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Introduction

Despite prominent previous research on disease in ancient Egypt through studies of human remains and Egyptian medical texts, we still know relatively little about how disease impacted daily life. This is especially true for short-term diseases, which leave no mark in the skeletal record and are often described only generally in medical texts. In this study, I use a scalar approach to analyze records recording absences from work at Deir el-Medina during the Nineteenth and Twentieth Dynasties, focusing on understanding how short-term diseases affected morbidity patterns at the site. At the broadest scale, I use a corpus of work texts to demonstrate a seasonal distribution of absences which can be accounted for by the seasonality of infectious disease in Upper Egypt. I then offer a circumstantial case for the contagion of one infectious disease in O. BM 5634 by identifying its transmission through the sequential absences of different workmen in the entire gang. Finally, I evaluate the impact of one disease on one workman through a close reading of the absences of *Mr-Šḥm.t* in O. Cairo CG 25785. This text elucidates how expectations for a workman's productivity were likely harmful to his well-being. I then combine these three levels of analysis to explore the social and economic ramifications these diseases would have had on both individual workmen and workforce productivity at Deir el-Medina.

Many scholars have examined the paleopathology of human remains in ancient Egypt and the history of Egyptian medicine.[1] Their publications offer numerous detailed accounts of the kinds of diseases present in ancient Egypt and their remedies, but they offer relatively little information about the impact of short-term diseases on daily life. Lesions from such diseases would not become manifest skeletally, and medical texts are often missing diagnostic criteria to reveal the

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[1] For extensive bibliographies of paleopathological scholarship, see Jerome Rose et al., *Bioarchaeology of Ancient Egypt and Nubia: A Bibliography* (London, 1996); and Lisa Sabbahy, *Paleopathology of the Ancient Egyptians: Annotated Bibliography: 1998–2011* (London, 2012). For general overviews of Egyptian medicine, see Bruno Halioua, Bernard Ziskind, and M. B. DeBevoise, *Medicine in the Days of the Pharaohs* (Cambridge, 2005); and John Nunn, *Ancient Egyptian Medicine* (Norman, OK, 1996).

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nature of the underlying ailment.[2] Medical texts were also generally written as manuals, and, while they can document the presence of an illness in ancient Egypt, they do not record its prevalence within a given population. Similarly, while mummified human remains can contain the DNA of viruses, studies of them only inform us of the presence of these viruses in a handful of individuals. They do not inform us about the social and biological impacts such illnesses would have had on the broader population.[3]

For this study, short-term diseases are considered to be any illnesses that affect the body for a period of weeks rather than years. This category can include common colds, flus, and diarrheal diseases, which normally process through the body in a matter of weeks. It can also include instances of more dangerous diseases which manifest for short-periods, but then incubate for longer periods. For example, the first two stages of syphilis, in which lesions develop on the skin but rarely the underlying tissue, often last only a couple of weeks.[4] Only tertiary syphilis, which can lie dormant for up to thirty years, results in observable skeletal lesions. These short term diseases thus rarely leave physical evidence in the archaeological record.

Despite their elusive presence in the archaeological record, short-term illnesses are integral to understanding health. The most ubiquitous diseases we see today are those short-term diseases largely inaccessible in the archaeological record. For example, in a U.S. survey, 49% of children were reported having a cold in 2012, in comparison with only 4% who had any kind of surgical procedure.[5] While the former is more representative of our daily interactions with disease, only the latter would be visible in a skeleton. Most diseases do not have enough time to manifest skeletally; no more than 2% of individuals infected with tuberculosis will reach a stage at which skeletal lesions are present.[6] Studying short-term diseases through other means thus offers us access to both a greater variety of diseases and a greater number of infected individuals than skeletal lesions alone.

These issues move beyond just morbidity, as short-term diseases are responsible for a large percentage of mortality rates. In modern populations, acute respiratory infections (ARIs)[7] and diarrheal diseases account for 55% of all deaths due to infectious disease.[8] ARIs are involved in nearly four million deaths globally, are the leading cause of death for children under five years of age,[9] and "for every death directly attributable to ARI there are two to three further deaths where ARI is an associated cause."[10]

Sickness was clearly a prominent matter in ancient Egypt as well. One need only consider the ubiquitous phrase "in life, prosperity, and health" to acknowledge the ever-present concern for wellness. In personal letters from Deir el-Medina, correspondents often went beyond simply wishing for the good health of a superior or friend. This is most evident in the correspondence between Dhutmose and his son Butehamun in P. Ashmolean 1945.93.[11] Dhutmose not only offers an opening exultation wishing life, prosperity, and health to Butehamun and Hemetsheri, but also dominates the rest of the letter with remarks about his condition and his concerns about their well-being. In this letter alone, Dhutmose references health (*snb*) seven separate times. Yet while concerns in ancient Egypt about health and wellness were a daily priority, direct

[2] The most comprehensive publications on the medical texts are H. Grapow, W. Westendorf, and H. von Deines, *Grundriss der Medizin der alten Ägypter,* 9 vols. (Berlin, 1954–1973); and Thierry Bardinet, *Les papyrus médicaux de l'Egypte pharaonique: Traduction intégrale et commentaire* (Paris, 1995). While Papyrus Edwin Smith lists diagnostic criteria for traumatic injuries, other medical texts such as Papyrus Ebers tend to only mention the location of the ailment and treatment. Earlier attempts at identifying specific diseases from textual descriptions of illnesses, such as B. Ebbell's *The Papyrus Ebers* (Copenhagen, 1937), have also been criticized and often dismissed.

[3] Evilena Anastasiou and Piers D. Mitchell, "Palaeopathology and Genes: Investigating the Genetics of Infectious Diseases in Excavated Human Skeletal Remains and Mummies from Past Populations," *Gene* 528/1 (2013): 33–40. doi:10.1016/j.gene.2013.06.017.

[4] Arthur C. Aufderheide, Conrado Rodríguez-Martín, and Odin Langsjoen, *The Cambridge Encyclopedia of Human Paleopathology* (Cambridge, 1998), 158.

[5] Center for Disease Control, "2012 National Health Interview Survey (NHIS) Sample Child Public Use File(samchild)," accessed October 3, 2013, ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2012/samchild_freq.pdf.

[6] Tony Waldron, *Palaeopathology* (Cambridge, 2008), 91.

[7] ARIs include rhinoviruses (responsible for the common cold), influenza, and pneumonia.

[8] Reported as 5,947,000/10,937,000 in the World Health Organization's "World Health Report 2002," 186, accessed September 21, 2013, http://www.who.int/whr/2002/whr2002_annex2.pdf.

[9] Ibid.

[10] The Health Research Program, "Focus Area: Acute Respiratory Infection (ARI)," accessed October 1, 2013, http://www.harpnet.org/focus/ari.html.

[11] Published in Jaroslav Černý, *Late Ramesside Letters* (Bruxelles, 1939), 12; in translation in Edward Wente, *Late Ramesside Letters*, SAOC 33 (Chicago, 1967), 32.

evidence for the majority of ailments is intangible in the archaeological record.

In this study, I use administrative texts from Deir el-Medina—the village of the workmen who built the royal tombs during the New Kingdom (1550–1080 BC)—to augment our understanding of disease in daily life. Specifically, I evaluate sixty-nine ostraca recording absences from work to assess patterns in sick days at Deir el-Medina.[12] These texts were part of the state's supervision over the Deir el-Medina workforce and were solely designed for recording the date and reason for each man's absence from working on the royal tomb. They document 2,043 total absences recorded over a 127-year period beginning in year forty of the reign of Ramses II and ending in year fourteen of Ramses IX. The texts recording absences from work were amassed from the Deir el-Medina database.[13]

Previous Research on the Texts Recording Absences from Work

Despite the great number of ostraca and papyri with records recording absences from work already transcribed and translated,[14] relatively few publications analyze the reasons for these absences. Instead, research has focused on the chronological and bureaucratic implications of these texts.

The texts recording absences from work are particularly well suited to research on dating or genealogy, as they include full regnal dates and invariably reference multiple workmen simultaneously.[15] In some cases, these records identify individuals through their father's name, allowing clearer delineations of family relationships and demonstrating the contemporaneous presence of multiple individuals of the same name.[16] While genealogical and chronological research has been critiqued,[17] recorded absences from work offer some of the clearest and most objective means of dating textual material from Deir el-Medina overall.

Additional research has used texts recording absences from work to describe bureaucratic practices at Deir el-Medina.[18] The recording of absences was conducted alongside other administrative documents such as lamp accounts and tomb progress reports. These records together show a sense of accountability for the Deir el-Medina workforce, albeit with noticeable errors in recordkeeping.[19] They further demonstrate

[12] The term "absence from work" was earlier used by Jac. J. Janssen, "Absence from Work by the Necropolis Workmen of Thebes," *Studien Zur Altägyptischen Kultur* 8 (1980): 127–52. I have kept this term, rather than "attendance records," as it emphasizes the difference between texts which focus on those workmen who are absent rather than those present. The texts included in this study are: O. Gardiner 0037, 0115, 0148, 0167, 0174, 0290, and 0291; O. BM EA 05634; O. Cairo CG 25505–25508, 25510–25512, 25514, 25516–25525, 25532, 25533, 25599, 25648, 25779, 25780, 25782–25787 and 25793; O. Cairo JE 72469; O. DeM 00099, 00209, 00284, 00340, 00353, and 00389; O. Gardiner AG 032; O. Michaelides 071; O. MMA 09.184.702; O. Turin N. 57026, 57029, 57035, 57039, 57056, 57281, 57283, 57388 and 57432; O. Varille 6 and 26; P. Berlin P 14448; P. Turin Cat. 1999+2009 verso and 2072; O. MMA 14.6.217; O. Gard 232; O. Turin 57028 and 57030; and O. IFAO 1105.

[13] K. Donker Van Heel et al., *The Deir el-Medina Database*, http://www.wepwawet.nl/dmd/, last updated January 1, 2012. A total of seventy-five of these texts had to be excluded from this study because they discuss only the general absence or presence of the entire workforce (e.g., O. Cairo JE 50250); are too fragmentary (e.g., O. Cairo SR 12042); were too poorly recorded in antiquity to provide a complete date, name, and/or reason for absence (e.g., O. Cairo CG 25527); or because they are currently unpublished (e.g., O. IFAO 252).

[14] The primary transcriptions of these ostraca can be found in Jaroslav Černý, *Ostraca hiératiques. Nos 15501–25832*, Catalogue général des antiquités égyptiennes du Musée du Caire (Cairo, 1935); Jaroslav Černý, *Catalogue des ostraca hiératiques non littéraires de Deir el-Médineh*, 6 vols., Documents de fouilles (Cairo, 1937); Jaroslav Černý and Alan Gardiner, *Hieratic Ostraca* (Oxford, 1957); and Kenneth Kitchen, *Ramesside Inscriptions* 8 vols. (Oxford, 1975–1990). Additional translations for these texts are available in Wolfgang Helck, *Die datierten und datierbaren Ostraka, Papyri und Graffiti von Deir el-Medineh* (Wiesbaden, 2002); and Andrea McDowell, *Village Life in Ancient Egypt: Laundry Lists and Love Songs* (Oxford, 2002).

[15] Primary publications on dating with these texts include Mark Collier, *Dating Late XIXth Dynasty Ostraca* (Leiden, 2004); Manfred Gutgesell, *Die Datierung Der Ostraka Und Papyri Aus Deir el-Medineh Und Ihre Ökonomische Interpretation: Teil I: Die 20. Dynastie, Band I und II. Datierung Der Ostraka Und Papyri I 18–19* (Hildesheim, 1983); Manfred Gutgesell, *Die Datierung Der Ostraka Und Papyri Aus Deir el-Medineh, Teil II: Die Ostraka Der 19. Dynastie. Datierung Der Ostraka Und Papyri II 44* (Hildesheim, 2002); and Helck, *Die datierten und datierbaren Ostraka*. Also see genealogical data in Benedict Davies, *Who's Who at Deir el-Medina: a Prosopographic Study of the Royal Workmen's Community* (Leiden, 1999).

[16] For example, *K3s3* son of *ʿ3-phtj* vs. *K3s3* son of *Rʿ-msw* in O. Cairo CG 25514.

[17] For example, a critique of Gutgesell in C. J. Eyre, "The Use of Data from Deir el-Medina," *Bibliotheca Orientalis* 44 1/2 (1987): cols. 21–32.

[18] Mahmoud Ezzamel, *Accounting and Order* (New York, 2012); and Koen Donker Van Heel and B. J. J. Haring, *Writing in a Workmen's Village: Scribal Practice in Ramesside Deir El-Medina* (Leiden, 2003).

[19] Jac Janssen, "Accountancy at Deir El-Medina: How Accurate Are the Administrative Ostraca?," *Studien Zur Altägyptischen Kultur* 33 (2005): 147–57.

the shift from detailed bureaucratic documentation in the Nineteenth Dynasty, to a more cursory style of documentation in the Twentieth.[20]

Finally, several publications have referenced texts recording absences from work to discuss women's health.[21] These publications specifically explore the meaning behind the term *ḥsmn,* "menstruation," and the phrase *t3 s.t ḥm.wt*, "the place of women." While these articles offer an interesting contribution to our understanding of workplace absences related to women's health, such absences account for less than 1% of total recorded absences from work at Deir el-Medina, and thus do not represent the vast majority of the corpus.[22]

Jac Janssen has produced the primary research to delve further into the reasons and distributions of absences. He evaluated the longest of the texts recording absences from work, O. BM 5634,[23] and the general terminology used in it and allied texts.[24] His two publications offer the foundations for the following description of the texts recording absences from work.

The Anatomy of the Texts Recording Absences from Work

Absence records can consist of four parts. First, the civil date is recorded, including the regnal year, season, month, and day number. In some cases, the date is followed by the term *ḥ‘.n*, the *sḏm.n=f* form of the verb *ḥ‘*, "to stand." Janssen has suggested that this term was meant to indicate that workmen stayed elsewhere, since it was used opposite of *jwj,* "to come," which suggests the movement of active workmen who had come to work on the royal tomb.[25] As reasons for absences often only state the location of the workman (e.g., "in the village"), it is logical to assume that the term *ḥ‘.n* applies to workmen who remained elsewhere rather than coming to work. The third component of an absence-from-work record is the workman's name. In cases in which multiple workmen were absent on the same day and for the same reason, multiple names were listed together. Fourth and finally, the reason for the absence was listed. In many cases, the reason given was abbreviated to one word. The most common of these is the term *wsf*, fully written as  , but often reduced simply to . This term has been discussed more fully by Janssen,[26] who connects the word etymologically to the phrase "to be slack, to neglect." In this context, some Egyptologists have taken the term to mean "idle," though Janssen convincingly argues that, given the variety of reasons listed with *wsf*, we should instead think of the term as a day on which the workman was off work from the Valley of the Kings specifically, but may have been working elsewhere.[27] Given the numerous entries with this term, it is distinctly possible that it is a generic reference to absence, regardless of reason. This is supported by several texts recording absences from work which exclusively use *wsf* as the reason for absence (e.g., O. Cairo CG 25520). The term *wsf,* listed after the workman's name, and the term *ḥ‘.n*, written prior to the workman's name, would have both indicated the simple fact that the workman was not at the Valley of the Kings. Consequently, this term would have been used when the scribe determined it was unnecessary to explain an absence, or when an explanation would not fit in the space available.

The second most common term is *mr*,  "illness." This term could be used for any kind of health-related problem which inhibited a workman from going to work. The illness of the workman is in some instances explained, though this is rare and inconsistent. For example, the author of O. Gardiner 37 indicates that *Ḥwj* son of *Ḥwj-nfr* and *Rwtj* suffered from injuries in the legs, and that *Nb-nfr* son of *Pn-nbw* was suffering

[20] Jaana Toivari-Viitala, "Absence from Work at Deir El-Medina," in *Living and Writing in Deir El-Medine: Socio-Historical Embodiment of Deir El-Medine Texts*, ed. Andreas Dorn and Tobias Hofmann (Basel, 2006), 158–59.

[21] P. J. Frandsen, "The Menstrual 'Taboo' in Ancient Egypt," *Journal of Near Eastern Studies* 66/2 (2007): 81–106; Jaana Toivari-Viitala, *Women at Deir el-Medina: a Study of the Status and Roles of the Female Inhabitants in the Workmen's Community During the Ramesside Period* (Leiden, 2001), 162–68; Terry Wilfong, "Menstrual Synchrony and the 'Place of Women' in Ancient Egypt (OIM 13512)," in *Gold of Praise. Studies on Ancient Egypt in Honor of Edward F. Wente*, ed. Emily Teeter and John A. Larson (Chicago, 1999): 419–34; and Janssen, "Absence from Work," 141–43.

[22] Only thirteen out of 2,043 absences involved a workman's absence due to his wife or daughter's *ḥsmn.*

[23] Janssen, "Absence from Work."

[24] Jac Janssen, *Village Varia: Ten Studies on the History and Administration of Deir el-Medina* (Leiden, 1997), 87–98.

[25] In *Village Varia*, 92, Janssen notes that according to O. Cairo CG 25515, *ḥ‘.n* stands in semantic opposition to *jw,* 'coming; moving.'

[26] Janssen, "Absence from Work," 145; Janssen, *Village Varia*, 93–95.

[27] In ibid., 94, Janssen does not go so far as to suggest this was an approved day off, or a day allocated to a workman.

in his ears, but simultaneously does not explain the illnesses of several other workmen.[28]

Reasons for absences can be broken down into the following categories: "elsewhere" (including *wsf*), "too sick to work" (including *mr*), "celebrating," "preparing food or beer," "caretaking," or "mourning." The distributions of these terms demonstrate that a workman's illness (29%) or presence elsewhere (62%) account for nearly all absences, with the remaining 9% spread amongst caretaking, preparing food or drink, celebrating, and mourning (see Figure 1). The use of *wsf* to indicate workmen are elsewhere confounds the data, as workmen could have been elsewhere because they were too sick to come to work, working on other projects, or at a festival. Regardless, health-related absences—including being sick, caretaking of the sick and infirm, and mourning the dead—represent one-third of all absences at Deir el-Medina.

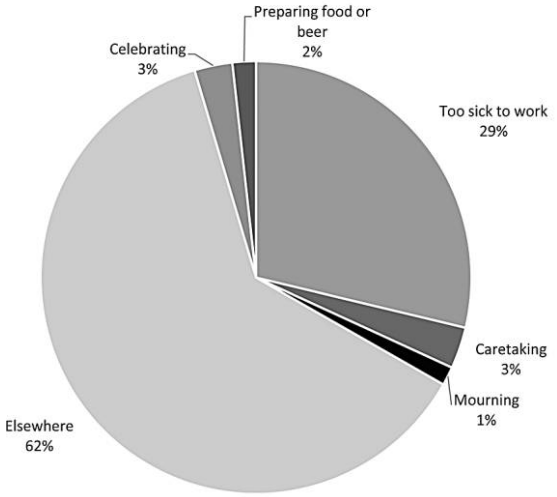

Figure 1—Absence from work distributions in Deir el-Medina texts.

The Seasonality of Illness

In order to comprehend the impact of illness through the texts recording absences from work, I compared the distributions of absences using a corpus of sixty-nine texts. As texts include day-dates for illnesses, it is possible to trace the relative shift over time in the number of illnesses per day. One complicating factor, however, is the civil calendar in Egypt, which is based on a 365-day cycle: every four years, the cycle falls one day behind, resulting in a significant shift in the seasons over time. To adjust for this, Egyptologists have used dates which associate known Egyptian civic dates with celestial phenomena and the Gregorian calendar.[29] Erik Hornung, Rolf Krauss, and David Warburton suggest converting dates using the Ptolemaic Royal Canon dates, which start with the first years of the Nabonassar Era and correlate Royal Canon, year 1, Thoth 1 to February 26, 747 BC.[30] Accordingly, Egyptian dates for this study were converted to the Gregorian calendar using this method. This shifts the Egyptian calendar date by the total number of leap year days between an Egyptian date and 747 BC, thus accounting for the difference in leap days lost over time. The UCLA *Encyclopedia of Egyptology* chronology was used to determine absolute years for reigns.[31] Alternative chronologies could result in a difference of up to twenty years by the end of the Twentieth Dynasty, but even then, the difference in the day date would be five days, and consequently does not affect our ability to interpret broader trends.

This conversion assumes that the Egyptians never adjusted for the gradual shift in their civil calendar; however, some scholars have argued that the Egyptian calendrical system did in fact account for the lost day by adding an intercalated day or by shifting the entire calendar back after it had shifted too far over time.[32] Such arguments not only lack textual evidence, but are also quickly contradicted based on the corroboration of Sothic and lunar dates with calendrical dates in the Illahun archive.[33] Furthermore, the attempt by

[28] Transcription in Černý and Gardiner, *Hieratic Ostraca*, pl. 26–26A no. 3 (facsimile, transcription) and Kitchen, *Ramesside Inscriptions IV*, 446–47; outlined in Helck, *Die datierten und datierbaren Ostraka*, 181–82.

[29] Since the year is actually closer to 365.2525 days long, the Julian calendar also includes a leap day every 400 years. This is not taken into consideration in the Gregorian system, which means that Gregorian and Julian dates will be off by 10 days every 4,000 years. Such differences are too minor for significant impact on a study on seasonality.

[30] Erik Hornung, Rolf Krauss, and David Warburton, *Ancient Egyptian Chronology* (Leiden, 2006), 49.

[31] Thomas Schneider, "UEE Chronology," accessed August 21, 2013: http://www.uee.ucla.edu/contributors/chronology.htm.

[32] For an overview, see Leo Depuydt, "On the Consistency of the Wandering Year as Backbone of Egyptian Chronology," *JARCE* 32 (1995): 43–58.

[33] Hornung, Krauss, and Warburton, *Ancient Egyptian Chronology*, 48.

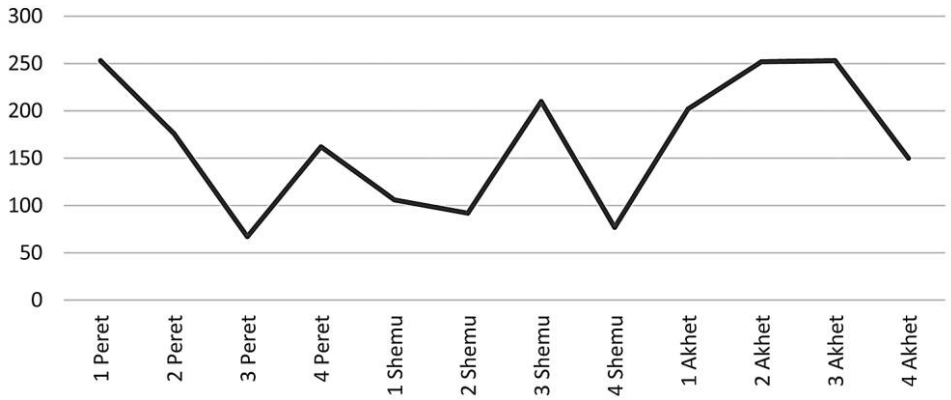

Figure 2—Absences due to illness by Egyptian month.

Ptolemy III to introduce a leap day was a failure,[34] implying that at least by the end of the Late Period, Egyptian calendars did not include a leap day, and Egyptian scribes were loath to change them.

This is further corroborated by the texts recording absences from work. The raw distribution of absences by Egyptian month (Figure 2), with no adjustment to the dates, is random over the course of the year. The erratic nature of these unadjusted dates suggests that either seasonality had no consistent influence over sickness, or, more likely, that the calendar did in fact lose a day every four years, skewing absences by as many as thirty-two days over the 127-year span of the texts. In contrast, the calculated distribution of absences due to illness appears more systematically spread over the seasons (Figure 3). This distribution shows a smoother curve, peaking in August with steadily decreasing sick days until the winter months of December and January.[35]

This figure may be misleading, however, due to the total number of absences recorded per month (Figure 4). Significantly more absences of all kinds were recorded in August through November than any other time of year, with noticeably fewer recorded absences in December and January. Since the total number of all absences was highest in August and lowest in January, it is possible that the similar seasonal distribution of sick days is a greater reflection of the chance preservation of texts than actual trends in illness. To account for this, the ratio of sick days were instead compared to total absences (Figure 5). This ratio shows a slightly different trend, moving the peak percentage of absences due to illness to April and the lowest percentage of absences to November. Based on these data, early spring had relatively more illness-related absences than both the hotter summer and colder winter months. On the other hand, fall represents the lowest period of illness in the year.

Comparative data shows similar trends in the seasonality of illness. Walter Scheidel accounts for the seasonality of illness through documenting Roman mummy tags, Greek funerary inscriptions, and Coptic epitaths from Egypt.[36] He uses these data sets to ascertain when peaks in deaths occurred during the Roman period. Scheidel not only evaluates these diverse texts, but considers how they varied between Alexandria, the Fayum, and Upper Egypt. The sources from Upper Egypt, the area corresponding to the present study, all demonstrate a peak of deaths by May, with a low in September. Though the timing of Scheidel's trend begins one month later and ends one month earlier than

[34] Ibid.

[35] Though the month with the highest raw number of sick days is September, the smoothed data shows a peak in August. Data was smoothed using three-month moving averages as used by Walter Scheidel, *Death on the Nile: Disease and the Demography of Roman Egypt* (Leiden, 2001).

[36] Ibid. Whereas the texts recording absences from work document morbidity, Scheidel's data documents mortality. My study assumes that these two data sets are affected by the same underlying factors in the distributions of illnesses over the year.

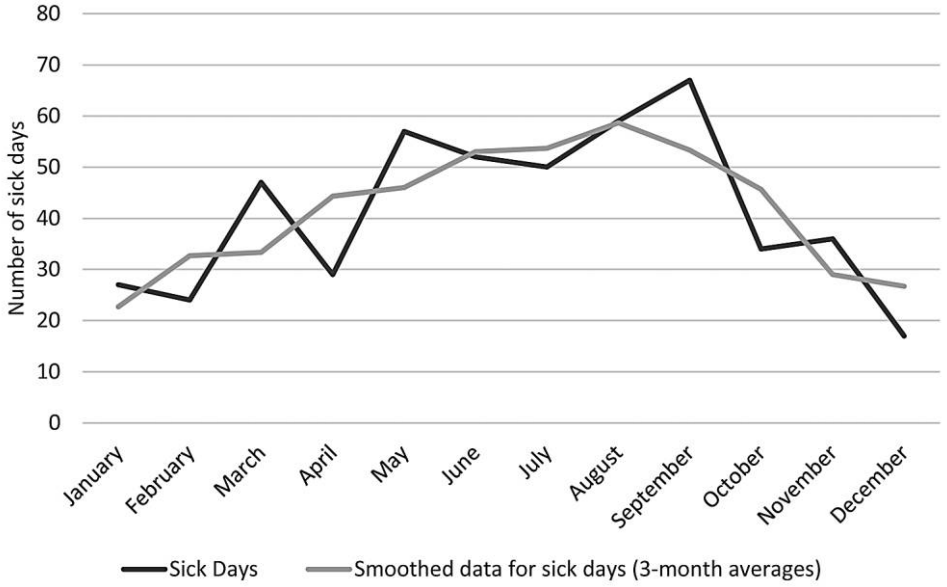

Figure 3—Total sick days by month.

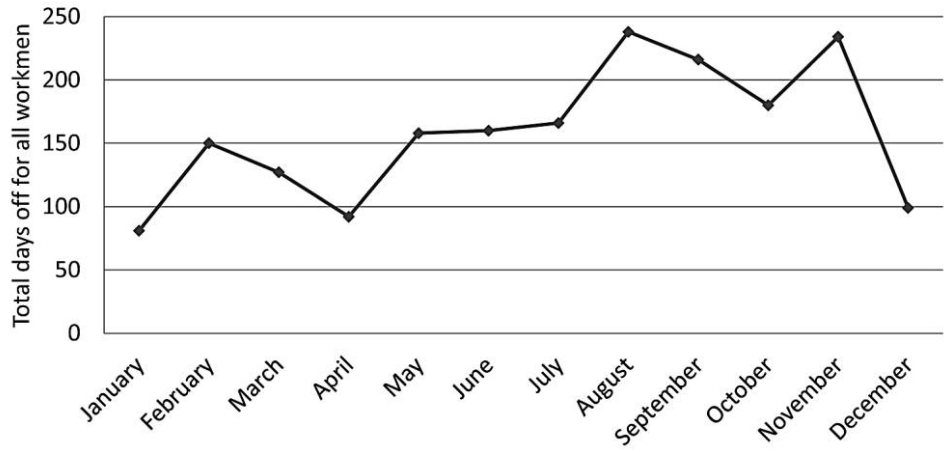

Figure 4—Total absences per month.

data from the texts recording absences from work, it shows the same development of increased illness in the spring and decreased illness in the fall.

Comparative data from modern historical accounts also suggest that March and April are particularly dangerous times of the year in terms of health. The seasonal prevalence of various infectious diseases during the modern era has been extensively documented by Western visitors to Egypt. For example, F. Sandwith found that bubonic plague was most virulent in March and April and least so in November, rising in virulence again in December or January. [37] Scheidel evaluates this and other accounts, and demonstrates that the number of diseases which are virulent are highest in

[37] F. Sandwith, *The Medical Diseases of Egypt* (London, 1905).

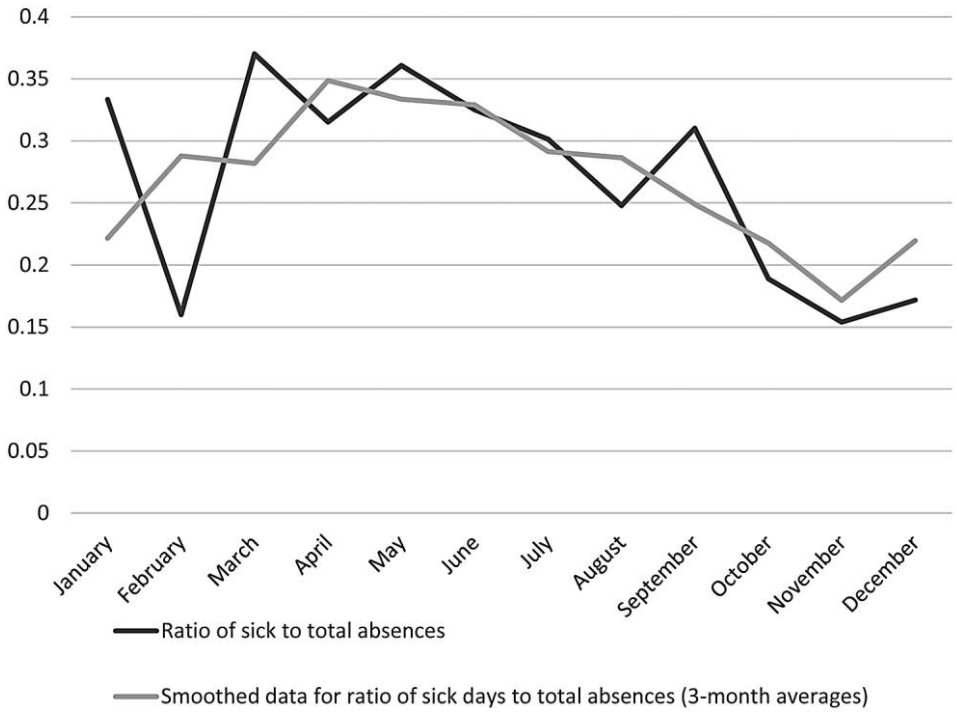

Figure 5—Ratio of sick days to total absences by month.

May and lowest in December, following the same seasonal distribution as both texts recording absences from work at Deir el-Medina and mortuary data in Upper Egypt during the Roman period.[38]

Without knowing the exact diseases affecting the population at Deir el-Medina, it is impossible to explain the underlying mechanisms affecting this seasonal distribution. Even modern studies of known pathogens are complicated by the many factors affecting seasonal infection, including climate, rates of contact, and seasonal cycles of carriers such as mosquitos.[39] It is interesting to note, however, that illness does not peak around the annual inundation when temperature[40] and flood levels are highest. The seasonal rise in the virulence of infectious diseases, which comes prior to the inundation, thus suggests that temperature, humidity, and flood levels were not the only (or even the primary) drivers for these infectious diseases.

This distribution may be complicated by the nature of the data itself; the texts recording absences from work only document the sick days for males, the majority of whom were young or middle-aged adults. Women, children, and the elderly would not have been part of this working population. Seasonal distributions of illness may have been different for these groups, since morbidity patterns can vary per disease based on age and sex.

Overall, the seasonal distribution of sick days points to infectious diseases as the primary cause of illness. The similar trends in morbidity patterns at Deir el-Medina during the New Kingdom and mortality rates in the Theban region during the Roman period suggests that these infectious diseases accounted for both short-term and fatal infections in Egypt. These patterns would have been exacerbated by contagious infection in the work force, increasing the overall number of workmen who required simultaneous sick days.

The Spread of Disease at Deir el-Medina in Year Forty of Ramesses II

Contagion may have played a part for the majority of days on which workmen were absent for illness; multiple individuals were sick on 52% of days with

[38] Scheidel, *Death on the Nile,* 51–125.

[39] For an overview of studies on the seasonality of infectious diseases, see Sonia Altizer et al., "Seasonality and the Dynamics of Infectious Diseases," *Ecology Letters* 9/4 (2006): 467–84.

[40] "Average Weather For Luxor, Egypt," accessed January 2, 2013, http://weatherspark.com/averages/29248/Luxor-Qina-Egypt.

	Workman					
Date(s)	*Mrj-w3st*	*Ḥr-m-wj3*	*Nb-n-m3ʿt*	*Nfr-rnpt*	*P3-sr*	*P3-ḥrj-pḏ.t*
3 *šmw* 5	sick	working	working	working	working	working
3 *šmw* 6	free					
3 *šmw* 7 3 *šmw* 8	sick	working	working	working	working	working
3 *šmw* 9 through 3 *šmw* 16	free					
3 *šmw* 17	sick	sick	working	working	working	with *Ḥr-m-wj3*
3 *šmw* 18	working					
3 *šmw* 19 3 *šmw* 20	free					
3 *šmw* 21 3 *šmw* 22	working	sick	sick	working	working	with *Ḥr-m-wj3*
3 *šmw* 23 through 4 *šmw* 3	free					
4 *šmw* 4 4 *šmw* 5 4 *šmw* 6 5 *šmw* 7 5 *šmw* 8	working	sick	sick	sick	sick	with *Ḥr-m-wj3*
4 *šmw* 9 through 4 *šmw* 23	free					
4 *šmw* 24 4 *šmw* 25 4 *šmw* 26	working	working	sick	working	working	sick
4 *šmw* 27 through 1 *3ḫt* 13	free					

Figure 6—Sick days in O. BM 5634 from 3 *šmw* **5** to 1 *3ḫt* 13.

absences due to sickness. Due to the fragmentary nature of the texts, it is difficult to consistently trace a development in absences which could be due to the sequential transmission of a disease. A circumstantial case can be made for the communication of an illness during the reign of Ramesses II in O. BM 5634.[41] In Year Forty, several workmen were sick for consecutive days during the majority of the *šmw* season, which would have fallen in late spring and early summer. Figure 6 shows the progression of their sick days. First, *Mrj-w3st* fell ill from III *šmw* 5 to III *šmw* 17. The workmen took a seven day break during this time. At some point during this break, *Ḥr-m-wj3* also became ill, as, when the workmen returned to work on the seventeenth, he was sick until at least IV *šmw* 8. Then, other workmen started to fall ill. First, *Nb-n-m3ʿt* was sick from III *šmw* 21 until IV *šmw* 26. Next, *P3-sr* and *Nfr-rnpt* both fell ill by IV *šmw* 4. Finally, the doctor himself,[42] *P3-ḥrj-pḏt*, who was with the sick workman *Ḥr-m-wj3* during this time, fell ill during an unusually long break between IV *šmw* 9 and 23.

While it is impossible to determine what caused their illnesses, the suggestion that the underlying cause was an infectious disease is supported by the following observations. First, there was a clear progression in virulence; while the illness began with just one individual, it gradually grew until at least four workmen were out sick simultaneously due to illness. Second, *Ḥr-m-wj3* may have directly communicated the illness to the doctor *P3-ḥrj-pḏt*, since we know the latter was with the sick workman before he himself fell ill. Third, for each of the workmen mentioned above, their sickness lasted for at least three days, but likely

[41] Transcription in Černý and Gardiner, *Hieratic Ostraca*, 22 and 23, pls. LXXXIII and LXXXIV and Kitchen, *Rameside Inscriptions III*, 515–25. An outline of contents appears in Helck, *Die datierten und datierbaren Ostraka*, 66–71. The workmen in this study are mentioned in the following lines: *Mrj-w3st* (verso 14), *Ḥr-m-wj3* (recto 5), *Nb-n-m3ʿt* (verso 13), *Nfr-rnpt* (recto 20), *P3-sr* (verso 5), *P3-ḥrj-pḏt* (recto 21).

[42] In Janssen, "Absence from work," 137, *P3-ḥrj-pḏt* is identified as the doctor given his time preparing medicine and caretaking in O. BM 5634. For more information about the official position of the doctor (*swnw*), see Janssen, *Village Varia*, 26–27.

longer, since the entire recorded workforce took several long breaks during this time. Fourth, the nature of the illness was not explained for any of these absences. By way of comparison, in O. BM 5634 the scribe occasionally mentioned the place of the body affected (e.g., eyes or legs) when a workman was out sick. The lack of any anatomical explanation for the described sick days may indicate that these workmen were suffering from a general illness, such as an infection, instead of a traumatic injury. Fifth, none of these workmen became sick again after the initial bout of illness. Finally, the entire workforce took several long breaks during this period. This time off could have been due to the degree of illness in the workforce since at least 13% of workmen were absent at one time. [43] It is possible that the workforce had extra free time to combat the disease, or alternatively, that some of these perceived free days were actually dates when the scribe himself was sick or caretaking,[44] and thus absences were not recorded. In either case, the number of days without work was unusually high during this period; over the span of fifty-one days, only fifteen were spent working.

Out of these remaining working days, the gang lost a total of forty-three individual work days due to sickness.[45] As this text records the absences of up to thirty-eight workmen simultaneously, it is possible that sick days would have accounted for only one or two days of lost work for the entire workforce. Given the numerous days of unrecorded work just mentioned, the impact of sickness may not have been significant on the broader progress of tomb decoration.

The impact could have been great on individual workmen, however, and especially on one side of the gang if more individuals were absent simultaneously due to illness. P. Ashmolean 1958.112 specifically discusses one such situation.[46] The left side of the gang progressed more slowly than the right, since one workman had consistently been out sick, and the draftsman requested assistance to make up for decreased productivity. He even offered to split rations with the assistant. This suggests an expectation that both sides would maintain the same rate of work. This expectation would have effectively reduced the impact of illness on workforce productivity, but certainly would have forced temporary financial and physical burdens on individuals to maintain the rate of work.

What was the underlying force pressuring the workmen to maintain a specific level of production? Constant visits from the vizier to inspect tomb progress were certainly a motivation. These visits could even come with bonuses for good work. In O. Cairo CG 25504, workmen were given several rewards by the vizier during the reign of Merneptah, presumably based on the vizier's approval of their progress.[47] Alternatively, in O. Oriental Institute 16991, the scribe specifically mentions the tomb's material progress as proof that the vizier ought to pay the workmen their regular (and likely overdue) rations.[48]

Mr-Sḫm.t's Battle Between Illness and Work

A close reading of one workman's absences allows us to better understand how these expectations of the workforce could have affected the well-being of individual workmen. The following detailed study of *Mr-Sḫm.t*'s sick days in O. Cairo CG 25785[49] assesses how pressure on the gang may have compelled him to continue to work even when sick.

In IV *ꜣḫt* 7 and 8 of year 3 of Amenmesse,[50] *Mr-Sḫm.t* was sick and unable to work.[51] The next two days, the entire gang was off. When they returned to work on the eleventh, the scribe recorded that *Mr-Sḫm.t* was in the Valley of the Kings.[52] As his col-

[43] Five of thirty-eight workmen were sick in O. BM 5634.

[44] We know the scribe's wife was also ill during this time, since *Pꜣ-ḥrj-pḏt* was absent from I *šmw* 25 to II *šmw* 8 to prepare medicine for her (O. BM 5634, recto 21) .

[45] Calculated as the sum of absences due to illness per workman, per day.

[46] Transcription and translation in C. J. Eyre, "A Draughtsman's Letter from Thebes," *Studien zur Altägyptischen Kultur* 11 (1984): 195–207. Transcription in Kitchen, *Ramesside Inscriptions VII*, 339 and 340.

[47] Transcription in Černý, *Ostraca Caire*, 2–3; and Kitchen, *Ramesside Inscriptions IV*, 155–58. Translation in Helck, *Die datierten und datierbaren Ostraka*, 87–88. While this text documents a specific event, it demonstrates that there was potential for rewards based on progress.

[48] Edward Wente, "A Letter of Complaint to the Vizier To," *JNES* 20/4 (1961): 252–57.

[49] Transcription in Černý, *Ostraca Caire*, 110; Kitchen, *Ramesside Inscriptions IV* (Oxford 1982), 234–35. Translations in Helck, *Die datierten und datierbaren Ostraka*, 112, and McDowell, *Village Life in Ancient Egypt*, 219–20.

[50] Helck, *Die datierten und datierbaren Ostraka*, 112.

[51] This may have been another case of a short-term infectious disease spreading in the workforce as *Mr-sḫmt*'s colleagues *Bꜣkj*, *Ḥr-nfr*, and *Kꜣsꜣ* were simultaneously ill on the 7th.

[52] See Jaroslav Černý, *A Community of Workmen at Thebes in the Ramesside period* (Cairo, 1976), 90. Černý suggests that the phrase "in the field" was used to indicate the Valley of the Kings.

leagues *K3s3* and *Ḥr-nfr* were specifically recorded as having returned to work during this time, the scribe likely indicated that *Mr-Sḫm.t* travelled to the workmen's huts on this day, but did not descend to the worksite. Interestingly, for the next two days, the scribe writes that *Mr-Sḫm.t* came, but could not work. This suggests that he descended to the valley, but was too sick to work once arriving there. Subsequently, from the fourteenth until the twenty-third, *Mr-Sḫm.t* returned to the village and stayed there until the scribe indicated that he was well enough to work again on the twenty-fourth.

This fourteen-day period of *Mr-Sḫm.t*'s punctuated attempts to work while ill suggests that Deir el-Medina's workplace expectations would have impacted the overall morbidity patterns of the gang. First, these expectations would have worsened individual health. *Mr-Sḫm.t*'s attempts to work—descending into and ascending from the Valley of the Kings in the middle of his sickness—likely exacerbated his symptoms. Further, his time spent recovering in the workmen's huts would have limited his access to health care, as the other workmen occupying the huts would be in the valley during the day. Second, these expectations would have increased the likelihood of contagion between workmen. If others worked through their illnesses like *Mr-Sḫm.t*, they would have exposed the rest of the gang to diseases in confined workspaces. Third, these data suggest that the distribution of recorded sick days only represents a portion of those workmen who were sick, the rest of whom were able to work through their illnesses. Finally, the fact that *Mr-Sḫm.t* was compelled to attempt to work while sick suggests that close monitoring of sick days made it difficult for workmen to pretend to be sick in order to avoid work.

Conclusions

This study offers a broad quantitative analysis of texts recording absences from work. These texts have an underlying seasonal distribution of sick days which are highest in early spring and lowest in late fall. Such a distribution mirrors seasonal changes in infectious diseases documented in modern Egypt as well as mortality patterns in Thebes during the Roman period. Sick days in O. BM 5634 offer more specific evidence for contagious disease. The distribution of sick days offers circumstantial evidence for the contraction of one infectious disease by multiple members of the Deir el-Medina workforce at the same time. Though 13% of the work force was out sick simultaneously, the overall time lost due to illness was significantly less than time taken off from work in general; in this case, sick days may not have significantly impacted productivity. On the other hand in P. Ashmolean 1958.112, productivity was an issue, and the workmen supplemented the workforce with additional labor, albeit at the expense of the laborers' own rations. At the most detailed level, *Mr-Sḫm.t*'s absences show that while he ultimately went home to the village, his movement to the workmen's huts and the Valley of the Kings demonstrated a commitment to continue working in the middle of his illness.

These three levels of analysis on the texts recording absences from work coalesce to demonstrate that short-term diseases carried with them social and physical impacts on the work force. While the government provided paid sick leave as well as a doctor, such support was likely only offered to ensure progress on the tomb. When productivity was hindered, the workforce was expected to turn to its own support mechanisms to make up the deficit.