capstract:2611.00021v1 [med.PH] 11 Nov 2026

Original investigation

Changes in civic dedications as a source of mortality follow-up in a municipal retirement cohort

Inessa D. Varelin[1,†], Leandro M. Soreva[2], Odile P. Tessaire[3], Greta E. Ilvonen[1,3]

[1] Population Records Unit, Cerrel Institute of Municipal Health, Hull, United Kingdom
[2] Department of Social Epidemiology, Tavola School of Population Studies, Turin, Italy
[3] Centre for Longitudinal Measurement, Institut de Valcour, Lille, France

Correspondence: Inessa D. Varelin, Population Records Unit, Cerrel Institute of Municipal Health.

Abstract

Background: Municipal employees may receive a named park bench on retirement. Subsequent changes to its inscription have no prescribed relation to the recipient’s vital status. We assessed the accuracy and timing of mortality ascertainment from the bench.

Methods: A closed cohort comprised 600 living pensioners with individually dedicated seats in three municipal districts on January 1, 2017. Readers blinded to civil records examined changes to the approved wording over eight years. A positive indication required an explicit memorial, a new past-tense description of the recipient, or the addition of a terminal year after a starting year. The civil register supplied dates of death independently.

Results: By December 31, 2024, 120 recipients had died. The bench indicated death in 72 of these and in 24 of the 480 survivors. Sensitivity was 60.0% (95% confidence interval 51.1 to 68.3) and specificity 95.0% (92.7 to 96.6). Six of the 72 indications preceded the death they appeared to identify. Restriction to explicit memorials increased positive predictive value from 75.0% to 98.2%. In a separate analysis of physical continuity, 79 original seats left service during the lifetime of the recipient.

Conclusions: A terminal date on a retirement bench can refer to the end of municipal service. Even when the wording correctly identifies a death by the end of follow-up, the date on which that wording enters the inventory can place the death in the wrong reporting year.

Keywords: mortality ascertainment; retired workers; civil registration; occupational cohort; record linkage

Introduction

Long follow-up of an occupational cohort can continue well after its members leave the payroll. Some sources of subsequent address information also carry an indication of death. A pension file may close on the transfer of a benefit to a spouse. A union circular may report a death at the next annual meeting. Before either event can enter a mortality series one needs to know which person it concerns and when it occurred [1, 2]. The date on a circular is generally easier to establish than the date of the event described in it.

In the three districts studied here a member of staff could, on retirement, accept a bench in a public park bearing an inscription of their choice. A retiring employee could also choose a tree. Benches belonged to the parks service, which kept a property record after the employee left the payroll. Families could ask to have the wording changed. Thus a man who liked to sit by the estuary could continue to like it for several years in the parks inventory before a work order recorded that he had loved it. Parks staff needed the exact wording to order replacement plates. They had no occasion to record the date on which the verb ceased to apply.

The distinction matters for studies of retired workers for whom a source of civic records is available over a longer period than direct contact. An engraving is identifiable, public and often legible for decades. These properties helped its use in local histories of former staff [3, 4]. They say little about the completeness of follow-up. A death can occur with no change at all to the seat. Conversely a change referring to a completed period of service may look much like a change commemorating a life. Case collections

assembled from memorial walks exclude living recipients at the point of sampling [5]. There is consequently little information about what a bench says in the ordinary course of its recipient’s continued survival.

We started with seats already dedicated while the recipient was alive. Our primary question concerned classification of all-cause death by the end of eight years. Two further questions concerned the order of the events and the identity of the item that went out of service. The protocol distinguished withdrawal of the original item of furniture from any change in the approved text. The person, the text and the seat could therefore have different end dates.

Methods

Setting and cohort entry

The districts joined a common municipal pension scheme before the introduction of the seat award. Each pension office held a personal reference number for its employees. The retirement award ledger recorded that number alongside the recipient’s choice of award. The parks offices used local site numbers and had no access to the pension database. An existing crosswalk related an approved award to its first site number. We reconstructed the cohort from copies of these ledgers deposited before the start of follow-up. No search term denoting bereavement or remembrance entered the selection.

Entry required a named individual, a legible baseline dedication, an active award and civil confirmation that the recipient was alive on January 1, 2017. None of the entering dedications already met the mortality rule. A second application by the same employee

could refer to a transfer between parks. We retained the earliest qualifying award and kept the transfer slip for the reconstruction of site history. Where a couple had retired together and the dedication named both, we excluded the application. A change from the plural to the singular is difficult to attribute to either partner without knowing the outcome. This restriction also kept the recipient as the unit for intervals.

Of 660 applications in the entry file, 24 named groups or couples, 16 repeated an earlier application, eight concerned recipients who had died before entry and 12 lacked a resolvable personal reference. We applied these exclusions in that order. All 600 remaining applications had a readable base text. No additional recipient entered when a replacement seat appeared during the observation period. Follow-up ended for the analysis of public indications on December 31, 2024, including for recipients who had already died. Closing a parks file at the date of death would eliminate exactly the interval during which a dedication could become a memorial.

The civil and municipal records

The register custodian matched the pension references to the civil population file and returned a death date or confirmation of survival through closure. For this linkage only, the custodian had access to the pensioner’s name history and date of birth. Clerks resolved changes of surname against the pension file without access to any wording on a seat. Moves between districts did not interrupt civil follow-up. All 600 references yielded a status at closure. Registration after the date of death was allowed by taking the civil extract nine months after the last day under study. Deaths occurring after that last day were outside the study. The clerks had to recover an exact identifier before accepting a match [6]. We did not assign probability weights to partial agreements [7].

The parks material consisted of the text authorized for engraving, the completion docket and a site number. A request could go through several proofs. Only a completed order replaced the preceding official text. The clerk’s signature accepted delivery of the plate for installation. We therefore use the term *indication date* for the completion date in the ledger. A resident walking through the park might read the new text later. We had no equivalent record of installation on the backrest. The baseline record and the successive completed orders were scanned in chronological order, with dates of birth and staff reference numbers masked on cover sheets. Years that formed part of the approved inscription remained visible.

Each of the 600 awards occupied a separate seat at entry. We refer to that seat as the original for the eight years under study. A separate equipment ledger gave the date, when applicable, on which the original seat was withdrawn from service. A repair retained the asset number. Full replacement retired that number and assigned a successor. Serial numbers stencilled on the frame resolved moves where the property ledger showed two active records for one site. We followed successor inscriptions under the award even when the original wood and metal left the park. The reverse occasionally occurred when a sound bench was moved to another site without its plate. Following the frame in that circumstance would transfer the pensioner’s person-time to the next dedication [8].

Reading the dedications

Two readers trained on closed orders from a neighboring district. They then read the entry text and the sequence of approved changes for each study award. They had access to the name as it appeared on the original dedication. For each change they

recorded the referent of the clause and the first applicable class in a short codebook. A phrase that explicitly commemorated the death of the named recipient took precedence. Next came a new past-tense description of that person’s relationship with the place. Last came the addition of a terminal year to a preceding year. To reflect a reading made from the facing side of a plate, the year rule did not require the first year to be a plausible year of birth. Some plates are headed by a job title where an outside reader would expect a name [9].

Precedence governed the classification of an individual revision. Over time we retained the first qualifying indication for dating and the strongest ever observed for a description of evidence. Readers recorded an indication only for the named recipient. A memorial for the employee’s partner on the lower line did not suffice. We excluded a historical past-tense description copied unchanged from the baseline. A verb referring to the recipient’s former work also failed the verb rule. The addition of a year after such a verb could still qualify under the separate year rule. The appendix gives examples of coding decisions without reproducing anyone’s dedication.

The readers reconciled differences after making independent entries. A third reader settled outstanding cases using the same masked material. We froze the classifications before the custodian returned dates. Prospective dating of changes in administrative sources has precedent in the study of staff rolls [10]. The opportunity for the analyst to read a meaning back into an inscription is considerable once the civil date is on screen. A second reading after linkage was limited to describing reasons for discordance. It could not revise the primary classification.

Outcomes and analysis

Let D denote death in the civil file during follow-up and B any positive indication in the parks file during the same period. A recipient contributes once to each margin. Our main estimates use fixed-horizon state classification, as in studies of administrative case definitions [11, 12]. In equation (1) n_{bd} counts recipients with $B = b$ and $D = d$.

$$S = \frac{n_{11}}{n_{11} + n_{01}}, \qquad C = \frac{n_{00}}{n_{00} + n_{10}}. \tag{1}$$

We give 95% Wilson intervals for proportions [13, 14]. They describe sampling variation under independent recipient sampling within this set of districts. They do not estimate variation across municipal inscription policies. We tabulated each district separately to expose that source of variation. There was no sample size calculation. The three ledgers constituted the available baseline census. The analysis and presentation follow recommendations for reporting linked observational studies [15].

A fixed closing date puts an early false indication in the concordant cell if the person dies later. Accordingly we also compared each first indication date with the date of the civil death. For positive intervals we report elapsed calendar months to registration in the parks inventory. A calendar anniversary counted as the end of its interval. The cumulative distribution among recipients who had both events in the prescribed order describes observed delays. It cannot estimate the distribution that would result if every death eventually led to a change on the seat. To assess reporting within a common window we separately considered all recipients who died by December 31, 2022, and had no prior indication. Each had two complete years of potential follow-up after the death.

The narrow definition used only an explicit memorial. It was specified before reading began. As a separate check on interpretation of the records, we substituted permanent withdrawal of the baseline seat for the textual indication. Withdrawal is a recognizable administrative event, dated to the day, for which there is no requirement to consult the family [16]. Correlation with age of the award could give it some association with human mortality. Calling it a reference standard would assume the answer to the question.

Governance

The Cerrel Population Records Board approved retrospective linkage under decision CPR-16-48 and waived individual contact. The pension office did not inform parks staff of any death during the study. The analytical file retained person and asset sequence numbers, district, time intervals and classifications. Photographs, site coordinates and literal inscriptions remained with the local custodian. A dedication may name a surviving relative who has no other connection with a study of former employees.

Results

Complete cohort

The cohort comprised 180 recipients in the upper district and 210 each in the central and lower districts. Median age at entry was 74 years (interquartile range 69 to 80). The median age of the original seat was six years (interquartile range three to ten). District-specific registration and ascertainment appear in Table 1. The lower district recorded the highest proportion of deaths and the smallest fraction of these deaths indicated by the bench. At closure the pooled civil risk was 20.0%. The parks figure was 16.0%.

Table 1. Eight-year outcomes by district. A positive indication is any qualifying change during follow-up.

District	Recipients	Civil deaths	Positive among deaths	Positive among survivors
Upper	180	36	26	4
Central	210	39	24	9
Lower	210	45	22	11
Total	600	120	72	24

The two cumulative counts separated early (Figure 1). The year plotted for an inscription is the year of completion of its first positive order. Later and less ambiguous wording on the same award cannot add a second person. We use a common y axis because readers of the annual municipal returns would see counts for this closed cohort and might reasonably compare their levels. Parallel increases in the two series gave little indication of how often they concerned the same people.

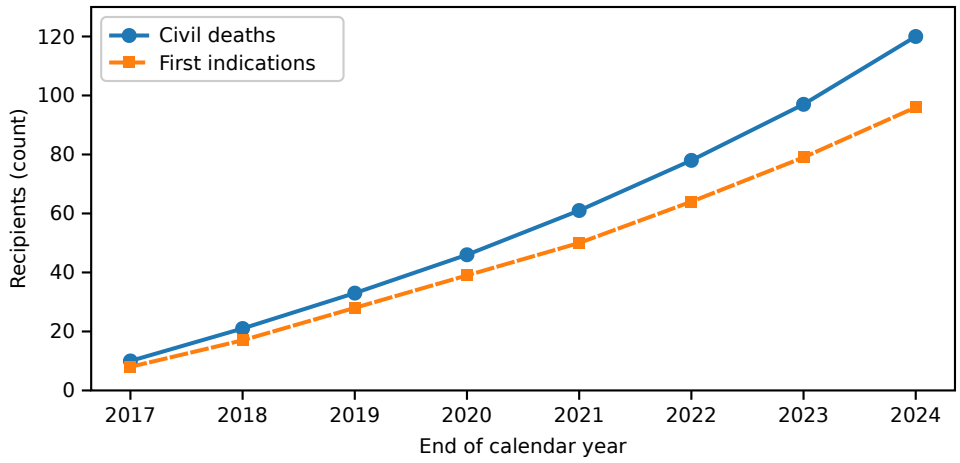


Figure 1. Cumulative count by year end among 600 recipients. Each person enters each series at most once.

The broad definition gave sensitivity of 72/120 (60.0%) and specificity of 456/480 (95.0%) under equation (1). Positive predictive value was 72/96 (75.0%, 95% interval 65.5 to 82.6). Among the 504 recipients with no indication, 456 survived through closure (90.5%, 87.6 to 92.7). Subtracting one source total from the other gives a deficit of 24

people. The person-level files disagreed about 72. A single correction added to the parks total would obscure two quite different demands on the record clerks, tracing a missed death and establishing why a living person had been marked.

Strength of wording and recorded survival

The relation between wording and civil status varied sharply within the 96 positives (Table 2). An explicit memorial yielded 54/55 true positives by closure (98.2%, 95% interval 90.4 to 99.7). Applying that rule to the entire cohort lowered sensitivity to 54/120 (45.0%, 36.4 to 53.9). The one survivor whose inscription met the explicit rule had purchased two plates together. The order form recorded the second, memorial version as completed on delivery to the store. A photograph in the maintenance file still showed the first plate on the bench at closure. The supply contract made no distinction between a spare and the plate in use when the invoice was settled.

Table 2. Strongest indication during follow-up. Each recipient appears in exactly one row.

Strongest wording	Died by closure	Alive at closure	Total
Explicit memorial	54	1	55
New past tense	13	17	30
Terminal year alone	5	6	11
No qualifying wording	48	456	504
Total	120	480	600

Among the 17 survivors in the past-tense row were employees who had moved inland. Their dedications referred accurately to a place where they used to take the air. In another case the removal of a view by a new footbridge made the original wording difficult to retain in the present tense. All six survivors indicated by years alone had completed a term of municipal service. The first year in each pair was the year of

appointment. The range of dates in one of these inscriptions covered 41 years and fit comfortably within a human life. Readers who had correctly copied every digit could still disagree with the pension return.

Timeliness

Six of 72 concordant indications preceded the recipient’s registered death. These cases counted as concordant at closure under the protocol. They supplied no confirmation that a death had already occurred at the time the parks file first appeared positive. Among the 66 remaining indications the parks date followed the civil date in every case. The denominator of Figure 2 consists only of these pairs. Within three months the parks file had recorded 11, within six months 25, and within one year 42. Nine appeared more than two years after the civil death. The latest order was still for the same recipient. It provided the first indication on a replacement plate after several years of identical wording on the original.

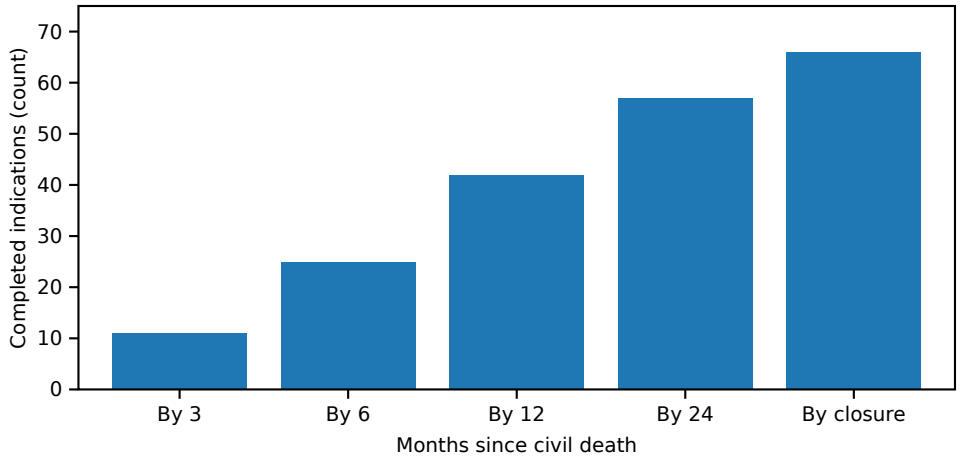


Figure 2. Recipients with a completed positive order by the specified interval after death. Denominator is the 66 observed pairs with the civil date first.

Of 78 deaths with two years of potential follow-up, four had prior indications. Among the remaining 74 the parks file first indicated the death within two years in 35 cases (47.3%, 95% interval 36.3 to 58.5). The 57 orders within two years in Figure 2 include orders for later deaths whose families acted quickly. A recipient dying late in 2024 could contribute to that figure if the workshop completed the order within days. A recipient from the same week whose family placed the order the following spring could not contribute. That selection accounts for much of the difference between a workshop delay among completed jobs and the probability that a deceased employee will appear in an annual return.

Withdrawal of the physical asset

The equipment ledger recorded 86 original seats permanently out of service by closure (Figure 3). In 79 cases the recipient was alive on the day of withdrawal. Seventeen of those recipients died subsequently during follow-up. In seven cases the human death preceded withdrawal. There were no ties in these 24 pairs. Thus a closed asset file had positive predictive value of 24/86 (27.9%, 95% interval 19.5 to 38.2) for the recipient’s death by closure. Its sensitivity was 24/120 (20.0%). Among the 514 original seats remaining in service, 96 belonged to recipients who had died. No delay in entering an inscription is needed to explain that last count. A district can leave the same frame in place when it puts up a memorial plate.

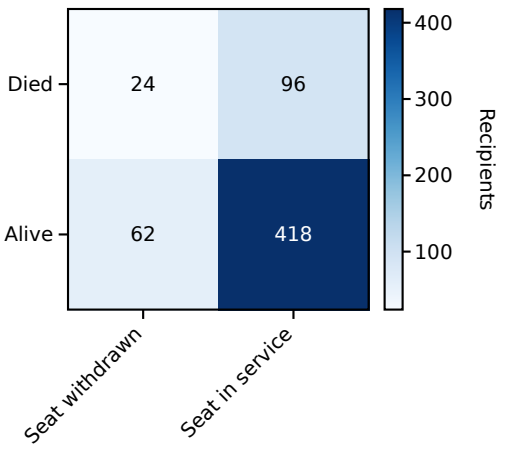


Figure 3. Joint status of the recipient and the original item of furniture at closure. Cells give numbers of people and sum to 600.

In the lower district withdrawal orders sometimes carried the term *end of life* as the reason for disposal. It referred to the frame. The identical term on a job ticket attached to the dedication did not by itself meet any of the language criteria in Reading the dedications. The contrast between the two ledgers was largest for materials returned to the depot, where protected storage could prolong the life of a readable plate after the fixing points on its seat had failed. The stores staff could trace the plate through a move without taking any interest in whether the named person could still occupy the replacement.

Discussion

Studies that depend on contact with retired staff often have a difficult last interval between the final employment record and the closure of follow-up. Here there was a third party with a continuing interest in the spelling of the employee’s name. This produced a source that was easy to link and cheap to inspect, with a specific form of error. A family might see no reason to amend accurate wording after a death. The

dedication “for our father” remains suitable. By contrast a living recipient moving away could reasonably want a past-tense verb above a newly unfamiliar view. The error need not arise in transcription or linkage.

Predictive value in this cohort depends partly on the eight-year risk among older recipients. If p is a target population’s risk, the expected proportion of positive seats is given by equation (2), subject to a common sensitivity and specificity [17].

$$q(p) = S p + (1 - C)(1 - p). \tag{2}$$

Our estimates give $q(p) = 0.05 + 0.55p$. The observed value at $p = 0.20$ is 0.16, as it must be when both parameters come from the same table. At a risk of one ninth the two margins would agree exactly. Agreement at that point would provide no evidence about whether the correct individuals had been identified. It would also be a questionable basis for transferring the rule to a younger workforce. Terminal years of service may appear at different frequencies there. The upper district allowed one free change on retirement anniversaries, whereas the lower district charged for changes after the initial order. Sparse numbers do not separate cost from local preferences in wording.

Our use of two clocks is relevant to follow-up beyond municipal employees. Retrospective work on voluntary notices has concentrated on the interval from occurrence to receipt [18, 19]. In this cohort receipt occasionally came first. Assigning these observations a delay of zero would create an apparent group of same-day reports. The direction of the discrepancy is observable because the civil date was supplied independently. Without linkage there is no textual feature that reliably distinguishes a plate held in stores for future use from an otherwise identical plate fixed to the back of a seat.

Limitations

This study begins only when a living pensioner already has a name in the inventory. A worker whose dedication is commissioned after death could never enter. The restriction gives us a denominator for sensitivity but precludes an estimate of the population fraction honored in this way. It also conditions on having survived from retirement until the entry date. Nothing in the observed proportion of deaths estimates a benefit or hazard of receiving a bench. Trees offered in the same scheme pose a different problem of follow-up, since a healthy specimen can gain a new site number when a path is renamed [20]. We had no comparable census of their labels.

The reference file supplied complete verified vital status for this cohort. The equipment and parks files supply complete histories only of recorded administrative acts. Some replacements may have gone ahead as routine repairs without a new job number. The study could miss a family placing its own temporary label, particularly on the anniversary of a death. District staff removed such labels during ordinary grounds maintenance. No one recorded how long they were visible to a park visitor. Our inference about receipt of an indication therefore pertains to authorized wording in the ledger. Direct annual inspection of all sites, even if it were possible in retrospect, would answer a different question about public display [21].

Confidence limits within Results treat outcomes for separate recipients as independent. A workshop closure can delay all orders in the same district. With three districts, estimating the sampling distribution of a district effect from this material would require assumptions about which policies could have been observed elsewhere. The figures give counts so that changes in local policy can be compared without carrying the pooled

interval over to another setting. We also lacked family contact histories. An unchanged inscription may reflect an explicit instruction to retain the words or simply the absence of anyone wishing to pay for a new plate.

For the civil custodian a correction to a date must include evidence about the individual. A completed order proves that someone supplied a piece of metal to the parks service. In the most convincing discordance here, even the relationship to the named individual and the exact words of commemoration were beyond doubt. What the investigators needed was a record of which of the two plates had come out of the box.

Access to materials

The tables contain the pooled cells used for classification and the separate district margins. The custodian retains the ordering histories under the original linkage agreement. Public release of the dedications would permit recovery of surviving employees’ identities by a walk through a small number of parks. The working definitions used for reclassification are given below.

Event coding and reconciliation

A baseline entry contained the complete approved text. An order referring to a new slat, arm or bracket could attach a copy of that text. A checksum of normalized line endings helped readers set aside exact copies. Readers compared all differing strings, including those differing by a single character. Erasing a final letter in a language with inflected verbs can change the time reference. Layout, punctuation and the location of a screw sometimes explain a changed line break, and no rule uses the number of lines.

The working examples in Table 3 refer to one hypothetical recipient. A terminal year following a service date qualified under the broad rule even if the context gave an occupational explanation. That decision reproduces a source consulted in a survey where the years may be entered in separate fields and the job title omitted. We retained the stronger grammatical exclusion for phrases about former employment because a clause can be classified only with its subject and predicate intact. A year can survive as a pair of digits in a different table long after the rest of its line has gone.

Table 3. Examples of changes considered by readers. The wording illustrates the codebook.

New feature on a completed order	Recorded indication
A statement that the named recipient died	Explicit memorial
A new statement that the recipient enjoyed this particular view	Past tense
A closing year added after the year of appointment	Terminal year
A new statement that the recipient once supervised the grounds	None
A statement commemorating only the recipient’s spouse	None
The old plate refitted with new screws	None

For dates we reconstructed the sequence within each award before joining calendar years across awards. A completed order canceled and reissued under a corrected invoice number contributed one visit to the workshop. A second plate ordered with different wording contributed a revision even when supplied at the same visit. The date comparison thus used the first completed qualifying order associated with the award. For physical withdrawal we froze the original asset number at entry. Subsequent numbers supplied continuity for the text series only.

The distinction can be seen from the four combinations at closure. Of 120 deceased people, 24 had lost the original seat and 96 still had it. Of 480 living people, 62 had lost it and 418 still had it. Asking whether the seat had outlived the person requires the order

of failures among the 24 pairs with both events. Seven seats did so within the study interval, in addition to the 96 still recorded in service at closure after the death. The corresponding count of people who had already outlived the furniture was 79. The remaining 418 pairs had two open records on the last day. Neither date of eventual failure can be recovered from that pair of entries.

Acknowledgments

The authors thank the municipal stores clerks who reconciled the original asset numbers with successor plates.

References

1. Marelle TF. Address continuity after retirement from district employment. Municipal Population Studies. 2013.
2. Sovic DP. Benefit transfers and ascertainment of deaths among former staff. Annals of Employment Follow-up. 2015.
3. Ocamvel ME. Inscribed Records of Municipal Employment. Orven Civic Press; 2009.
4. Darets VL. Indexing donors in public inventories of park seating. Quarterly of Civic Archives. 2012.
5. Talven AD. Sampling frames for retrospective studies of municipal remembrance. Municipal Population Studies. 2015.
6. Felderin KP, Mervelle AT. Blinded resolution of pension references in district cohorts. Annals of Employment Follow-up. 2014.
7. Fellegi IP, Sunter AB. A Theory for Record Linkage. Journal of the American Statistical Association. 1969;64:1183–1210.
8. Berathi DE. Asset continuity and attribution in inventories of sponsored public space. Quarterly of Civic Archives. 2011.
9. Melros JF. Attributing dates on retirement awards to periods of employment. Studies in Civic Epigraphy. 2010.
10. Rezekin MV. When a name leaves the roll: dates of occurrence in historical staff registers. Annals of Employment Follow-up. 2016.
11. Garelin NJ. Fixed dates of closure in the evaluation of secondary sources. Observational Methods Bulletin. 2014.
12. Dorven IP. Person-level denominators in comparisons of municipal lists. Observational Methods Bulletin. 2016.
13. Wilson EB. Probable inference, the law of succession, and statistical inference. Journal of the American Statistical Association. 1927;22:209–212.

14. Newcombe RG. Two-sided confidence intervals for the single proportion: comparison of seven methods. Statistics in Medicine. 1998;17:857–872.
15. Benchimol EI, Smeeth L, Guttmann A, Harron K, Moher D, Petersen I, et al. The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) statement. PLOS Medicine. 2015;12:e1001885.
16. Korvell AT. Disposal orders and closure dates in three asset registers. Quarterly of Civic Archives. 2013.
17. Rogan WJ, Gladen B. Estimating prevalence from the results of a screening test. American Journal of Epidemiology. 1978;107:71–76.
18. Levarek IN. Late reporting in voluntary occupational notices. Annals of Employment Follow-up. 2018.
19. Kamase TJ. Return intervals for civic notices after household deaths. Municipal Population Studies. 2021.
20. Narel SK. Changing identifiers in the long-term follow-up of municipal planting awards. Quarterly of Civic Archives. 2022.
21. Erivaux DG. Comparing approved and displayed inscriptions at open sites. Studies in Civic Epigraphy. 2020.