DIFFERENTIATING HOSPITAL INTERRED INDIVIDUALS FROM THE LARGER CEMETERY POPULATION: THE CURIOUS CASE OF SCVMC BUTTONS

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The excavation from 2012 to 2014 of the Santa Clara Valley Medical Center Historic cemetery (circa 1875-1935) resulted in the exhumation of 1,004 individuals. Clothing related objects were present in 734 burials, including 3,485 buttons. This research project centers on the separation of hospital direct interred individuals from individuals buried from the larger community via artifact and spatial analysis. In this study the presence and absence of specific buttons types and patterns was used. Individuals with the hospital gown button pattern highly trend toward clustering, and had statistically significant higher rates of periosteal reactions and fractures.

This research project centers on the potential analytic separation via spatial analysis of hospital direct interred individuals from individuals buried by their families from the larger community. In this paper I analyze relations between grave goods and social categories. Specifically, the presence and absence of clothing related material, buttons, will be used. Is there differential spatial disposal of hospitalized individuals present in the population, and is there differential disposal of those individuals by age and sex at the Santa Clara Valley Medical Center (SCVMC) Historic Cemetery?

BACKGROUND

The SCVMC Historic Cemetery, located in San Jose, California, was re-discovered in 2012 due to construction related to expansion and seismic retrofitting at the west end of the hospital property. The construction plans could not be altered to avoid the cemetery so a large-scale mitigation excavation was conducted by URS Corporation (now AECOM) and D&D Osteology to exhume the remains of individuals located inside the project area.

The county has owned this property since 1871, when a county infirmary dedicated to caring for indigent members of Santa Clara County opened in 1876. It was noted to be a "magnificent building that was dedicated to sickness, poverty, and charity – a temple which is an honor to Santa Clara County and is considered a model of its kind throughout the state" (Munro-Fraser 1881:148). It is believed that the cemetery, located behind the main hospital building, began operation shortly after the hospital's construction was completed in 1875. It served as the county potter's field where unknown individuals were buried at the county's expense, individuals that could not afford the burial fees at privately owned cemeteries could be buried at a reduced rate, and where individuals were also buried directly from the adjacent hospital and almshouse.

Direct archival evidence of the cemetery is scant, with the cemetery appearing in only three maps discovered thus far. Based on these few surviving historic maps, the cemetery is estimated to have contained more than 3,000 individuals, of whom 1,004 were exhumed during excavations. At some point between 1935 and 1937 the cemetery was removed from area maps, buildings were erected on top of it, and in the 1950's a parking lot was installed over a majority of the area. It remained an active parking lot until the construction activities in 2012. At this time no burial records have been located to inform researchers of the individual demographic makeup of the cemetery.

Analysis of grave good association and spatial patterning within historic and prehistoric cemeteries has allowed the association of cultural identity (Goldstein et al. 2012), status (Cannon 1989; Mainfort 1985) and social relations (Bigman 2014) among other variables. Determining social status or position in historical

cemeteries by grave good association has been performed at many different historical cemeteries. In this specific case "hospital patient" will be treated as a social category.

As previously mentioned, I'm working under the assumption that the cemetery is comprised of unknown individuals buried at the community's expense, members of the larger community that could not afford burial elsewhere that had familial or community involvement in their burial, and individuals that died at the hospital/almshouse that did not have familial support. Archival evidence supports the use of these three categories. For example, the coroner's inquest summary of Chris Christenson, a laborer that died after being struck by a construction crane notes, "Body buried at County Infirmary. The brother tells me that Chris Christenson was 43 years of age," (State of California 1893). Although Mr. Christenson's brother was in contact with the county, he was still buried at the infirmary. The coroner's inquest summary and historic newspaper articles surrounding the death of Antone Perez indicate no familial involvement in his burial. Mr. Perez, an Italian woodchopper, died from pickaxe wounds inflicted by his wood chopping partner William Lorenzo. The inquest notes that the hospital superintendent buried Antone on the hospital grounds. There is also archival evidence for the burial of unknown individuals at this cemetery.

This research supposes that individuals that died at the hospital, and were subsequently buried in the adjacent cemetery, were interred in hospital provided clothing. Other hospital documentation and similar cemeteries indicate that individuals that died while in the hospital's care had their personal effects removed and returned directly to family members, while they were buried in hospital provided clothing or shrouds (Richards 1997). A 1907 manual for hospital nurses describes the preparation of the dead as removing the clothing the patient was wearing, washing the body, and finally dressing them in a clean "bedgown" (Domville 1907:60-61). If the county hospital followed similar procedures, this would result in a repeated pattern of the buttons used on the hospital clothing within multiple burials. Specifically, a linear row of three to four white buttons located along the vertebral column, and possibly one additional button located at each wrist. The presence of a metal clasp or safety pin is also possible, depending on the specific style of hospital gown.

Available literature and advertisements from the period (Figure 1) indicate that adult females wore loose dresses, and adult male hospital clothing consisted of nightshifts with three to four buttons, and day time wear consisted of a button down shirt and pant combinations also with three to four buttons (Modern Hospital Publishing Inc. 1919; PatternVault 2014; Peek 1917).

The presence of any other burial goods, clothing related or otherwise, would suggest that the individual was wearing their own personal clothing when interred and thus either was not a patient at the hospital at the time of their death, or were removed by others and culturally treated in a different fashion prior to burial.

MATERIALS AND METHODS

For this project, information regarding age, sex, ancestry, and burial related artifacts was tabulated from a master Excel™ sheet provided by URS, Inc. and verified by examining scans of the burial records and photographs of the burials. Burials with only buttons, nails, and safety pins or metal claps were selected from the larger data set. Buttons make an ideal artifact to use as material correlates of status, as the generally poor preservation at the site resulted in little cloth preservation and at times very poor bone preservation. The excavation pictures of burials fitting this pattern were examined to document not only the type of button (if not mentioned on the excavation form), but to also confirm location placement of the buttons within the grave (Figure 2). Burials fitting the pattern were established, and coded geo-spatially within the larger cemetery.

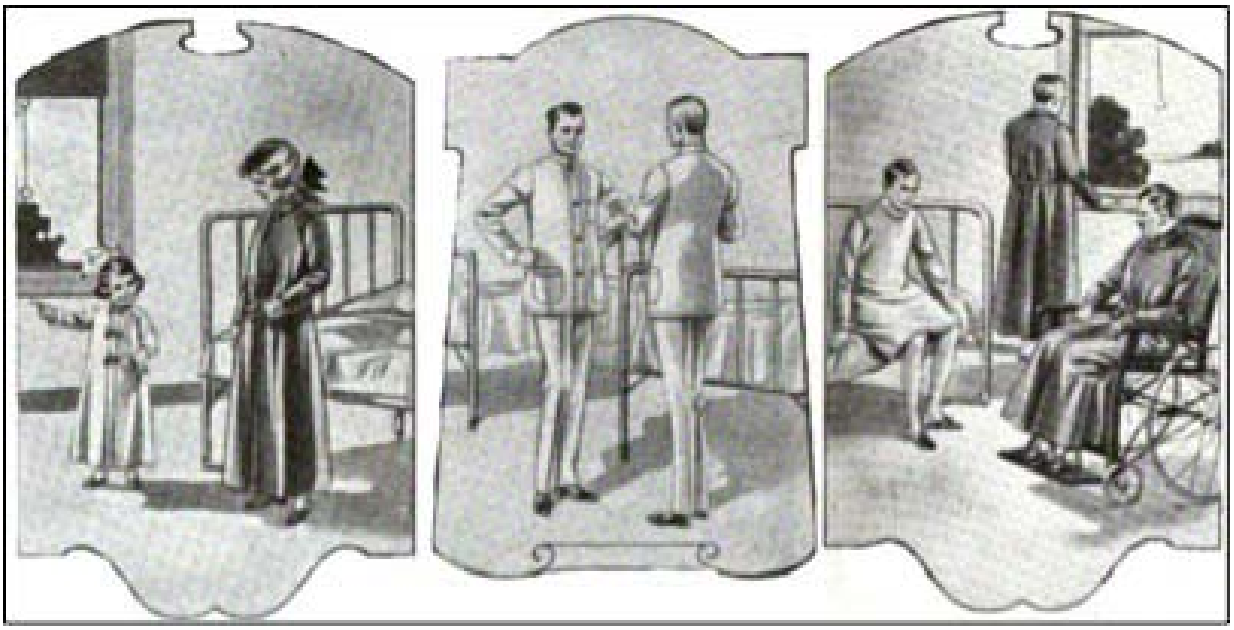

Figure 1 Hospital gown advertisement from 1919. Source: The Modern Hospital Publishing Company, Inc.,1919.

Figure 2 Burial 832 button pattern present along spin e (photograph courtesy of URS Corporation.).

Members of URS, Inc., D&D Osteology, and Foothill College collected the osteological, artifact, and geospatial data used in this study. Data collection focused on grave dimensions, artifact documentation, and the collection of bioarchaeological indicators of skeletal health, trauma, and biological profile data. Analysis of the human remains was conducted *in-situ*, with a more thorough analysis taking place later on-site. Sex and age-at-death estimation was conducted following procedures outlined in Standards for Data Collection from Human Skeletal Remains (Buikstra and Ubelaker 1994).

Burial Associated Artifacts

In the cemetery, burial associated artifacts ranged from coffin related items such as nails and decorative hardware, to personal items such as clothing, jewelry, money, and health related items such as dentures and medical devices. A total of 993 burials had associated artifacts, with nearly 16,000 total

artifacts recovered. The majority of the artifacts were mortuary items, including 9,321 coffin nails, 4,686 personal items including 3,485 buttons (Rehor and Beck 2015). Clothing related objects were represented in 734 burials, ranging from fairly complete cloth garments (Figure 3) to just buttons, snaps, suspender buckles, cufflinks (Figure 4), corset stays, and bowties. But buttons were the most prolific clothing associated object and several styles were represented; Prosser (n=1,577), metal (n=1,388), shell (n=377), bone (n=43), wood (n=42), clay (n=40), rubber (n=22), and other/unidentified (n=32) (Rehor and Beck 2015:7-14). Prosser porcelain buttons were very common in the 19th and early 20th century. Prosser refers to the manufacturing technique and they can be plain white or highly decorated (Sprague 2002). Most burials had multiple buttons, and often multiple buttons types were represented within a single burial (Figure 5). However, the button pattern investigated here focuses on plain, white Prosser buttons.

DATA ANALYSIS

The burials were coded for presence or absence of the hospital gown button pattern. Although the data for sex and age was recorded in finer detail, it was coarsened into broader categories. Sex was classified as male, female, or indeterminate. Age categories were similarly coarsened to: subadult (<29 years), adult (30-59 years), older adult (60+ years), and indeterminate. Ancestry was coarsened into European, Asian, African, or indeterminate. For all cases, the null hypothesis was that there was no difference between the button subsample and the larger population. The statistical significance (p-value) threshold was set to 0.05. It is always necessary to consider potential sample biases, and issues with spurious significant results due to the large sample size.

Only 35% of the SCVMC cemetery was excavated, so the data being examined is already a subsample of the total potential cemetery population. However, most archaeological data sets do not encompass the entirety of the potential site, and meaningful results and population level inferences can still be achieved. There are also other potential observational biases as the author collected only some of the data personally. Statistical tests were conducted to test the combination of variables being analyzed, including $\chi 2$ analysis of contingency tables for nominal data, and spatial autocorrelation using average nearest neighbor.

FINDINGS

The sex and age distribution of the total sample is provided in Table 1. Table 2 presents the sex and age data for the hospital button pattern subsample. A majority of both the total population and button sample is comprised of adult males.

Cluster Analysis

The identified button pattern burials are displayed in Figure 6. The results of the spatial autocorrelation average nearest neighbor test are presented in Table 3. If the nearest neighbor ratio (index) is less than 1, the pattern exhibits clustering. If the ratio is greater than 1, the trend is towards dispersion. As expected with a planned historic cemetery, when all of the burials are considered they form a highly statistically significant regular pattern, with a nearest neighbor ratio of 1.12 ($p<0.000000$).

Figure 3. Burial 150 suit jacket, vest, and pants. Source: Rehor and Beck 2015:7-18.

Figure 4. Burial 382 gold-plated amethyst stone cufflink. Source: Rehor and Beck 2015:7-18.

Figure 5 Metal and Prosser Buttons from Burial 22: Image Source Rehor and Beck 2015:7-16

Table 1. Demographics of the SCVMC total sample.

	TOTAL[1]	MALE	FEMALE	INDETERMINATE
0-29 years (young)	62/1006 (6.16)	33	10	19
30-59 years (adult)	746/1006 (74.16)	540	44	162
60+ years (old)	169/1006 (16.8)	169	20	6
Indeterminate age	27/1006 (2.69)	4	1	24
Total	1004	720/1004 (71.71)	75/1004 (7.47)	2 211/1004 (20.82)

[1]Number of individuals within each age category (% of individuals in parentheses).

Table 2. Demographics of the SCVMC button sample.

	TOTAL[1]	MALE	FEMALE	INDETERMINATE
0-29 years (young)	7/121 (5.79)	6	1	-
30-59 years (adult)	97/121 (80.17)	77	1	15
60+ years (old)	15/121 (12.40)	14	5	-
Indeterminate age	2/121 (1.65)	-	-	2
Total	121	97/121 (80.17)	7/121 (5.79)	17/121 (14.05)

[1]Number of individuals within each age category (% of individuals in parentheses).

Table 3. Nearest neighbor results.

	OBSERVED MEAN DISTANCE	EXPECTED MEAN DISTANCE	NEAREST NEIGHBOR RATIO	Z-SCORE	P-VALUE
All burials	1.15	1.03	1.12	7.11	0.000000
All - female	3.90	3.51	1.11	1.86	0.063
All - male	2.69	3.10	0.866	-2.05	0.011
All - European	3.64	3.61	1.01	0.11	.904
All - African	4.51	4.25	1.06	0.78	0.43
All – Asian	2.80	2.54	1.10	2.34	.019
Button burials	2.57	2.87	.091	-1.78	0.074
Button - female	6.77	6.65	1.01	0.09	.93
Button - male	1.25	1.21	1.03	1.86	0.063

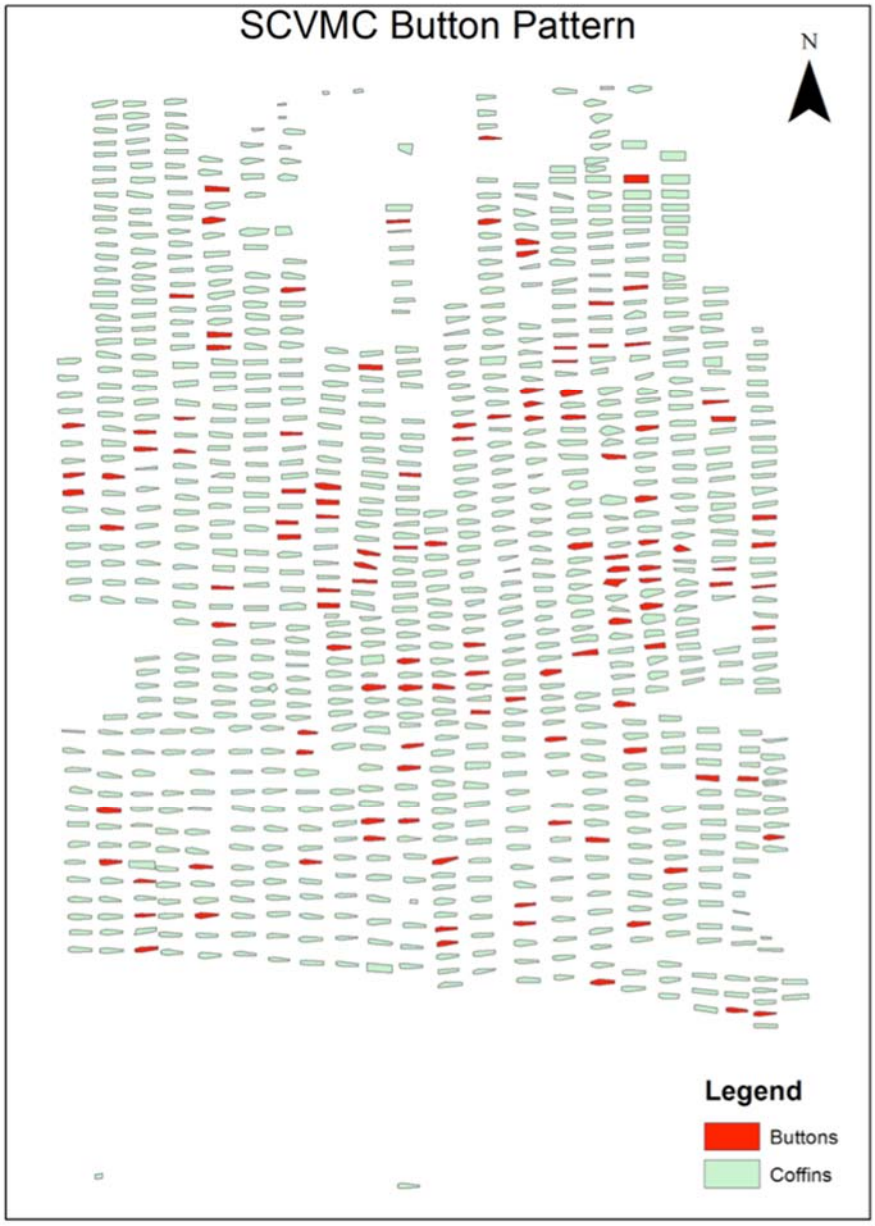

Figure 6. Map showing button subsample and larger population.

Of all tested variables, the button burials were the only group to highly tend toward clustering, with a nearest neighbor ratio of 0.09 (p=0.07), although not with as strong of significance as all of the burials. There was no significant clustering pattern found with regard to age, sex or ancestry in the entire sample, or the button group. Although the male sample is slightly clustered (nearest neighbor ratio 0.866, p-value 0.011), since males constitute a majority of the cemetery (71.71%), it is likely a result of composition sample. When conducting a nearest neighbor analysis, the boundary effect must be taken into consideration. The nearest neighbor statistic assumes that there is boundless space, so when a finite area is investigated that may sever potential connections between nearest neighbors, and the results are biased by raising the average distance between nearest neighbors (Carr 1984, Pinder et al. 1979:431). However, because the button burials extend to the limit of the excavation, there is a low probability that the excavated portion of the cemetery is producing a boundary affect that would significantly impact the nearest neighbor results.

Table 4. Non-button versus button sample.

	X^2	DF	P-VALUE	φ
Sex	1.02	1	0.31	0.04
Age	2.24	2	0.32	0.05
Periosteal Reaction	22.01	1	<.0001	0.15
Fracture	4.49	1	0.05	-0.07

Chi-squared tests for the button versus non-button group were run for age, sex, periosteal reactions, and fractures. No significant results were obtained for age and sex. However, significant results were obtained for periosteal reactions ($p<.0001$), and fractures ($p<0.05$). Periosteal reactions and fractures were scored only for presence and absence, while severity and number of reactions or fractures was not taken into consideration. The results are presented in Table 4. Because of the large sample size, a Φ correlation coefficient was also calculated, with periosteal reactions having a slight positive association (0.15), and fractures having a slight negative association (-.07).

CONCLUSION

The linear white button pattern was able to be isolated as a valid subset of the cemetery population. It may be possible that this button pattern, with lack of other burial artifacts, could potentially be produced by a variety of clothing types, however the increased rate of periosteal reactions and fractures in the subsample would suggest that the probability of these individuals being chronically or critically ill is highly likely, and thus were treated at the hospital. This does make the potential assumption that people who die while admitted to the hospital are likely to show increased stress indicators compared to the rest of the population. However, the statistically significant difference between the button subset and the larger cemetery population suggests that this assumption is not without merit.

There is also historic documentation that indicates individuals with chronic conditions were treated at the infirmary/almshouse for extended periods of time. The 1880 Federal Census of Defective, Dependent, and Delinquent Classes lists not only the name, occupation, and age/sex data for individuals residing at the hospital, but also lists the cause of their disability and the date that they entered the care of the hospital. Although some of the individuals had been residents for only a few months, a majority had been there for 1-4 years. Those with longer residents list their chronic issues as kidney disease, gout, rheumatism, syphilis, tuberculosis, and old age to name a few (U.S. Census 1880). This supports the assumption that the individuals in the hospital's care were struggling with long-term illness that would impact the stress indicators skeletally.

The spatial clustering of the button individuals can be explained in several ways. It is possible that the hospital waited until there were several deceased individuals needing to be buried, or it is possible that different units of the hospital (such as the tuberculosis ward or old men/women's homes) used different portions of the cemetery. The only way to confirm the use pattern would be to find historical documentation, which as of yet is lacking.

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