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**Uruguay's 2023 Combined Census:
Integrating Administrative Registers
and Traditional Enumeration**

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Uruguay's 2023 Combined Census: Integrating administrative registers and traditional enumeration

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Abstract

Uruguay's 2023 Combined Census pioneered a hybrid methodology that merged traditional field enumeration with administrative register data to achieve a more complete population count. This article analyzes the institutional, legal, and technical conditions that enabled Uruguay's success – including a strong legal mandate for data sharing, a robust unique ID system, and an integrated data infrastructure – and details the methods and outcomes of the combined census. Approximately 10% of Uruguay's population was added via administrative enumeration – real individuals from administrative records – to compensate for non-response or omissions in the field. This approach, inspired by Statistics New Zealand's 2018 combined census model, allowed Uruguay to avoid the need for “synthetic” imputation of missing persons by using verified administrative data. The results show improved coverage and reduced bias. We present comparative analyses with New Zealand's experience, illustrate the coverage gains from administrative data inclusion, and discuss how Uruguay's use of “Signs of Life” indicators, administrative residence construction, and the SIREE platform for data linkage ensured data quality. International peer reviews by the United Nations Statistics Division (UNSD) and Statistics Norway affirm Uruguay's innovative strategy as a replicable model for countries lacking a central population register, highlighting the importance of legal frameworks, inter-agency cooperation, and public trust in enabling register-based censuses.

Keywords: Combined census; administrative data; register-based census; population statistics; official statistics; data integration; coverage evaluation; signs of life model; unique ID systems; data quality; census methodology; Uruguay.

JEL Classification: C80; C82; J11; H83; O54.

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1. Introduction

Censuses are a cornerstone of demographic statistics, but traditional census-taking faces growing challenges: high costs, declining response rates, and coverage gaps due to mobility and omissions (UNSD, 2017). Many nations are therefore shifting toward register-based censuses, which leverage existing administrative records to produce official population counts (UNSD, 2022). Countries with long-established Central Population Registers (CPRs), such as those in the Nordic region, have demonstrated that fully register-based censuses can replace traditional enumeration, yielding timely and cost-effective results (UNECE, 2007). However, in countries without a single CPR, innovative multi-source approaches are required (UNSD, 2022).

In Latin America, Uruguay emerged as a trailblazer by conducting the region's first "combined census" in 2023, integrating field enumeration with administrative register data to achieve full population coverage (INE, 2024; Aboal, 2023). Uruguay's National Institute of Statistics (INE) recognized that purely traditional methods were no longer sufficient to enumerate the entire population, especially given non-response and hard-to-reach groups. Instead of treating administrative records as merely auxiliary or post-enumeration tools, INE embedded them directly into the census process. This decision was facilitated by crucial institutional, legal, and technical conditions that had matured in Uruguay.

Since 2020, INE invested in modernizing its data infrastructure and forging partnerships. Uruguay's National Statistical System evolved toward a Nordic-style model where multiple administrative sources are routinely used for official statistics. INE had established a dedicated Administrative Registers Unit and developed an Integrated System of Statistical Registers and Surveys (SIREE) that links core statistical registers (population, business, addresses) with survey data (INE, 2021) (UNSD, 2025).

Close collaboration with other government agencies provided INE access to micro-data from civil identification, health, education, social protection, and other systems, all interconnected via a unique national ID number assigned to residents since 1914 (INE, 2021). The ubiquity of this personal identifier (reported by 95% of 2023 census respondents, with 97% accuracy) enabled high-precision record linkage across datasets (INE, 2024).

Strong institutional support was further evidenced by international cooperation. Well before 2023, INE engaged in knowledge exchange with countries experienced in register-based censuses. Experts from Statistics New Zealand and UNSD provided technical assistance during the design of Uruguay's combined census methodology, and Statistics Norway collaborated through a peer-to-peer program to assess Uruguay's register-based system. INE staff participated in study visits and virtual exchanges with numerous NSOs (Norway, Finland, Sweden, Netherlands, Germany, Spain, Canada, USA, Lithuania, Estonia, New Zealand, among others), ensuring that global best practices were adapted to Uruguay's context. This institutional groundwork built the technical know-how and credibility necessary for the bold methodological leap in 2023.

A supportive legal environment underpinned INE's access to administrative records. Uruguay's Statistical Law (Law 16,616 of 1994), although enacted before the era of big data, provides a sufficiently flexible framework to accommodate the use of administrative registers for statistical purposes. Combined with strong confidentiality provisions and INE's mandate to produce official statistics, this framework offered a solid legal basis for incorporating administrative data into the census process. Additionally, in 2021 Uruguay passed a law to develop a new Demographic Information Registry, intended as a central population register maintained by the e-government agency AGESIC (Law 19,996 of 2021). While this register is still being operationalized, its legislative approval reflects political commitment to integrating data sources. International reviewers noted that the current laws, albeit sufficient to allow INE's data access, could be strengthened.

Uruguay's approach also recognized the importance of public trust and ethical data use. INE has been transparent about its methods and has emphasized privacy protections, aware that public acceptance is key to using administrative data in statistics. By proactively engaging stakeholders and maintaining confidentiality standards, INE built a social license to innovate. These institutional and legal conditions established a solid foundation for conducting a combined census.

Given this enabling context, the 2023 Combined Census of Uruguay was conceived not merely as a temporary remedy for non-response but as a transformative step toward modern census-taking in a middle-income country without a central population register.

This experience is closely aligned with the recommendations of the Statistical Conference of the Americas of the Economic Commission for Latin America and the Caribbean, which encourage countries to expand the use of administrative records, develop combined census approaches, and advance toward register-based censuses. Uruguay's 2023 census offers an empirical illustration of how these recommendations can be translated into practice (CEPAL, 2024).

In what follows, section 2 describes the methodological design of the combined census, detailing how administrative registers and field enumeration were integrated. Section 3 presents the main results, including the gains in coverage and data quality achieved through this hybrid approach, followed by a comparative analysis with New Zealand's 2018 combined census (Stats NZ, 2019)—which served as a key methodological inspiration. Section 4 then expands the discussion to consider the broader implications for census modernization and the lessons that Uruguay's experience offers to other national statistical systems seeking to adopt or transition toward register-based approaches. Section 5 concludes.

2. Methods

2.1 Overview of the combined approach

Uruguay's 2023 Combined Census integrated multiple data collection modes and sources in order to enumerate the entire usual resident population. Traditional census enumeration

was carried out via online self-enumeration (CAWI), face-to-face interviews (CAPI), and telephone interviews (CATT) for those who did not respond online (INE, 2024).

Alongside this field operation, INE leveraged high-quality administrative registers to identify and count individuals who were missed in the field. The resulting microdata consists of two types of records: (1) census questionnaire responses obtained directly from households during fieldwork, and (2) administrative enumerations – people added from administrative sources under strict inclusion criteria (INE, 2024).

Importantly, this combined methodology was carefully designed drawing on Statistics New Zealand’s successful integration of admin data in their 2018 Census (Stats NZ, 2019). By design, the primary priority was given to field enumeration, with administrative data filling in only where needed to maximize coverage.

2.2 Data Integration Platform and Statistical Population Register

Central to the methodology was INE’s Integrated System of Statistical Registers and Surveys (SIREE) (INE, 2021) (UNSD, 2025). SIREE provided the infrastructure to ingest data from various administrative systems and transform them into statistical registers with common identifiers and formats. Within SIREE, the Statistical Register of Resident Population (SRRP) (INE, 2024b) served as a de facto population register, constructed by linking person-level data from disparate sources (civil registry, migration records, health, education, social security, etc.). The SRRP is essentially a continuously updated list of individuals believed to be usual residents of Uruguay, created in the absence of a single CPR. It incorporates the unique personal ID number to link records and uses a combination of demographic events (births, deaths) and activity indicators to maintain an up-to-date resident population list.

For the census, the SRRP became the master reference of people potentially to be counted. INE first linked the census field enumeration data to the SRRP to flag which individuals had already been counted via questionnaires. This linkage used a two-step process, deterministic matching on the statistical person ID and date of birth, followed by probabilistic record linkage (Fellegi & Sunter, 1969) on names, sex, and birthdate for cases where the unique ID might be missing or erroneous. This careful linkage ensured that no person would be counted twice – a crucial quality control to avoid duplication. After linking, all individuals already enumerated by field operations were excluded from further consideration in the admin-based enumeration process. At this stage, any remaining person in the SRRP represented someone not captured by the field census (due to non-response, inability to contact, or being in an unvisited dwelling). These were the candidates for administrative enumeration.

2.3 Inclusion of administrative enumerations

INE established clear criteria and a multi-step procedure for adding people from the SRRP into the census count (INE, 2024). This procedure was governed by guiding quality principles adapted from New Zealand’s 2018 approach (Stats NZ, 2019), emphasizing coverage maximization with minimal error. Three main steps were implemented.

Step 1: Household-level Inclusion where possible. If a person was missing from a household that did respond to the census, INE attempted to add that person directly into the household based on administrative evidence. A strong evidence threshold was enforced: the admin data had to clearly indicate that the person resided in that specific household on the census date. For example, minors under 14 were a common category of omissions; INE used the national live birth registry to link babies and young children to their mothers. If a mother was enumerated in the census but her child was not, the child's birth certificate (which contains the mother's ID) served as evidence to add the child into that same household. This careful inclusion avoided altering household compositions unless there was high confidence (e.g. parent-child links). INE deliberately set a high bar for such additions to prevent erroneous insertions into otherwise correctly enumerated households.

Step 2: Assigning administrative residence to census residence. For dwellings that did not respond to the census—despite repeated visits or contact attempts—INE sought to assign a census area of residence using information from administrative registers. Uruguay's recent development of a national address database (SuDir) under Presidential Decree 160 of 2022, together with the Statistical Address Register, was instrumental in this process. By combining geocoded address information with utility meter data, INE was able to match individuals to dwellings or small geographic areas with greater reliability.

The procedure aimed to link the administrative address of individuals, as recorded in the SRRP and other administrative systems, to a corresponding census location. Even when an exact address match to a specific dwelling was technically possible, individuals were conservatively assigned to the corresponding census block or enumeration area rather than to a specific household, in order to preserve internal consistency and avoid overstating locational precision. Where precise geolocation was not available but there was sufficient evidence of residence within a given area, assignments were likewise made at the block or enumeration area level.

This approach ensured that non-responding households were nonetheless represented in the census through administrative data. Importantly, individuals were included only when the quality of the linkage between administrative addresses and census geography was deemed high, or when area-level residence could be reliably inferred. Overall, the methodology prioritized the use of observed administrative information over statistical imputation, enabling INE to recover census coverage while maintaining a cautious and transparent approach.

Step 3: Area-level counts for residual cases. In some instances, even with extensive administrative data, INE could not confidently assign people to a specific address or block / enumeration area. This can occur if addresses are missing or too ambiguous. Rather than exclude such individuals entirely (which would undercount the population), INE adopted a principle (borrowed from New Zealand) that including people at a broader geographic level is preferable to not including them at all. Thus, any remaining persons in the SRRP who were identified as likely residents (see "Signs of Life" below) but who could not be placed into an address or block were enumerated at the level of the smallest possible area. They

were assigned to the most specific location possible – ideally at the second level of census enumeration area (aggregated EA) or at least a municipality or department (province) of residence. Uruguay’s approach was hierarchical: wherever possible, assign the person to a block; if not, to a neighborhood/aggregated EA; if not, to a city or county. This ensured that local population totals were corrected for omissions, even if household composition details were missing. The underlying idea is that macro-level accuracy and coverage take precedence over micro-level precision in household structure when necessary. By adding individuals in their correct communities, Uruguay improved overall coverage and reduced bias from non-response, albeit accepting that a small fraction of people would not be attached to a specific household in the data.

For individuals incorporated into the census through administrative enumeration, INE was able to retrieve a substantial set of demographic and contextual variables from existing administrative sources. These included sex; age (derived from date of birth); department and locality of residence; nationality (Uruguayan or foreign); retirement or pensioner status; current enrolment in formal education; and the level of studies being pursued. Together, these variables enabled a partial characterization of individuals not captured through direct census interviews, resulting in more accurate population structures than would have been possible through imputation alone.

However, for other variables traditionally collected in the census—such as employment status, occupation, household characteristics, and detailed educational attainment—administrative sources did not offer sufficient coverage. Consequently, this information remains unavailable for the population enumerated administratively. Addressing this limitation in future censuses will require a longer-term strategy to strengthen the availability and quality of administrative data for key sociodemographic variables, including the expansion of data-sharing agreements and improvements in the structure and standardization of sectoral registers. In the shorter term, administrative data could be complemented with statistical techniques such as multiple imputation or tailored weighting schemes to mitigate item non-response bias in critical variables.

2.4 “Signs of Life” model for residency verification

A critical concern in including administrative records was overcoverage – the risk of counting people who shouldn’t be (e.g., those who died or emigrated but linger in some databases). To address this, INE implemented an innovative “Signs of Life” model to filter the SRRP population (INE, 2024; Moss & Dubourdieu, 2025). Inspired by practices in countries like Estonia (UNECE, 2018) and New Zealand (Stats NZ, 2019), the model assigns each person a Residence Probability that they were actually living in Uruguay at the census reference date (May 31, 2023).

The model compiles recent evidence of an individual’s activity across multiple domains – essentially looking for signals of life in the 1-3 years³ leading up to the census. Examples of such signals include recent employment or income records, contributions to social security,

³ The length of the reference period varies by type of sign of life: one year for most, and longer in certain cases.

school or university enrollment, use of public services, border exit/entry records, etc. A person with no such activity in any system might be an expatriate or deceased person still on file, whereas someone appearing frequently (working, using utilities, etc.) is likely a current resident. INE's model weighed these indicators to compute a score for each individual. Only those exceeding a calibrated probability threshold were deemed "definite residents" to be included from administrative sources. This threshold was informed by the post-enumeration survey and demographic estimates. Essentially, it was known how many people were "missing" and the model was used to pick the top-ranking probable residents until reaching that number. By doing so, INE minimized false inclusions from administrative data. The model embodies a dynamic definition of residency – without a continuously updated CPR, Uruguay inferred likely residency through behavior and administrative footprints, an approach at the cutting edge of register-based census methodology (UNSD, 2022).

2.5 Address validation and geocoding

Ensuring that each administratively added person was assigned to the correct location was another methodological challenge. Uruguay tackled this through its investments in address data standardization. The SuDir (National Address Database), a national spatial data infrastructure project, created a high-quality, unified address database for the country. INE built a Statistical Address Register on top of SuDir, incorporating not only official street addresses but also utility connection identifiers (e.g., electric meter numbers from the national electricity company, UTE) and property cadastral codes.

Because the 2023 online census questionnaire asked households to input their UTE (electricity) meter number as an access key, INE could link many census responses to precise addresses via that meter ID. For administrative data, INE geocoded as many addresses as possible: 70% of individuals in SRRP had their address pinpointed to exact coordinates or matched to the standardized address list. The remaining had partial info – some only to street or city level. Using deterministic matching and the prioritization of sources, INE chose the best available address for each person when placing them geographically. After adding admin persons, the final step was to assign any not tied to a specific dwelling to an EA or higher area as noted.

By the end, about 61% of administratively added persons (360,000 records) to the census dataset were placed at a specific census enumeration area (blocks) level, 38% at a broader locality (municipality/city), and only 2% at the department (province) level. This multi-level geocoding approach ensured that virtually all added individuals contributed to local counts, even if not attached to a particular household, thereby improving small-area population figures.

2.6 Quality assurance and international benchmarks

Throughout the process, Uruguay adhered to rigorous quality standards, many drawn from Stats NZ's methods for their combined census. For instance, New Zealand's methodology for 2018 similarly constructed an administrative resident population from integrated data

(the IDI-based ERP) to identify people to add, and placed them in dwellings or meshblocks when reliable (Stats NZ, 2019c). Uruguay’s adaptation involved continuous testing of the inclusion models (e.g., checking the “Signs of Life” model against known census respondents to validate its accuracy) and comparison of aggregate distributions.

INE conducted a post-enumeration survey (ENEC) to independently measure coverage, which indicated how many people the field census missed (INE, 2024c). Using this and other demographic estimation techniques, INE confirmed that the total population count after adding administrative records was plausible and that the age-sex and geographic (department and locality) distributions from the combined census aligned well with expectations (INE, 2024c). In fact, multiple estimation approaches (census + ENEC, demographic cohort analysis, SRRP alone) converged on very similar population structures, giving confidence that the inclusion of admin data did not distort the statistics.

Moreover, the traceability of data sources was maintained in the final microdata. Each person record can be flagged whether they came from a questionnaire, an admin source, or had any statistically imputed characteristics. This transparency allows researchers to utilize the dataset flexibly and enhances credibility.

3. Results

3.1 Coverage improvement and population count

The 2023 Combined Census achieved virtually complete coverage of Uruguay’s population by combining field and administrative enumeration. The final published usual resident population count was the sum of field responses plus administrative additions, with no need for conjectural person imputation. In total, 10.3% of the population – representing tens of thousands of individuals – was counted solely through administrative data integration. These were people who would have been missed in a traditional census but were identified and included thanks to the SRRP and associated registers. The remaining 89.7% of the population was enumerated via direct census questionnaires. Figure 1 illustrates this breakdown and compares it to New Zealand’s 2018 Census, which had a very similar composition of sources.

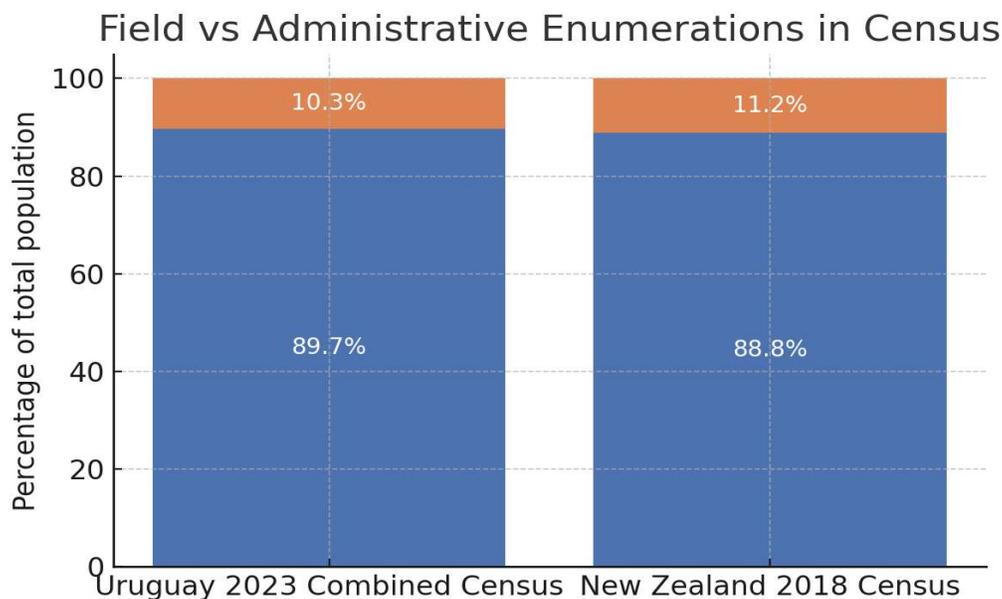


Figure 1: Proportion of population enumerated by traditional field methods vs. administrative registers in Uruguay’s 2023 Combined Census and New Zealand’s 2018 Census. In both cases, roughly 10–11% of the total count was contributed by administrative data (Uruguay: 10.3%; NZ: 11.2%), markedly reducing the undercount that would have occurred with field enumeration alone. Each bar is segmented into the percentage of people counted via census field operations (blue) and via administrative enumeration (orange).

Uruguay’s inclusion of 10.3% of the population through administrative records had a substantial impact on coverage, effectively closing the gap revealed by the post-enumeration survey. The ENEC and subsequent analysis indicated that the traditional field enumeration, despite best efforts, would have undercounted the population by around 10% due to non-response and omissions.

Thanks to administrative enumeration, the final census count matches the expected population size, meaning those missing 10% were successfully added back in. As a result, Uruguay avoided the scenario of an undercount and the consequent need for heavy adjustments. Notably, previous Uruguayan censuses (e.g., 2011) had to resort to imputing “synthetic people” into the data to compensate for non-response, without knowing their true characteristics. In 2011, thousands of individuals were statistically imputed to fill households that didn’t respond, inevitably introducing uncertainty and potential bias. By contrast, in 2023 zero individuals were imputed in the population count. Every person in the census dataset corresponds to a real individual, either enumerated directly or confirmed via administrative data. This is a landmark achievement: it demonstrates a shift from model-based adjustment to data-based completion of the census.

3.2 Bias reduction and data quality

The robustness of the 2023 Combined Census is further supported by a series of independent validation exercises documented in the methodological annexes of the Census Technical Report (INE, 2024e). These checks assess whether the population resulting from the integration of field and administrative enumeration is demographically and

geographically coherent, and whether the administrative additions correct the undercount without introducing new sources of bias.

First, omission patterns by sex and age were benchmarked against the Post-Enumeration Survey (ENEC), the primary external source for evaluating census coverage. The omission rates implicitly produced by the combined census—11.5% for men and 9.1% for women—are nearly identical to ENEC’s independent estimates of 11.2% and 9.4%, respectively. Moreover, the age profiles of omission in both sources closely match, with the combined census producing a smoother pattern due to its age-specific adjustments enabled by administrative enumeration. This close alignment confirms that the administrative additions corrected the field undercount in a statistically coherent manner and did not distort the demographic structure of the population.

Second, it was exploited the operational event of the web-based census to assess subnational omission. Roughly 17% of web codes could not be verified in the field, yet these dwellings were still geolocatable within small areas. Because the reasons behind non-verification (non-contact or absence of a field visit) mirror the mechanisms generating traditional census undercoverage, the incidence of unverified web codes provides indirect evidence of local omission. When analyzed, these rates were consistent with the omission patterns implied by the combined census, and aligned with an alternative estimation based on UTE electricity meter records. Both methods reinforced the credibility of the small-area population counts generated by the combined census.

A third validation exercise used long-term demographic reconstruction for 2012–2023. This analysis compares the census age structure with what would be expected from observed births, deaths, and migration. The reconstruction confirms that the levels observed in the 2023 Combined Census are fully compatible with independent demographic signals. Apparent irregularities at older ages are shown to stem from underestimation in earlier years rather than from the 2023 census, indicating that the combined census produced a demographically consistent age distribution when viewed over a decade-long horizon.

Finally, geographic validation was performed using three independent sources: (i) the non-verified web-code method, (ii) UTE-based estimates of occupied dwellings, and (iii) projections of locality-level populations derived from the 2011 census. The convergence of these approaches on results highly consistent with those produced by the combined census demonstrates that the administrative additions were correctly placed in the territorial hierarchy and that the resulting locality-level population estimates—which were unattainable in previous censuses—are reliable.

The geographic distribution of the population resulting from the combined census was therefore more accurate than would have been possible through field enumeration alone. In particular, in sparsely surveyed areas and among specific demographic groups, the incorporation of administrative data led to meaningful upward revisions of population counts. Preliminary analyses indicate that young adults (aged 20–34) accounted for a higher share of the administratively enumerated population than of the field-enumerated population, consistent with their comparatively lower response rates in traditional census operations. This pattern echoes findings from New Zealand’s 2018 census, where young

adults were both less likely to respond and less likely to be captured through high-quality administrative households, necessitating their inclusion through alternative enumeration strategies.

Overall, Uruguay’s combined census approach proved effective in mitigating undercount among groups that are typically harder to enumerate, such as young adults and highly mobile urban populations. By systematically recovering these groups through administrative registers, the census reduced distortions that might otherwise affect cohort-specific analyses and subnational population distributions, thereby strengthening the representativeness and analytical reliability of the final results.

Taken together, these validation exercises show that the combined census systematically reduces the biases of traditional enumeration by correcting undercoverage with real administrative information, while preserving the internal demographic and territorial coherence of the population count. The convergence of multiple independent methods provides strong evidence that the 2023 Combined Census achieves high data quality by international standards.

3.3 Comparison with New Zealand’s 2018 Census

Table 1 compares key features and outcomes of Uruguay 2023 and New Zealand 2018, highlighting their convergences and differences in implementing a combined census.

Both countries ultimately counted roughly 10–11 percent of their populations using administrative data, although the underlying contexts differed. In Uruguay, a register-based census pilot was deliberately planned and conducted in parallel with the traditional census, with specific resources allocated for this purpose from the outset. However, the use of administrative registers as a complementary source in the final population count was not initially foreseen; this decision was taken at a later stage of the census process. In this respect, Uruguay’s experience shares similarities with that of New Zealand, where administrative data were incorporated as a pragmatic response to lower-than-expected field response rates.

In both cases, the resulting methodologies align closely, pointing to a set of emerging best practices for combined censuses: the use of an integrated administrative resident population, stringent criteria for adding records, placement into households whenever possible, and the use of area-level counts when household assignment is not feasible.

New Zealand’s approach included “admin household enumerations” (placing admin people into known dwellings that had no response) and “admin meshblock enumerations” (counting people at area level when dwelling assignment was not possible). Uruguay followed an analogous strategy at the household level—adding children to their mother’s household using birth certificate data—as well as through area-level inclusions.

Both countries leveraged a rich data infrastructure. Stats NZ’s Integrated Data Infrastructure (IDI) provided the linked data environment for their census, while INE’s SIREE played that role in Uruguay.

An important commonality is the use of recent activity criteria to define who qualifies as a resident in admin data – Stats NZ used an “activity in the past 12/18 months” rule to construct its admin population (IDI-ERP), comparable to Uruguay’s “Signs of Life” model for current residency.

New Zealand’s long-standing Statistics Act and Privacy Act explicitly support combining data sources, whereas Uruguay navigated within a more general statistical law.

Ultimately, the outcomes were positive in both cases, with improved coverage and quality metrics as evidenced by subsequent evaluations. Table 1 summarizes these points.

Aspect/ Indicator	Uruguay 2023 Census	Combined	New Zealand 2018 Census
Initial census design	Traditional census, later <i>supplemented</i> with admin data when field response was insufficient. A parallel register-based census pilot was also run for evaluation.	later	Traditional census, later <i>supplemented</i> with admin data when field response was insufficient. Not originally planned as combined.
Legal authority for data use	Statistical Law 16,616 (1994) and amendments grant INE access to administrative microdata. 2021 law initiated building a national demographic register.	(1994)	Statistics Act 1975 and Privacy Act 1993 enabled linking admin data for statistics. Comprehensive data integration provisions existed pre-2018.
Unique identifier for linking	Yes – National ID number used universally; ~98% coverage among residents. Enabled deterministic linkage via SIREE.		No – various IDs (e.g., IRD tax, healthcare IDs) linked in Stats NZ’s IDI; created an IDI spine covering ~98% of population. Deterministic/probabilistic matching used.
Admin data sources used	Multi-source Statistical Population Register (SRRP) built from civil ID, birth/death registries, migration, education, health, social programs, etc.. “Signs of Life” activity model to confirm residency.		IDI-based Admin Resident Population (ERP) from linked tax, health, education, travel, benefits, etc.. Required recent activity in ≥2 admin sources to qualify as resident.
Administrative enumeration method	Added individuals not in field count: first into actual households (if evidence of relation/address); then formed admin households for non-responding dwellings; remaining people counted in area (EA/municipality) if no address. Residence index used to exclude likely emigrants.		Added individuals not in field count via two modes: Admin household enumerations – placing people into occupied dwellings that had no response (where admin records showed residents); Admin meshblock enumerations – counting people at meshblock (area) level when dwelling placement wasn’t reliable. Admin records derived from

Aspect/ Indicator	Uruguay 2023 Combined Census	New Zealand 2018 Combined Census
Percent of population from admin	10.3% of total count added via admin registers (89.7% from direct responses). No synthetic persons imputed.	IDI spine with activity criteria (to exclude deceased/emigrants). 11.2% of total count from admin data (about 3.0% in admin households, 7.6% in meshblock area counts). The other 88.8% from direct responses.
Post-enumeration adjustments	Coverage measured by post-census survey (ENEC); final counts adjusted by adding admin persons to meet estimated true population. Age-sex distribution taken from SRRP for precision. No traditional undercount adjustment needed beyond admin inclusion.	Coverage measured against demographic estimates and a partial PES. Final count includes admin additions and some statistical imputation for residual undercount. Still had an estimated net undercount (~2%) even after admin, due to unprecedented non-response (admin data mitigated but didn't fully close gap in 2018).
International context	First country in Americas to fully integrate admin registers for a national census count. Methodology heavily informed by NZ 2018, with support from UNSD and Statistics Norway. Seen as a model for countries without CPRs.	First combined census in Oceania; unusual internationally at the time (only example of admin adding in a census was Northern Ireland 2011). Provided a blueprint that Uruguay and others followed. Now cited in UNECE/UNSD guidelines for register-based censuses.

Table 1: Comparison of key features of Uruguay's 2023 Combined Census and New Zealand's 2018 Census. Both employed a hybrid approach of field enumeration plus administrative records, but under different initial conditions.

The above comparison underscores that Uruguay's strategy was not developed in isolation but stood on the shoulders of international experience. By the time of census, all systems were in place to implement the combined methodology, and the execution went largely as planned. Minor challenges did arise – for example, reconciling differences between a person's address in the census versus in administrative sources (Uruguay found an overwhelmingly high match rate, but any mismatches had to be resolved by predefined rules). Also, communicating to the public and data users that the census count includes people coming from administrative registers required careful explanation to avoid confusion. INE addressed this with a transparent documentation and communication campaign, emphasizing that using real administrative data is superior to “guessing” and that the rights and privacy of individuals were respected throughout.

The combined census methodology implemented in the 2023 Census has been internationally recognized as an example of good practice. The next section discusses the implications of Uruguay's achievement and how it can inform census-taking in other countries.

4. Discussion

Uruguay's successful execution of a combined census in 2023 holds important lessons for the international statistical community, especially for countries seeking to modernize their censuses in the absence of a central population register. The experience demonstrates that with the right preconditions and innovative methods, a hybrid census model can significantly improve coverage and data quality, even in a middle-income country context. Several key themes emerge from this case.

4.1 Necessary conditions for a combined census

Uruguay's case confirms that certain institutional, legal, and technical ingredients are indispensable. On the institutional side, strong leadership by the NSO (INE) and a strategic vision were crucial – the decision to invest in building the SRRP and SIREE years before the census was visionary. Furthermore, INE cultivated partnerships (e.g., the MoU with Statistics Norway for knowledge exchange) and participated in international collaboratives on administrative data use, which helped it leapfrog methodological hurdles.

Legally, having a mandate to access and use administrative data is non-negotiable. While Uruguay's laws did not explicitly foresee a register-based census, they were flexible enough to allow it. The UNSD peer review recommended that Uruguay strengthen its legal framework further – for example, by explicitly legislating the conduct of combined or register-based censuses and embedding provisions for data protection and inter-agency cooperation. Such legal clarity would institutionalize the gains made and ensure sustainability (so that future censuses can build on 2023 without legal ambiguity).

Technically, the existence of unique identifiers and integrated databases was a linchpin. Countries attempting this without a high-coverage personal ID system would likely struggle; Uruguay's near-universal ID and the integration of data via the SIAS and SIREE platforms were fundamental enablers.

Also, the development of a national address register (SuDir) proved extremely valuable – it is a reminder that register-based census approaches require not just people registers, but also robust address and dwelling registers. Uruguay recognized this and synchronized the update of its address database with the census operation, yielding long-term benefits for both statistics and public administration.

4.2 Innovation in methodology

Uruguay's adoption of the "Signs of Life" concept (INE, 2024; Moss & Dubourdieu, 2025) and administrative residence construction are standout innovations that can guide other nations lacking a centralized population register. These methods essentially simulate the functions of a population register through multi-source triangulation. The "Signs of Life" approach shows that it is possible to statistically infer current residency status in the absence of formal deregistration of emigrants. By compiling recent administrative transactions, NSOs can create a dynamic residency index. This is replicable wherever digital footprints exist (tax filings, phone usage, school enrollment, etc.), and it can drastically improve the value of population data.

These innovations underscore a broader point. Even without a single comprehensive register, a system of registers can be orchestrated to achieve similar outcomes. Uruguay's experience validates the concept outlined in recent international guidelines that a "multiple source" register-based census is feasible with sufficient data integration and quality checks (UNECE, 2018; UNSD, 2023; CEPAL, 2024).

4.3 Data quality and bias considerations

A combined census must balance the goal of maximal coverage with the imperative of accuracy. Uruguay's guiding principles – favor inclusion at household level when possible, require strong evidence for any addition that alters a household, and accept area-level inclusion if that improves overall counts – can serve as a quality framework for others.

The outcome in Uruguay was that biases were reduced, not increased, by admin data (INE 2024e). This addresses a prior skepticism in some statistical circles that mixing sources might "muddy" the census. New Zealand's post-2018 evaluations and Uruguay's results both indicate that if done carefully, the opposite is true. Leveraging administrative records can fill in the blind spots of field enumeration and yield a more faithful representation of the population.

One reason is that high-quality registers (e.g., vital stats for age/sex, or school enrollment for children) provide accurate data that can even correct errors from field responses. For example, if a respondent misreported the age of a household member, an administrative birth date can fix that. Uruguay also minimized proxy response errors and recall bias by later integrating official data.

The UNSD review of the Uruguayan experience highlighted the importance of continued validation studies – for instance, comparing socio-economic variables from the admin-based pilot with the traditional census. Indeed, Uruguay found that while core demographic registers are strong, some socio-economic information in administrative sources (like highest education level, or certain employment details) may not yet be fully aligned or complete. For the 2023 combined census, this was mitigated by still collecting those variables in the field. Going forward, closing those gaps (e.g., adding additional variables from admin sources) will be key to moving toward a more fully register-based census by the next round.

4.4 International cooperation and knowledge transfer

Uruguay's census exemplifies how global cooperation can accelerate innovation. From the initial inspiration drawn from New Zealand's experience to the hands-on peer review by Norway's Statistics Bureau, Uruguay benefited from the peer-to-peer learning model. Organizations like UNSD facilitated this by convening a collaborative on use of administrative data where countries share experiences. One tangible outcome was the peer review mission by Statistics Norway in late 2023, which provided Uruguay with an external assessment of its register-based census pilot and recommendations for improvement.

Such exchanges build confidence and create a repository of methodological solutions that others can tap into. As more countries conduct combined or register-based censuses (several in Europe, plus Canada and the US experimenting in 2020, etc.), a body of

comparative evidence is emerging. Uruguay has now joined that vanguard. It is telling that UNSD in its feedback called Uruguay’s approach “groundbreaking” in the region and suggested that it “holds potential for enhancing accuracy and timeliness of population statistics” broadly.

In turn, Uruguay’s lessons will inform forthcoming guidelines and may inspire similar pilots in other Latin American countries that have decent administrative data but no CPR. The case also underscores the value of south-south and north-south cooperation. Uruguay learned from both advanced register countries (Nordics, New Zealand) and shared insights with peers in the region who observed its process.

This dynamic of knowledge exchange was further consolidated through the *International Workshop on Register-Based Censuses*, jointly organized by Uruguay with the United Nations Population Fund (UNFPA), the Population Division of ECLAC (CELADE), and the United Nations Statistics Division (UNSD). The workshop positioned Uruguay as a regional reference in census modernization, providing a concrete platform through which the country both deepened its learning from countries with advanced register-based systems—such as the Nordic countries and New Zealand—and shared its own experience and methodological innovations with national statistical offices across Latin America and the Caribbean that engaged directly with the Uruguayan census process.

4.5 Public trust and transparency

An often understated aspect of such innovation is the need to actively maintain public trust. In Uruguay’s case, transparency was treated as a core principle rather than an afterthought. INE published extensive methodological documentation (INE 2024, 2024b, 2024c, 2024d, 2024e) and made the final microdata available with source flags, allowing researchers to identify which records originated from which data source. This level of openness is essential for dispelling misconceptions—such as the notion that individuals added through administrative sources might be somehow “less real” or less accurately counted—and it laid the groundwork for broader institutional and public confidence in the census process. The public’s primary concerns were that the census be accurate and that privacy be respected, both of which were explicitly addressed. Uruguay’s approach ensured that no personal information was misused. Data sharing was strictly limited to statistical purposes and governed by the confidentiality provisions of the statistical law.

Institutional oversight also played a key role in reinforcing credibility. The National Census Commission—composed of leading professionals from relevant fields—accompanied the census process from start to finish and formally endorsed the methodology implemented. Its involvement provided an additional layer of assurance that the innovative approaches adopted were subject to rigorous professional scrutiny and aligned with established statistical standards.

At the same time, the United Nations Population Fund (UNFPA) provided continuous technical assistance throughout the census project, supporting INE in the design and validation of its methodological choices. This international backing not only strengthened the technical robustness of the operation but also helped situate Uruguay’s census within globally recognized best practices, further bolstering public and institutional confidence.

Building on this foundation of transparency, institutional oversight, and international technical support, further efforts were directed toward sustaining and deepening public trust. The UNSD review recommended additional measures, such as engaging independent privacy experts or establishing an ethics committee, alongside continued communication of the tangible benefits of the new approach (for example, fewer household visits and more timely, policy-relevant data). As Uruguay moves toward potential future stages involving even greater use of administrative registers, preserving and strengthening trust will be critical, particularly given the heightened sensitivity such approaches may raise. Uruguay's successful delivery on its census commitments thus represents a significant step in consolidating public confidence in this emerging census paradigm.

4.6 Looking ahead – toward 2030 and beyond

With the 2023 combined census under its belt, Uruguay is poised to further increase the role of administrative data. The experience and infrastructure can now be used for annual population updates, something Statistics Norway noted in its review – that Uruguay could potentially generate census-like statistics on a regular basis using the system it built.

For the 2030 round, a plausible scenario is a fully combined census where only essential socio-economic questions are collected by survey, and all basic demographic counts come from the registers. This hybrid approach (sometimes termed a “register-assisted census” or a “rolling census”) would reduce fieldwork costs and respondent burden while still providing rich data. Uruguay will, however, need to address the remaining data gaps: for example, improving registers for education, employment, and housing characteristics that were identified as incomplete.

The ongoing project to establish a Demographic Register via AGESIC will also be critical. If that system successfully gets citizens and institutions to regularly update addresses online, by 2030 Uruguay might have near-real-time residency information. Ensuring higher frequency address updates (potentially making it mandatory to report address changes) was a recommendation to further enhance register quality.

From a global perspective, Uruguay's 2023 census can be seen as a proof of concept that countries with moderately developed administrative data ecosystems can achieve what was once thought possible only in nations with decades-old CPRs. It validates the approach advocated in recent literature on “register-based censuses without a population register” (UNSD, 2022).

This doesn't mean every country can or should immediately do the same – there are prerequisites in data infrastructure and governance that not all have. But it provides a template. Invest in linking existing registers, enact supportive laws, start with combined methods to build experience, and iterate toward a full register-based model.

Middle-income countries with strong digital governance (e.g., some in Latin America, Eastern Europe, or Asia) are well positioned to follow Uruguay's lead. The replicability of Uruguay's success lies in its methodical approach. Incremental pilots, parallel running of a traditional and register-based census for comparison, and the gradual trust built in the system's outputs.

5. Conclusions

In line with the mandates of the Statistical Conference of the Americas of ECLAC (CEPAL, 2024), Uruguay's 2023 Combined Census provides concrete evidence of how administrative records can be effectively integrated into population and housing censuses to improve coverage and data quality.

The experience demonstrates that combined census approaches—merging traditional enumeration with administrative data—and, potentially, fully register-based censuses are viable and advantageous even in the absence of a central population register. By systematically leveraging administrative records as a core statistical resource, Uruguay not only addressed non-response and coverage gaps but also set a practical benchmark for census modernization in the region, illustrating how international recommendations can be operationalized through robust institutional, legal, and technical frameworks.

Uruguay's 2023 Combined Census stands as a scientifically rigorous and innovative endeavor that has pushed the frontier of census methodology. By achieving a complete count through the marriage of survey and register data, Uruguay improved accuracy, saved costs on extensive follow-up, and set itself on a path toward a future of fully register-based censuses. The experience underscores that the absence of a monolithic population register is not an insurmountable barrier – inventive use of multiple data sources can compensate, provided there is institutional commitment and technical expertise.

As statistical agencies worldwide grapple with census challenges, the Uruguayan case offers a valuable blueprint. It illustrates the importance of robust data integration frameworks (such as SIREE), sound legal underpinnings for data access, advanced modeling techniques like “Signs of Life” to ensure data validity, and an unwavering focus on quality and transparency.

In a broader sense, Uruguay has contributed to the ongoing paradigm shift in census-taking from the traditional decennial headcount to a continuous data-driven model. The replicability of this approach is evidenced by its foundation in principles that are universally applicable (unique IDs, record linkage, incremental inclusion, etc.), and by the positive peer validation it received internationally.

Uruguay's census of 2023 not only enriched the country's own data arsenal but also provided a real-world example of how to bridge the gap between traditional and register-based censuses, providing an example for many other countries on the horizon of their census modernization journey.

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