early period of the attack.**"

*The Sacred Heart Review.* May 12, 1900: "**In many cases it [the rash] is hardly to be seen at all.** A malignant form known as 'black measles' exists, which is extremely dangerous. The eruption appears slowly and imperfectly, and the temperature is very high. **The measles are dark in color, and the skin is mottled.**"

*The Practice of Medicine: A text-book for practitioners and students with special reference to diagnosis and treatment.* By James Tyson, M.D. 5th edition, Philadelphia, 1911: "... a malignant form of



The Mississippi regiments numbering ca 950 men arrived at camp in the first week of October. The contingent of Kentuckians (ca 600 men) were recruited at Hopkinsville ca. Oct. 10-30.



Nine companies (ca 750 men) of the 7th Texas arrived at camp on Nov. 7.

measles sometimes occurs, called 'black measles', which is very serious -- often indeed fatal. The vast majority of cases of measles get well. It is only in epidemics of the malignant form, in hospitals, camps, and foundling asylums, that death occurs as a direct result of the disease. In these the mortality is sometimes very high."

"Measles: its pathogenesis and treatment" by Charles E. de M. Sajous, MD. [in] *Monthly Cyclopaedia and Medical Bulletin* vol. 1, page 63. 1908: the body may even be covered with purple blotches, blood ooze through the gums, the nasal mucous membrane, etc. constituting the so-called black measles. **Fortunately, such cases are now seldom encountered.**"

What is striking about these descriptions is the probability that black measles was simply ordinary measles with a complication of pneumonia, or rarely hemorrhage as sequel. The reason that by 1908 "such cases are now seldom encountered" could be that it had been recognized that pneumonia or a rare hemorrhagic complication were sequelae. As black measles 'disappeared' the term began to be used for Rocky Mountain Spotted Fever. [22]

Some of the above descriptions of black measles sound eerily similar to the lethal stage of the Spanish Flu of 1918: "The victim would get the flu, and then get a secondary infection. His lungs would fill with fluid, preventing him from breathing, and his face would turn blue as he died drowning in his own fluids. The color of the people's faces was so striking they called it 'heliotrope cyanosis' " (purplish discoloration of the skin). On September 29, 1918 a doctor at Camp Devens near Boston described the horror taking place there:

"These men start with what appears to be an attack of la grippe or influenza, and when brought to the hospital they very rapidly develop the most viscous type of pneumonia that has ever been seen. Two hours after admission they have the mahogany spots over the cheek bones, and a few hours later you can

begin to see the cyanosis extending from their ears and spreading all over the face, until it is hard to distinguish the coloured men from the white. It is only a matter of a few hours then until death comes, and it is simply a struggle for air until they suffocate." [23]

Another account mentions that "the 'bluish cast' of victims' faces eventually turned brown or purple and their feet turned black ... their cough brings up the blood-stained sputum." [24] Clearly these symptoms occurring in 1861 could well have been labeled black measles, especially if occurring alongside an outbreak of ordinary measles. And significantly, in all the camp measles outbreaks reviewed, one does not find any mention of hemorrhaging.

Whatever black measles was, there is evidence (discussed below) that indicates it was not regular measles, and that previous infection with measles did not provide immunity to it. Research in the 20th century has shown that "there is no direct evidence of hypervirulent strains of measles virus or genetic predispositions to fatal outcomes after measles infection." [25] Where hemorrhagic complications occurred, they were presumably to be due to individual deficiencies, pre-existing conditions and/or weakened immune systems. There remains however much uncertainty over exactly what it was. One of the leading modern experts on measles, James Cherry, wrote: "Of historic interest was the occurrence of a severe, often fatal form of measles called black measles ... Severe hemorrhagic measles is rarely seen today, and little is known about the pathogenesis." [26]

### **Was lifelong immunity to measles known at the time?**

In his study of Civil War medicine, Freemon wrote: "A significant advance of medical thought early in the War was the appreciation by J.J. Woodward and Roberts Bartholow that these diseases [measles and mumps] occur only once in each individual." [27] It is hard to believe that these



leading lights of the medical establishment would not have known of the discovery, published in 1847 by Peter Panum after a study of measles on the Faroe islands in Denmark, that infection and recovery from measles provided lifelong immunity. [28]

Popular knowledge was apparently far ahead even of Panum. As early as 1814, one finds this newspaper account of a new skin disease: "It is however different from the measles in several particulars, and one that is very important, which is, that the same person may have this complaint more than once." [29]. In an anecdote published in 1831, one finds this statement which seems to reflect a widely held belief: "A gentleman once asked Dr. B--- the reason why certain diseases, such as measles, whooping cough, and small pox, could only be had but once." [30] C.W. Love, wrote from Hopkinsville: "The Camp East of this place and about a mile and a half from us has Meazles and Mumps they will no doubt soon be in our camp but there are not many who have not already had them." [31] Love was from Freestone county, Texas. Others in his regiment were from similar small town and rural territories. It is instructive to note that despite his statement, the Texas regiment of 749 men suffered horrendous casualties from the epidemic at Hopkinsville, with more than half falling ill and 140 dead. Among those lost were 31 boys aged 17 to 19 years old.

Finally, the following is from a letter written in May 1864 on arrival in San Francisco after a journey by ship:

"There was plenty measles aboard, of course we thought we were all right, we had had the measles ... On Friday morning when I saw Peter's face it was all over with spots. Well it could not be the measles for he had them before. ... So I called the doctor and he said it was the black measles – the worst measles. He said if a person did not have the measles right it would be the black measles. ... He was not very sick at all. It was not like the measles in Illinois." [32]

Peter recovered in two days; thousands of soldiers in

the east were not so lucky. His was probably a rare case of atypical measles, the first infection failing to provide complete immunity for some reason.

### Large pools of uninfected people?

The general view of Civil War medical historians regarding camp diseases is represented in the summation by Bollet: "Because most new soldiers were from rural areas, few had developed immunity to even the common epidemic infections." [33] Freemon however asserted that most people North and South had had measles as a child, but he did note that "many people in rural America were immunologically isolated." [34] But how accurate are these assessments? Could it be that a relatively small percentage of rural men had not had measles? The evidence from newspaper archives [35] and other sources from the mid-19th century indicates that measles was widely found in small towns, rural communities and Southern plantations. This fact was embedded in popular wisdom already:

*Boon's Lick Times* (Missouri), June 10, 1848 – "all [children] are subject to teething, whooping cough and measles."

*Daily Louisville Democrat*, October 17, 1856 -- A political party can no more escape the Marshalls [prominent family] than an individual can hope to escape the measles. Happy would it be for parties if like the measles they were never inflicted but once.

*Athens Post* (Tennessee), May 1, 1857 – "They followed each other in as rapid succession as children take the measles in a country school."

*Southern Banner* (Athens, Georgia), Oct. 8, 1857 – "Matrimony ... its the hardest way on earth to get a living. Think of carrying 8 or 9 children through measles, chicken pox, rash, mumps, scarlet fever."

*Weekly Georgia Telegraph* (Macon), Jul. 19, 1859 – "Generally such things are taken as children do the measles, as a matter of course, and what has to be endured."

The above citations (except Louisville's) come from

small town newspapers in rural areas of the South. Reports from similar rural areas indicate that measles was a common but not lethal occurrence (to adults):

*The Catawba Journal* (North Carolina), Oct. 16, 1827 – “At the present season, when disease and particularly measles, is so very prevalent.”

*Federal Union* (Milledgeville, Georgia) June 23, 1835 – “We have been retarded in our operations here [building a railroad], by many of the hands taking the measles, but fortunately it has not proven fatal in no instance.” Dec. 25, 1838 – “Union Hill (Georgia) Male and Female Academy closed ... in consequence of the measles having prevailed so generally among the pupils of this institution.”

Mark Twain – “When I was twelve and a half years old [1848] ... the summer came, and brought with it an epidemic of measles. For a time a child died almost every day. The village [Hannibal, Missouri] was paralyzed with fright, distress, despair. Children that were not smitten with the disease were imprisoned in their homes to save them from the infection.” [36]

*Weekly Georgia Telegraph*, Sept. 7, 1852 – “Within the last five or six months much sickness has prevailed in our midst [Fort Valley] ... Nearly all the cases originated and followed in the train of the measles.” April 15, 1856 – “prevalence of measles in Irwinton.” Feb. 17, 1857 – “measles now said to be very prevalent in the region of Tallahassee.”

*The Lexington Advertiser* (Tennessee), May 6, 1857 – “... at no time for several years has there been so much sickness in and around [here]. The prevailing diseases are pneumonia, chill and measles.”

*Glasgow Weekly Times* (Missouri), July 16, 1857 – “... the school has been reduced to less than half of its original number of pupils by the measles.”

*Panola Star* (Mississippi), Aug. 18, 1858 – “THE HEALTH OF THE COUNTRY: We regret to say that we have never heard of so much sickness as now prevails in this county, and in fact, all over the

South. In this neighborhood there are whole families of whites and blacks down with the chills and fever, measles, billious fevers, etc. In some instances there are not a sufficient number well in a family to nurse the sick ones. ... The mortality is very light compared with the sickness.”

*Daily Louisville Democrat*, December 4, 1858 – [report from Muhlenburg county, adjacent to Hopkinsville] we have had the severest tour this fall, with the measles, that I have ever noticed; but I am happy to say that it has not caused many deaths, although, in some cases, it has been severe.

*Texas Republican*, May 12, 1860 – “the measles, whooping cough, and scarlet fever are prevailing at Tyler” [37]

Tyler was the county seat of Smith county, the source of men who in 1861 formed company F of the Texas regiment later stationed at Hopkinsville. Muhlenburg county was the source of many Kentucky recruits. And Panola county provided the men of one of the Mississippi companies there.

Finally, this post-war report raises serious doubts about the lethality of measles invading an isolated, sparsely populated rural community:

*Columbia Herald* (Tennessee), March 15, 1872 – “The Snow Creek neighborhood is overrun with the measles. Esq. Rountree tells us that there are one hundred cases on that creek. Many families have five or six members down with it. ... We are glad to learn that the measles has not proven very fatal on Snow Creek, only one person having died of it.”

### **Measles in mortality records 1850-1870**

If there were many isolated communities such as Snow Creek in antebellum America where measles had never infected anyone, one would expect not only widespread outbreaks but also deaths on an even greater scale than seen among young men in the army camps in 1861. Such communities would have many elderly people, individuals with chronic illness, others with malnutrition or debilitating lifestyles such as

alcoholism, obesity, etc. And there should be even worse mortality among slaves, since as Freemon notes: "Black slaves were more isolated than white farmers." [38] However, one simply does not find waves of measles-induced adult fatalities sweeping rural hamlets and farming areas. Snow Creek, Tennessee was a remote area 10 miles from the market town of Columbia. It probably provides the standard for such communities: measles spread to most or even all who had not had it, but hardly anyone died. The data from cemeteries, county records, and US census Mortality Schedules is very compelling – there is nothing comparable to the deadly measles outbreaks that happened in army camps.

In the rural areas that most Confederate soldiers came from, measles appears regularly in the death of children but infrequently among adults. I have examined hundreds of Mortality Schedules from Southern states, including those of all 110 counties in Kentucky for 1850, 1860 and 1870, and all 84 counties in Tennessee for 1850 and 1860. [39] Measles deaths occurred in the majority of counties, and of the 414 deaths from measles in those census years in Kentucky, and 147 in Tennessee, 80-85% were children, with ca. 5% elderly; 25-30% were black. These numbers represent no doubt thousands if not tens of thousands of infections that resolved without fatality. (For comparison, deaths from other diseases reported in the same three census years in Kentucky were: 'fever' 4981, TB/consumption 4172, pneumonia 2109, typhoid 1756, croup 1453, scarlet fever 1428, dysentery/diarrhea/flux 1015, cholera 766, smallpox 194, jaundice 135 and meningitis 55.)

One would certainly expect many clusters of adult deaths from measles if it had such a powerful deadly impact on young soldiers in the prime of life. Lethal complications would be much more likely to develop when the virus attacked a rural village or district with many vulnerable individuals, including the elderly, malnourished, chronically ill, etc. For typhoid, dysentery, scarlet fever, and cholera, clusters of adult deaths for both races are frequently seen in the records, but this is not what one finds for measles. Apart from two instances where measles killed all

members of a single family that included teenagers, only one cluster of four or more measles deaths in adults was found in the same rural district or town within a time frame of four months. This occurred in 1870 involving one elderly white female and three middle aged black females in Ward 4 of Simpson county, Kentucky.

Even among slaves and free blacks there were no adult clusters, and death from measles mainly afflicted black children just as whites, indicating that measles was equally circulating among slaves in 1850-60 and free blacks in 1870. Blacks seem to have had the same natural resistance to measles as whites, perhaps due to close 'interaction' (miscegenation) since the 17th century. And measles may have been endemic in Africa before the slave trade; this has also been claimed for yellow fever. [40] Blacks in America did have a much lower mortality than whites (but roughly equal morbidity) during major 19th century outbreaks of yellow fever in the South.

The following is a sampling of the total number of deaths by disease, and by measles in particular, as reported in the Mortality Schedules (which cover the 12 months prior to the census-taking day), or found in county and cemetery records where cause of death is given. The total of deaths from disease is given first; it excludes accident, childbirth, homicide, suicide and stillborn; sudden and unknown are included; 14 years of age and above are counted as adult. Measles victims are described by adult or child and race or status where available.

Columbiana county, Ohio 1860 – 12 deaths from disease; 6 white children of measles

Shelby county, Indiana 1850 – 156 deaths; one white adult, two white children

Greenwood Cemetery, Iowa 1843-1853 (eleven years) – 568 deaths; 3 adults; 17 children [41]

Oskaloosa township, Mahaska county, Iowa 1860 – 59 deaths; one white adult, 6 white children

Owsley County Kentucky 1850-1862 (13

years) – 235 deaths; 2 adults, one child [42]

Barren county, Kentucky 1860 – 224 deaths; one white adult, 2 white children, 2 slave children

Bourbon county, Kentucky 1870 – 96 deaths; 7 black children

Pendleton county, Kentucky 1852-1859 (eight years) – 742 deaths; one adult, four children [43]

Spencer county, Kentucky, 1850 – 57 deaths; one slave adult, five slave children, one white child

Lauderdale county, Tennessee, 1860 – 202 deaths; two white adults, three white children

Districts 10 and 15, Madison county, Tennessee, 1860 – 24 deaths; 8 slave children

Wilson county, Tennessee, 1860 – 138 deaths; one slave adult; 3 slave children

Scott County, Arkansas 1850 – 143 deaths; two white children

Desha county, Arkansas 1860 – 148 deaths; 5 slave children

Glynn county, Georgia, 1870 – one white adult, one white child, six black children

Clarke county, Georgia 1850 – 142 deaths; one white adult, 3 white children, 6 slave children

Surry county, Virginia 1860 (slaves and free blacks only) – 45 deaths; one adult (slave); one child (free black)

Anson county, North Carolina 1860 – 105 deaths; one slave adult, 5 slave children, one white child

Letter from James Franklin, slave trader at Natchez, Mississippi, April 29, 1832 – “Owing to the measles and having our negroes crowded in the Brig we have had a great many sick” [but only one died] [44]

Jefferson county, Mississippi 1860 (slaves

only) – 88 deaths; 1 adult, 3 children

Noxubee county, Mississippi 1870 (blacks only) – 290 deaths; 11 children

Washington county, Texas 1860 – 236 deaths; 9 slave children, one white child, one adult slave, one adult white.

Bastrop county, Texas 1870 – 131 deaths; one black adult, 7 black children, 6 white children

Jefferson parish, Louisiana 1860 – 111 deaths; 2 slave adults, 14 slave children, 3 white children

Tensas parish, Louisiana 1860 – 357 deaths; one slave adult, 22 slave children

Journal kept by the owner of Magnolia Plantation (south of New Orleans), October 4, 1860 – “We have had during the past 18 months over 150 cases [among the slaves] of measles and numerous cases of whooping cough then diphtheria, all of which we have gone through with but little loss save in the whooping cough we lost 12 children.” [45]

Duval county, Florida 1870 (blacks only) – 49 deaths; one adult, two children

### **How did ordinary measles kill soldiers in their prime?**

In response to a query, Jeffrey Taubenberger of the National Institute of Health (NIH) wrote that measles was: “... a well-recognized clinical disease entity by the mid 19th century and it is likely that measles would have been correctly diagnosed by physicians in camps in the Civil War with its high infectiousness, and its clinical signs and symptoms. In naïve individuals, especially in adults, measles can cause serious and fatal complications with prominent viral pneumonia and encephalitis.” [46]

There is no doubt that significant measles outbreaks did occur in the camps, and that in certain cases its consequences would have proved fatal. But it seems from the data reviewed above that the proportion of ‘naïve individuals’ (those without

immunity created by previous infection) in the armies would never have been high, and certainly not half or more of a regiment. It also seems extremely unlikely that measles would have led to death at the high rate indicated in the reports. The 'naïve individuals' were not aboriginals, and had a level of inherited resistance.

Black measles was of course much more lethal, but what modern medicine has identified as hemorrhagic or malignant measles arises only in special circumstances. David Morens of the NIH wrote: "The whole issue of black measles is well known in medical fields ... 'black measles' was once very common especially in developing countries. My CDC colleagues used to see it routinely in Africa in the 60s and early 70s. Most cases were just regular measles in people who had various forms of vitamin deficiency due to poor diets." [47] Being the result of individual vulnerabilities, malignant measles per se would not spread as an epidemic among hundreds of able-bodied young men, especially at the beginning of the war when food supplies were ample, as noted in many letters. It would only arise in a few vulnerable individuals.

Studies have demonstrated a correlation between the severity and mortality of measles with the degree of malnutrition. [48] But in people of normal health, recent research has shown that the most virulent measles infections result when the virus is caught from a sibling, less virulent if transmitted from a parent or cousin, and least virulent when contagion spreads among strangers. [49]

Bartholow studied 100 cases of measles patients from the time they were admitted to the General Field Hospital of the Union Army in Chattanooga, Tennessee in 1863. He argued that what he called 'camp measles' and ordinary measles were the same; he did not mention any of the special symptoms associated with black measles. On the significant mortality of camp measles, he commented: "... the peculiar poison which produces them does not differ. The poison luxurates amongst recruits and in camps, because the objective and subjective conditions for its development are peculiarly rich in this class of patients." [50]

This is clearly the crux of the matter. It now

seems quite untenable to argue that 'objective and subjective conditions' represented by simply being in a military camp, away from home, could make such an enormous difference in mortality. Bartholow described ordinary measles as a disease "which usually prevails amongst children and most housewives feel competent to treat." Could it transform itself under any conditions into the unmitigated horror that cut down able-bodied men in their prime like flies? We have seen that when it spread into rural communities where there were much weaker and more vulnerable individuals, significant adult mortality did not occur. And would anyone seriously contend that the 'objective and subjective conditions' in slave quarters on Southern plantations 1850-60 or among free blacks in Mississippi or Georgia in 1870 were better than in the army camps? Even blacks held by slave traders 'in the Brig' did not die of measles, yet well fed young soldiers in good health and high spirits were killed in large numbers? This simply does not make sense, unless black measles was a totally different and highly virulent strain of measles that has disappeared today. More likely, the cause of death in many cases was a deadly strain of influenza like that of 1918-20 that proved particularly dangerous in healthy adults, provoking an over-reaction from the strong immune system, in a 'cytokine storm' with the lethal build-up of fluid in the lungs. [51]

Bartholow put the general mortality rate from measles at 2%. This corresponds with Woodward's statistic for the first year of the war, and also with that observed on the Faroe islands of Denmark in 1846 and among American soldiers with measles during World War I. The relatively low death toll for measles among white and black adults as revealed in U.S. census records from 1850-70 must be attributed to the natural resistance or tolerance that developed over centuries in populations where the disease was endemic.

In contrast, 'virgin soil' populations such as Native Americans lacked this inherited ability to resist, and suffered very high mortality among adults as a consequence. Death rates from measles as high

as 40 to 50% have been cited among certain AmerIndian tribes and in other aboriginal populations on Fiji and Hawaii. [52] The mechanism of natural resistance arising from endemicity has been much debated; it seems clear that genetic, environmental and cultural aspects play a role, as well as antibodies inherited maternally. The geneticist James Neel speculated as much as 20% of 'excess mortality' in aboriginals was due to genetic factors. [53]

### **Was influenza the main killer?**

According to the official record published by the then Surgeon General, between May 1861 and June 1862 there were 85,677 cases of 'catarrh' reported from the field among Union troops [54], but in monthly records the term 'acute bronchitis' was substituted for catarrh. [55] The extensive occurrence of this malady was attributed to climate, fatigue and privations. It seems highly probable that this was the flu, and it was clearly widespread. For the entire four years of the war, the total cases of 'acute bronchitis' among Union troops was 191,363; almost half (45%) occurred in the first year of the war. Like the measles outbreaks, the first year saw by far the most cases. The fatality rate reported for acute bronchitis was low, only 650 deaths or 0.27 per thousand. It was noted that the low mortality was due to the rare occurrence of pneumonia as a sequel. The reason for this may well have been in how pneumonia deaths were recorded.

'Camp fever' was often cited along with measles and typhoid as the main scourges of the assembled troops both Union and Confederate. Clearly measles and typhoid both bring on a fever, and detailed accounts of any individual's symptoms are rare for many of the camp epidemics, as opposed to hospital reports. There is ample evidence that there were other fevers as well, without the diagnostic traits of measles or typhoid. Indeed, in the 'grand summary' of all 14,597 field deaths from disease in the Confederate army in 1861 and 1862, 'continued' and 'eruptive' fevers together accounted for 43%, with pulmonary at 24%, diarrhea 12%, malaria 5%, and others 16%. [56] While typhoid and dysentery are the

probable culprits for most diarrhea deaths, it is impossible to proportion the fevers and pulmonary deaths to measles or influenza or 'homesickness' (as fevers were often attributed to).

It seems clear that when regiments were first mustered into service, outbreaks of measles, mumps, whooping cough and other 'childhood maladies' occurred among those who had not had them, measles being the most serious and fever-producing. When men in significant numbers began falling ill and dying, the epidemic and deaths were blamed on measles in the reports from the camp. But many deaths were attributed to fevers because the diagnosis was unclear. Influenza may well have been an unrecognized killer. In some cases where 'epidemic catarrh' was reported, the cause of death was uncertain. A surgeon with the 48th Pennsylvania Volunteers in 1861 in southeast Virginia noted that:

"the last week in October, an epidemic of catarrh set in, having its origin in the exposure incident to the service during very inclement weather. This epidemic was also very general in its manifestations, and exceedingly painful ... During the first week in November typhoid fever made its appearance among us, following immediately in the footsteps of the epidemic catarrh, many of the cases of the latter appearing to glide by almost imperceptible gradations into a typhoid condition." [57]

A surgeon from a nearby camp reported a similar epidemic in March 1862, stating that nearly every man in the regiment was affected by it. The symptoms were described as "severe aching, throbbing pains in the head, back and limbs, bronchial inflammation ... followed by unusual debility and tedious convalescence." [58]

It is quite possible that influenza was in many other instances present and diagnosed as typhoid or remittent or intermittent fever. Also in October 1861 but 1000 miles to the west, the soldiers in the 7th Texas were suffering from flu-like symptoms even before they arrived at Hopkinsville, and five of their

number died in route. The unit then made a forced night march in frigid rain without proper shelter. A few days later men began to get sick and die. Yet the general camp epidemic there was called black measles. One of the Texans who fell seriously ill and came close to death wrote this account:

Jan. 4, 1862: "I was attacked with billious remittant fever and was confined to my bed for twenty days, never getting up without help. I have missed the fever for about 10 days, and I have been sitting up for that length of time, but I am almost reduced to a skeleton, 110 pounds. I am as weak as a child. I walked out a little yesterday and today, but it fatigued me very much. I think, however, I am improving very rapidly."

Jan. 22, 1862: "My physician said my disease from which I am recovering was produced by homesickness. I am near about well though and I am still staying in my room [with a local family] but I will go back to my camp next week." [59]

No mention of measles, and one can be certain that if a rash had been thrown out, or jaundice observed, the doctor would not have labeled the disease as homesickness. This man was surely afflicted with, and nearly died of, the disease that was claiming many dozens of his Texas comrades. Another letter written Jan. 27 from the camp mentions a soldier who "took ill so suddenly at night ... His disease is 'billious' pneumonia." [60] This was clearly not measles. And we recall that another soldier in his regiment had noted that most of the men had already had measles and mumps before entering the military.

The most detailed account of an individual's fatal illness at Hopkinsville is also the most dramatic, demonstrating that the disease was acute and severe. It comes from a memoire written in 1902 by one of the Mississippi regiment doctors. He describes how a sergeant suddenly fell ill:

"Forty years old, [Rufus was] a man of great strength physically ... That night we had a

regular Kentucky blizzard, and the officers next morning found Rufus nearly frozen, and seemingly very ill. [After being warmed up later that day he said:] 'I have a strange feeling in my head and lungs, and I believe I am going to die.' I examined the man carefully. He was very hoarse, sore throat, all the evidences of a severe catarrh, slight congestion of both lungs, but nothing sufficient to cause serious alarm; I felt uneasy and afraid his case was more serious than the symptoms indicated, so I called for Surgeon Hall, and my old friend Dr. Raiford, who, after a careful examination, laughed heartily at the patient's prognosis and the idea of his dying. Nevertheless he did die, and in a very short time, living only about thirty-six hours. [61]

The memoire also mentions a young soldier who recovered from a mild case of measles, 'felt fine' and rejoined his unit, only to fall ill later with pneumonia and die.

In the same months that the epidemic was wreaking its toll in Hopkinsville, another Confederate camp, 70 miles to the southeast, was experiencing an even worse situation. Camp Beauregard has been called 'The Valley Forge of the Confederacy'. Estimates of the dead range from 1000 to 1500 out of the 6000 soldiers who assembled there in the winter of 1861. The camp was evacuated and burned by the commander after four months. Hardly any contemporaneous accounts survive. One letter written in December 1861 mentions 'bad colds' among the men; another stated "there is no local cause for sickness here. But exposure will kill a great of us. We have plenty of [food], but blankets and clothes are very scarce." [62] General Alcorn was in charge there on Christmas Eve and wrote about what difficult conditions his men were enduring "in the cold rain and the mud." [63] A memoire written in 1914 by a surgeon who was at the camp describes several diseases and complications, especially noting the rapid onset of illness then death:

"The measles had gone through the regiment

before it was made up of the companies then composing it, in many cases leaving some bronchial or intestinal [sic] trouble, rendering them easy marks for pneumonia and typhoid fever. The weather became cold and rainy, then sleet and snow. ... Soon typhoid fever and pneumonia broke out among the men. There were 75 cases of typhoid fever and typhoid pneumonia in my hospital tent during one month. I speak only of our own regiment. It was as bad or worse than other regiments. Then the most terrible disease, cerebrospinal meningitis broke out, killing nearly every case attacked, and frequently in a few hours. ... None of us had ever seen a case of this disease. We knew the brain and spinal cord were affected, but why so many similar cases? This was an epidemic and more fatal than yellow fever. ... Men in apparent perfect health, on going to bed, would be taken in the night, and by the next night might be dead.” [64]

The first sentence above is quite significant – that measles had gone through the regiment when the basic companies were formed, which was in April to July of 1861. The regiments from Mississippi and Texas at Hopkinsville were also formed in same period. Thus measles was certainly not the main killer at Camp Beauregard, and most probably not at Hopkinsville. The surgeon also described convulsions and delirium among some of those affected. Just as in other camp epidemics, a connection was made between exposure to the winter weather and the sudden spike in fever, pneumonia and death.

The doctors at Camp Beauregard had never seen a case of cerebral meningitis, nor had they ever seen a disease as virulent as the Spanish Flu. Much of the description of how the men suffered would be matched by the worst cases in the 1918 flu pandemic that were marked by fainting, convulsions, delirium, rapid progression from onset of symptoms to death. Some medical men on the Union side did however note the close similarities between influenza and ‘spotted fever’ (epidemic cerebrospinal meningitis);

in 1863 a committee was appointed by the American Medical Association to investigate the issue. Some doctors quoted in the study considered the two to be the same, with one labeling spotted fever as ‘malignant influenza.’ [65]

Yet another large epidemic was raging nearby during the winter of 1861-62 at the Confederate headquarters for western Kentucky at Bowling Green, affecting more than half the regiment, and killing hundreds. A newspaper report stated that “The small pox, a virulent type of the typhoid fever, and the ‘black measles’ were prevailing, causing frightful mortality among the rebel troops near Bowling Green, Kentucky. Large numbers were dying daily.” [66] A letter from one soldier states that “measles, typhoid pneumonia, and homesickness are widespread ... Though up to this time I had enjoyed uninterrupted good health, the pneumonia now seized me violently; and after a week of ‘heroic treatment,’ I was put into a box-car and started for the hospital at Nashville.” [67] There is no mention of measles or diarrhea in his account, and the suddenness of the attack sounds very much like the flu, as does his description of convalescence over two weeks.

### **Typhoid fever, ‘typhoid pneumonia’ and flu**

There are several reasons why typhoid fever can be rejected as the main lethal agent in most of the camp epidemics attributed to measles. While it does often bring out a rash and has other similar symptoms, it is usually associated with severe diarrhea and abdominal pain. It is highly doubtful that camp doctors would have labeled an epidemic as measles if typhoid was the main killer. It normally follows a progression of stages, has persistent and severe diarrhea, and brings death usually from dehydration, intestinal and bowel complications, or kidney failure, whereas flu does not cause gastrointestinal issues. Pneumonia is usually the fatal complication of flu, and many of the deaths reportedly due to ‘typhoid pneumonia’ were most likely due instead to measles, influenza or other illness.



A medical text in 1873 gave this account of ‘typhoid pneumonia’:

“... it usually commences with a chill, which is often of great severity and long continuance ... This cold stage is sometimes so intense as to destroy the patient before the slightest reaction occurs. Where the disease is violent in its attack, the patient may suddenly become cold and pulseless, lethargic, and often insensible without previous complaint. [there are] instances in which the patient was found dead, or died within three or four hours after being in apparent health ... even in the strongest subjects, [it can] prove fatal in from forty-eight to sixty hours. Being usually brought on by exposure to a cold and damp atmosphere” [68]

Chill and lethargy would suggest incipient flu, cold and wet exposure would fuel it. It reminds us of what took the life of Sgt. Rufus. And one recalls again the similar descriptions of the Spanish Flu of 1918, with the rapid progression from chills, fever and fatigue to pneumonia and death, often within hours.

Typhoid fever itself appears to have sometimes been a catch-all term, and accurate diagnosis may not have been possible in many cases, especially when it is borne in mind that its signature symptom – moderate to severe diarrhea – was available from various causes and ubiquitous in the army camps. Freeman noted : “In its early phase, typhoid fever is difficult to diagnose. The fever is chronic and was therefore called continuous fever by Civil War physicians” as opposed to the intermittent fever of malaria. [69] Mixed symptoms and uncertain diagnosis caused Woodward to coin the phrase ‘typho-malarial fever’ in 1863 [70], and the term remained popular in the remaining decades of the 19th century. By the early 20th century it was abandoned. William Osier, one of the founders of Johns Hopkins Hospital, wrote that it existed “in the minds of doctors but not in the bodies of patients.” [71]

The confusing nature of these febrile diseases is seen in the report cited above from the 48th

Pennsylvania: “... in these cases typhoid fever, epidemic catarrh, remittent and intermittent fevers were so commingled and so complicated one another as to render the diagnosis very obscure, the treatment unsatisfactory, and the prognosis unfavorable. ... [until] they assumed a malignant and unmanageable aspect, such as I had never witnessed.” [72]

In a report of March 1862 the surgeon of the 30th Ohio Volunteers in western Virginia noted:

“The prevalent diseases during this quarter have been fevers, diarrhoea, jaundice, and catarrhs. These diseases have prevailed among the citizens in about equal proportions and severity as with the troops. The fever classed as typhoid is not the disease so recognized by most physicians in private practice, but a continued fever of typhoid type, modified by change of habits, food, and to a certain extent climate. Many cases when first reported are found delirious, with cold extremities, congestion of the capillaries of the surface, profuse perspiration, pulse 120 to 160 per minute and feeble, profuse watery diarrhoea, followed by a fatal termination in from forty-eight to seventy-two hours.” [73]

Again the severity of symptoms and rapid fatal conclusion was noted. In the normal course of typhoid in the 19th century leading to death, there is a deterioration of the infected person over 3 to 4 weeks. The accounts from Civil War and other 19th century black measles outbreaks stress how quickly that disease killed, often in just a few days. This is seen dramatically in the account of Camp Beauregard and in the fatality charts for Hopkinsville that show a very high death rate for each regiment soon after their arrival. It is difficult to believe that typhoid could have infected each regiment (and all 8 to 10 companies within the regiments) with such speed and devastating consequences in such a short time.

Furthermore, the primary source of typhoid is contaminated water. The Confederates at Camp Beauregard had ‘numerous streams’ for water supply; those at Hopkinsville were encamped in 8 to 10

separate bivouacs at different places around the city, each with its own water supply. The city also drew water from many of these sources, yet citizens recorded no major epidemic at the time. Although the causative bacteria could have spread on dirty hands from unit to unit, typhoid seems most unlikely to have spread through all the bivouacs.

## Conclusion

There are several options to understand the lethality attributed to measles outbreaks in the military camps:

1. Measles assumed a deadly character among the soldiers that it did not have in ordinary civilian communities, even in slave quarters.
2. Black measles was a different and highly lethal strain of measles.
3. Measles was a major contributor to the death toll when malnutrition was also present, or when measles and another disease afflicted the same individual.
4. Measles was for the most part not a cause of death in the camps.

The first two options seem untenable in the light of evidence presented here, though of course they cannot be completely ruled out. It remains possible that there was an extremely virulent strain of measles that no longer exists, and it would indeed be highly dangerous if capable of bringing death in the prodromal phase of 3 to 4 days “before a rash is thrown out.”

The third scenario seems quite plausible, and no doubt did occur frequently, but unlikely to apply in the majority of cases. Malnutrition would not have been a major factor in the early months of the war when food supplies were both readily available. Diarrhea was chronic in camps on both sides, and most soldiers had it often. It may have been a contributing factor if severe, but ‘ordinary’ diarrhea in

combination with measles would probably not increase the likelihood of death. Nor would mumps, chicken pox or catarrh if simply colds or sore throats. But the presence of a deadly disease such as typhoid, malaria, dysentery or influenza contemporaneous or in close sequence with a measles outbreak, would certainly produce a high casualty rate.

In an important study of measles epidemics among white Americans in the 17th and 18th centuries, Caulfield noted: “One gets the impression [from mortality rates] that measles was at times a very severe disease [but at other times mild] ... The one outstanding factor that varied from town to town was the incidence of other diseases. ... Certainly the presence of other diseases is a factor that must be taken into consideration before concluding that measles once was a very fatal disease.” [74]

Taubenberger noted that: “... illness and disease in these Civil War camps were multifactorial – with malnutrition and different infectious outbreaks. I would not be surprised if in addition to measles there were outbreaks of other respiratory infections like influenza.” [75] Hackett has demonstrated that among Native American groups in Newfoundland in the early 19th century, influenza was an important contributing factor to the high mortality due to measles, whooping cough, mumps and scarlet fever. [76] Thus, measles and ‘epidemic catarrh’ acting in concert could explain a high mortality rate. A letter from one of the soldiers in the Texas unit at Hopkinsville written Jan. 13, 1862, at the height of the epidemic, would support this model: “The disease most prevalent is that of measles and while down with them, [the men] by carelessness of some kind or another catch cold which gives them the pneumonia, and when they once get that they are past curing as I have never yet heard of a single case cured. ... until only a few days ago we have buried as many as 15 in one day.” [77]

For the majority of deaths, however, the fourth scenario seems to me more likely. As demonstrated above, measles infections in adults seldom resulted in death in civilian life, even though it would surely have

infected many elderly, malnourished, chronically ill and others with weak resistance, not to mention slaves in all stages of poor health and environment. One factor strongly suggesting flu as the main culprit is the observation, often repeated in accounts of measles outbreaks, that exposure to cold and wet triggered the serious epidemic and sharp increase in death. Second, the symptoms described are mostly in line with flu, with pneumonia as the usual complication when death occurred. Third, the epidemics often affected more than half of an entire regiment of several thousand, or 500 of Alcorn's 950 men within days of arriving at Hopkinsville. Such numbers require the difficult assumption that such a high proportion of these men had never had measles, especially in view of the statement of a soldier there that "there are not many [in our camp] who have not already had them." Further, in many of the measles outbreaks no other major disease is mentioned, only mumps, chicken pox, etc, and camp doctors would surely have noted typhoid fever or dysentery or malaria if present. Flu seems the most likely candidate to go unnoticed within the range of measles symptoms, be diagnosed as 'typhoid pneumonia' or be dismissed as 'homesickness' when no rash was observed. Finally, it is known that certain strains of flu seem to produce higher mortality in healthy adults, as noted above for the Spanish flu, and documented in a case study of the H1N1 pandemic of 2009. [78]

With regard to the 'extremely dangerous and often fatal' black measles, it seems likely that this phenomenon was mainly cyanosis from severe acute pneumonia, with rare instances of a hemorrhagic complication arising from regular measles. Although relatively poorly understood, there is evidence that what was called black measles in modern times arises when compounded by another infection: "Observations in Africa and elsewhere have shown that severe measles, including 'hemorrhagic measles' and 'black measles' may be associated with marasmus, kwashiokor, and underlying infections." [79] Since serious malnutrition was not present among soldiers in 1861, one may conclude that the cases called black measles early in the Civil War were caused in the main by another infection, leading to

pneumonia. This was a quick spreading, fast-acting and very lethal disease. The probability is that it was influenza.

If this hypothesis is correct, it was a deadly form of the virus, perhaps a more virulent strain that developed at the tail end of the 1857-59 worldwide influenza epidemic [80] – foreshadowing an even greater horror to come half a century later.

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