E-DEMOGRAPHY AS A PLATFORM FOR POPULATION DATA ANALYSIS: A CONCEPTUAL REVIEW AND THE CASE OF AZERBAIJAN

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Abstract

Electronic demography (e-demography) refers to the application of digital technologies and big data in demographic research and population-related decision-making. This study explores the concept, importance, and evolution of e-demography through a comprehensive review of the literature and a comparative assessment of international practices. Particular emphasis is placed on the role of government registers in the development of e-demography systems and the implementation of digital platforms. The study presents Azerbaijan as a practical context by briefly describing the population register and the Azerbaijan Service and Assessment Network (ASAN) Service digital platform as enabling components for e-demography-oriented applications. In addition, the study discusses how e-demography complements classical demographic infrastructure (including vital statistics) and it outlines key challenges and opportunities, such as data quality, interoperability, privacy protection, and institutional capacity. The results highlight the role of digital transformation in demographic management and underscore the potential of global best practices to inform the development of e-demography in Azerbaijan. Implications include enhancing e-government service quality, increasing citizen satisfaction, and improving oversight of socio-political processes. Future research will focus on expanding socio-demographic analyses and applying advanced analytical methods.

Keywords: Electronic demography, Population register, Government registers, Big data, Digital footprints, Artificial intelligence, Machine learning, Internet of Things, ASAN Service

Demografie, 2026, **68(1): 42–51**

DOI: https://doi.org/10.54694/dem.0375

INTRODUCTION

The rapid advancement of information and communication technologies has driven digital transformation across socio-economic domains, profoundly influencing both the field of demography and the practice of population governance. This study is structured as a review, synthesising current literature and international practices related to e-demography and digital population governance. Traditionally, demographic research relied on large-scale data sources such as censuses, civil registration records, and surveys. However, in recent decades, the digitalisation of society has generated unprecedented volumes of digital data about people's activities and the traces of those activities. In this context, the concept of electronic demography (e-demography)

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has emerged to denote the integration of digital data and technologies into the study of demographic processes and into the decision-making on population management. In this study, the term "e-demography system" refers to an integrated socio-technical arrangement in which digital data sources (for example, registers and platforms) are linked with analytical methods to support demographic monitoring and policy-oriented decision-making.

In classical demography, researchers have long utilised big datasets, censuses, and registration systems containing millions of individual records. In the digital age, the notion of big data encompasses diverse, high-velocity, real-time data streams. Demographers can now harness new-generation data sources such as users' digital footprints (for example, social media activity, mobile phone location data) (*Kashyap*, 2021). Alongside these novel data, the application of advanced analytical methods and computational technologies has given rise to a subfield often termed computational or digital demography. *Kashyap and Zagheni* (2023) note that e-demography investigates how emerging digital data streams and computational techniques contribute to understanding population dynamics, while concurrently examining the effects of digital technologies on demographic outcomes such as health, fertility, and migration. This development expands the boundaries of demographic science, enabling more timely and comprehensive information to inform policy decisions.

The importance of e-demography is underscored by modern governments' need for timely and accurate data to develop sustainable demographic policies. Trends such as population ageing, migration flows, urbanisation, and fertility rates evolve rapidly, and traditional decennial census data may prove insufficiently responsive. In this regard, integrating state information resources and establishing real-time statistical monitoring systems are essential for informed demographic policymaking. E-demography addresses this requirement by merging data from multiple government registers, digital platforms, and alternative sources, thus facilitating operational analytical assessments of the current population status, trend dynamics, and forecasts. Consequently, the e-demography paradigm has crystallised in response to the digital revolution within the demographic data ecosystem and has assumed a critical role in both academic research and governmental decision-making practice. Finally, since not all countries operate population registers, classical demographic infrastructure, particularly civil registration and vital statistics, remains a foundational component of demographic measurement and should be considered alongside newer digital data sources.

This article addresses key issues in e-demography, integrating conceptual, infrastructural, operational, and technological perspectives. Section 2 reviews conceptual frameworks and international practices. Section 3 examines population registers as data sources; Section 4 illustrates the realization of ASAN Service in Azerbaijan; Section 5 explores technological advances such as AI, machine learning, remote sensing, and IoT; and Section 6 discusses challenges and opportunities for building robust, ethical, and sustainable e-demography systems.

CONCEPTUAL FRAMEWORKS AND INTERNATIONAL PRACTICES IN E-DEMOGRAPHY SYSTEMS

Recent studies in e-demography indicate that the discipline of demography has undergone a profound transformation under the influence of the big data era (*Poulain – Herm*, 2013; *Cesare et al.*, 2018; *Alguliyev et al.*, 2019; *Yusifov*, 2021; *Kashyap – Zagheni*, 2023; *Civelek*, 2023). This section synthesises key scholarly perspectives on e-demography and reviews selected international practices in digital demographic data systems relevant to population governance. *Kashyap* (2021) observes that although demographers have traditionally been accustomed to handling large-scale datasets, the proliferation of digital data generated by a digitising society not only creates new opportunities but also poses ethical and technical challenges. The study highlights two primary shifts in the data ecosystem: first, the enhancement and increased interoperability of traditional data sources (censuses, surveys, administrative registries); and second, the incorporation of digital footprints arising from internet and mobile device usage into research (*Kashyap*, 2021). In this context, *Cesare et al.* (2018) argue that digital traces of online activities (for example, social media posts, search queries) are

attractive data sources for the real-time monitoring of demographic processes. However, they caution that issues of privacy, representativeness, and data quality must be carefully addressed, noting that digital traces cover only internet users and thus may under-represent certain social groups (*Cesare et al.*, 2018). *Yusifov* (2021) proposes a conceptual model for an e-demography system in Azerbaijan that is based on public registers, emphasising the use of personal identification numbers to integrate individual-level data. Leveraging these administrative data sources can significantly enhance demographic research by enabling more detailed analyses of population characteristics. *Kashyap and Zagheni* (2023) propose integrating policy-oriented simulation models into e-demographic research. By generating "synthetic populations" through agent-based models and microsimulation techniques, they explore the potential to virtually assess the demographic impacts of social policies. Importantly, these simulation-based synthetic populations are typically used for scenario testing and require calibration/validation against empirical demographic data; they are no substitute for real-world measurement. Such approaches permit the pre-evaluation of long-term outcomes for policies aimed at, for example, stimulating population growth or strengthening social protections for the elderly (*Kashyap – Zagheni*, 2023). Additional studies support this paradigm. *Juranek and Zoutman* (2021) utilised mobile phone data to assess the effects of social restrictions during the pandemic, while *Wilde et al.* (2020) attempted to forecast US birth rates using Google search queries. Similarly, *Zagheni et al.* (2019) proposed statistical correction models to track migrant flows via social media advertising platforms (*Zagheni et al.*, 2019; *Wilde et al.*, 2020; *Juranek – Zoutman*, 2021).

Nevertheless, literature reviews reveal that demographers have not reached a full consensus regarding big data. *Wunsch et al.* (2024), in a systematic analysis, found that researchers generally prefer official and statistical sources, treating non-traditional digital data with caution. This reluctance stems partly from methodological challenges in establishing causal inferences and partly from insufficient ethical and legal regulations (*Wunsch et al.*, 2024). This debate also highlights a practical point: population registers are not universal, and many countries continue to rely primarily on civil registration and vital statistics alongside other official sources. These theoretical and methodological perspectives are reflected in the practical models adopted by many countries. In Europe, the transition to digital demographic management systems is widespread. Scandinavian nations like Denmark and Sweden have, for many years, conducted population enumeration entirely through administrative registers, providing researchers with high quality, linkable datasets (*United Nations Statistics Division*, 2019; *Juranek – Zoutman*, 2021). Estonia's X-Road platform integrates state information systems and automates data exchange among institutions; by linking register data via unique citizen identifiers, it has enhanced the efficiency and transparency of e-services and even enabled cross-border data sharing with Finland (*Vassil*, 2016; *OECD*, 2021). Guided by recommendations from the United Nations Statistical Commission, countries are urged to modernise demographic data systems through "digital-first" strategies, multi-channel data collection methods (such as mobile applications, telephone surveys, e-forms), and the integration of geographic information systems. Such initiatives will lay the groundwork for more agile, accurate, and comparable demographic statistics in the future (*United Nations Statistical Commission*, 2025). *Weber and State* (2017) define "digital demography", showing how digital trace data can complement surveys/censuses to yield timelier, granular indicators. They also caution about selection bias and privacy, urging triangulation with official statistics (*Weber – State*, 2017).

In recent years, e-demography has emerged as a pivotal approach for analysing population dynamics through the integration of digital data sources and computational methods. The development of e-demography systems has been driven by the expansion of population registers, administrative databases, and other electronic records. These systems provide more timely, detailed, and comprehensive demographic analyses, thereby supporting evidence-based policy and planning. Looking forward, e-demography is expected to advance further through the incorporation of big data, artificial intelligence (AI), and real-time analytics. Such innovations will enhance the capacity of governments and researchers

to monitor population trends, evaluate social outcomes, and deliver personalised public services.

POPULATION REGISTERS AS DATA SOURCES FOR E-DEMOGRAPHY SYSTEMS

The primary data backbone of an e-demography system is constituted by government information resources, notably the national population register. According to the *United Nations Statistics Division* (2019), a national population register is an individualised information system that ensures the continuous and coherent recording of selected data for each member of a country's permanent population. Such a register operates on the principle of regularly updating the central database with all demographic events such as births, deaths, marriages, divorces, and changes of residence, thereby enabling real-time access to accurate population counts and structures. In practice, the reliability of register-based systems is closely linked to the strength of civil registration and vital statistics (CRVS), because many core demographic events enter the register through civil-status registration mechanisms.

Primarily, the population register serves to provide reliable information for governmental management and planning purposes. For instance, register data are indispensable for budget allocation, taxation, insurance, social protection, healthcare, education, electoral administration, military conscription, and other routine administrative functions. Furthermore, a comprehensive population register enables rapid and precise identification of citizens (in accordance with the "single window" principle). Experts note that the continuous administrative use of the register also enhances its data quality: daily usage facilitates the prompt detection and correction of errors, thereby establishing a robust statistical foundation (*United Nations Statistics Division*, 2019).

Within the e-demography framework, government registers are integrated not only for administrative objectives but also for statistical analysis. Whereas traditional censuses collected data once every decade, modern population registers allow demographic indicators to be updated with near real-time precision. This capability constitutes a revolutionary advance for agile monitoring of demographic processes and short-term forecasting. It is also important to distinguish the integration of data sources (registers and platforms) from the subsequent statistical evaluation and modelling that may be applied to the integrated data. For example, the Scandinavian experience demonstrates that the coordinated expansion and linkage of individual registration records over many years have provided demographers with unparalleled advantages. *Lyngstad and Skardhamar* (2011) emphasise that demographers in Norway, Sweden, and Denmark benefit most from possessing linked, individual-level demographic databases. Such integrated systems underpin the long-term tracking of demographic trends, cohort analyses, precise measurement of migration flows, and other complex investigations. Similarly, efforts in Belgium and the Netherlands to merge various administrative registers with census data have significantly expanded demographic analysis capabilities (*Lyngstad – Skardhamar*, 2011). These linked registries can be treated as "data sources" that enable particular methodological choices (for example, record linkage, cohort analysis, forecasting, and other computational approaches), which are discussed in the methods-focused sections of this paper.

In the context of Azerbaijan, the integration of government registers is likewise regarded as foundational to e-demography. The Presidential Decree issued in 2004 on the establishment of the "State Population Register of the Republic of Azerbaijan" initiated the creation of a unified population information system. Under the Ministry of Justice's oversight, technological infrastructure was developed to link existing databases across government agencies and to ensure rapid access to necessary information. A central register was established, containing core identification data for all citizens and legal permanent residents – such as full names, patronymics, and dates and places of birth. This central database is updated daily with inputs from sectoral registers (birth and death records, marriage registrations, migration records, etc.). Because population registers are not universal internationally, this national approach can be interpreted as one possible model of e-demography infrastructure rather than a universal prerequisite.

As a result, Azerbaijan's unified population register not only facilitates the "single window" provision of diverse state services but also enables the operational generation of demographic statistics. To date, nearly 17 million archival civil-status records have been digitised and incorporated into the register, and relevant agencies have been equipped with hardware and software to support real-time data transmission. These initiatives constitute the fundamental infrastructure of the national e-demography system. Conceptual studies emphasise that Azerbaijan's e-demography platform must be built upon the unified government population register and that all electronic government registers should integrate into this central framework. Such an approach is strategically vital to ensure that the e-demography system is supplied with reliable and comprehensive data and to facilitate the coordination of demographic information across diverse e-government services. Furthermore, the rapid development of e-government and digital transformations in public administration profoundly influences government–citizen interactions and highlights the importance of providing personalised services (*Yusifov*, 2025). A dedicated section later in the study will provide a brief, structured description of the population register and associated digital platforms as practical enablers for e-demography in Azerbaijan.

REALISATION OF THE ASAN SERVICE BASED ON POPULATION REGISTERS

A practical e-demography framework typically depends on two mutually reinforcing components: (i) authoritative administrative registers that store legally validated demographic attributes and continuously updated life events; and (ii) digital public service platforms that operationalise these registries in citizen–state interaction while generating process information useful for monitoring accessibility and service quality. In this sense, e-demography should be understood not only as the availability of "more data", but as the emergence of an integrated socio-technical setting where data infrastructures and institutional arrangements enable more timely population governance (*Weber – State*, 2017; *Kashyap*, 2021). The Azerbaijani case is relevant for review-based discussion because the country has pursued (a) a unified population register and (b) a standardised one-stop public service model through the Azerbaijan Service and Assessment Network (ASAN), both of which can support e-demography-oriented applications when used with appropriate safeguards.

International statistical guidance defines a population register as an individualised information system that continuously records selected attributes for members of a country's usual resident population and is regularly updated through demographic events, including births, deaths, marriages, divorces, and changes of residence (*United Nations Statistics Division*, 2019). Such systems are not merely technical databases; they function as a governance instrument supporting administrative planning and, under certain conditions, the production of demographic statistics. A register's demographic value emerges from (i) continuity of updates, (ii) standardised definitions, and (iii) the possibility of controlled linkage across domains (*United Nations Statistics Division*, 2019). At the same time, register-based approaches do not eliminate the need for civil registration and vital statistics (CRVS); rather, high-quality CRVS remains essential because it provides the primary institutional channel through which vital events become recorded, validated, and suitable for statistical use (*United Nations Statistics Division*, 2019). This point is also consistent with broader debates in digital demography: even where digital systems expand data availability, the quality of inference depends on coverage, definitions, and governance rules (*Cesare et al.*, 2018; *Wunsch et al.*, 2024).

In Azerbaijan, the creation of a unified population register was initiated through a presidential decision in 2004 that set the direction for establishing a state register of the population and organising inter-agency coordination for population information management (*Presidential Decree of the Republic of Azerbaijan*, 2004). In the Azerbaijani context, digitisation efforts and inter-agency connectivity are also emphasised in national-level discussions on strengthening electronic governance and demographic information systems, where the population register is treated as a central infrastructure for consolidating demographic information and supporting state services (*Alguliyev et al.*, 2019; *Yusifov*, 2021; *Yusifov – Akhundova*, 2022).

A second practical component in Azerbaijan's digital governance landscape is the ASAN Service, established by presidential decree in 2012 as a one-stop model for delivering public services, with objectives centred on improving service coordination, standardisation, transparency, and citizen satisfaction (ASAN Service). While a population register primarily supports the authoritative recording of demographic attributes and events, a service platform such as ASAN represents the operational interface through which citizens access state services and through which the state can observe patterns of service demand and access barriers. This is relevant for e-demography because demographic governance increasingly depends on understanding not only population structure, but also the accessibility and usability of public services across demographic groups especially in contexts where digital transformation is expected to reduce administrative burden and improve inclusion (*Weber – State*, 2017; *Kashyap*, 2021).

Overall, Azerbaijan's population register and the ASAN Service can be presented as practical enablers that illustrate how digital governance infrastructures may support e-demography. In review terms, the key contribution is not an "analysis result", but a structured interpretation of how register-based infrastructures and service platforms can enhance timeliness, coordination, and policy relevance, while requiring explicit methodological discipline and governance safeguards consistent with international guidance and the broader digital demography literature (*United Nations Statistics Division*, 2019; *Kashyap – Zagheni*, 2023).

TECHNOLOGICAL ADVANCES AND ANALYTICAL METHODS IN E-DEMOGRAPHY

E-demography involves not only the digitisation of administrative registries but also the full exploitation of capabilities offered by modern information technologies. Within the e-demography paradigm, the concept of big data is characterised by multiple "V" attributes, including volume, velocity, variety, variability, and visualisation capability (*Nabibayova*, 2021). These attributes demand novel approaches to the collection and processing of demographic data that differ fundamentally from traditional methods.

In recent years, artificial intelligence (AI) and machine learning (ML) algorithms have become indispensable tools for analysing large-scale demographic datasets. For example, clustering techniques (for example, k-means) are employed to uncover latent patterns in high-volume data, thereby enabling segmentation of population subgroups according to shared characteristics (*Yusifov – Akhundova*, 2021). Although methods such as k-means have long been part of established statistical toolkits, their value in e-demography is strengthened when integrated datasets and high-frequency digital sources enable more granular and timely segmentation. Such segmentation allows researchers to examine factors influencing demographic processes within distinct cohorts (for instance, fertility behaviour among different income brackets or migration trends across various regions). Other ML applications include predictive modelling: beyond conventional statistical regression, more sophisticated forecasting models are built using artificial neural networks. In particular, deep learning methods confer unique advantages in extracting actionable insights from unstructured big data.

One of the most compelling applications of deep learning in contemporary demography is population estimation through remote sensing and satellite imagery. Because traditional censuses occur at multi-year intervals, producing an accurate settlement map between enumeration points is challenging. However, by applying deep learning models to high-resolution satellite images and geospatial data, researchers have demonstrated the feasibility of an "alternative census". For instance, *Neal et al.* (2022) applied representation learning algorithms to satellite imagery over Mozambique and generated highly accurate population density maps without reliance on an official census. Their results matched the precision of leading global datasets such as WorldPop and Facebook's High Resolution Settlement Layer (HRSL). These models infer population counts and habitation extents from automatically detected features, such as building footprints, nighttime illumination, and road networks, in satellite imagery. Thus, deep learning algorithms integrate geographic information with demographic

statistics to support the creation of continuously updated population databases. Nevertheless, such approaches should be interpreted as complementary tools that require careful validation against official demographic sources and well-defined quality criteria.

The Internet of Things (IoT) technologies also hold significant promise for digital demography. IoT generally denotes the real-time collection of data from various sensors, smart devices, and internet-connected equipment. Within a demographic context, IoT applications span several domains. In urban environments, deployed sensors (for example, smart cameras, traffic counters, mobile-phone towers) enable the monitoring of population mobility and urban flows. Under the Smart City framework, data collected from these devices can quantify the number of individuals in a given area at different times and track their movements, thereby contributing to the real-time monitoring of migration and urbanisation processes. Moreover, wearable devices (fitness trackers, smartwatches) produce large volumes of health and physical activity data that serve as valuable demographic indicators of population well-being. Data from such devices can be aggregated to derive statistics on community-level physical activity, sleep patterns, and cardiovascular metrics, disaggregated by geographical area and age cohort (*Zaman et al.*, 2024). Consequently, the rich datasets harvested from IoT devices enhance demographic analyses, enabling more informed decision-making in public health, transportation planning, and emergency preparedness. As with other digital traces, the interpretability of IoT-derived indicators depends on coverage, representativeness, privacy safeguards, and appropriate aggregation.

DEVELOPING AN E-DEMOGRAPHY SYSTEM: CHALLENGES AND OPPORTUNITIES

One of the principal advantages of the e-demography approach is its ability to ensure the timeliness and responsiveness of demographic data. Unlike the traditional census model, e-demography can support more frequently updated statistics in near real time, depending on the underlying data infrastructure and reporting mechanisms. This capability allows changes in population size and composition (births, deaths, migration, etc.) to be monitored on an annual, monthly, or even daily basis. For example, a system built upon a national population register and supported by strong civil registration and vital statistics (CRVS) can compute indicators such as annual population growth rate, components of natural increase, and migration balance on a monthly schedule (*United Nations Statistics Division*, 2019). Such agility enables governments to implement adaptive demographic policies as issues and trends arise, eliminating reliance on data that are years out of date (*Cesare et al.*, 2018).

Another strength of e-demography lies in its high level of data granularity. Because population registers and integrated digital sources contain individual-level records, analyses can be easily disaggregated by any demographic subgroup (age, sex, region, socio-economic status, etc.). This permits more nuanced examinations of demographic heterogeneity – for instance, calculating birth rates among young families in a specific city or net migration flows in a particular district rather than relying on national averages. By integrating multiple data sources, e-demography systems also facilitate multifactorial analyses of demographic processes. In addition to conventional demographic metrics (births, deaths, marriages, divorces, migration), socio-economic indicators such as educational attainment, income level, health status, and employment can be combined on a single platform, yielding a richer understanding of the causes and consequences of demographic change, which in turn supports evidence-based decision-making (*Alburez-Gutierrez et al.*, 2019). However, since not all countries maintain population registers, e-demography applications must also be framed in relation to classical sources, especially CRVS, censuses, and surveys depending on national statistical capacity (*United Nations Statistics Division*, 2019).

E-demography also eliminates redundancy and enhances efficiency: rather than multiple agencies collecting the same data independently, all government bodies can draw from a single register, reducing the need to request identical information from citizens multiple times. Finally, digital platforms improve the visualisation (interactive maps, dashboards) and dissemination of data, raising public awareness

and creating open data resources for researchers (*Alburez-Gutierrez et al.*, 2019). In such cases, transparency and dissemination should be balanced with privacy protection through aggregation and appropriate governance safeguards (*Cesare et al.*, 2018).

Despite these significant benefits, e-demography faces several challenges. The foremost concern is privacy and data security. Population registers and integrated demographic databases contain sensitive personal information on every citizen. Protecting these data against unauthorised access and misuse requires robust cybersecurity measures and comprehensive legal frameworks. Public scepticism may arise when governments collect personal data at scale, making it imperative to communicate the system's benefits and build public trust (*Civelek*, 2023).

Second, data quality and completeness can pose problems. If a birth or death notification is not reported to the register, or if a migrating individual fails to deregister, gaps will emerge in the register data, undermining statistical accuracy. Therefore, the legal and administrative procedures governing data submission must be rigorously enforced, and all relevant agencies must treat data provision as a high priority (*Civelek*, 2023). Routine quality checks and reconciliation with official vital statistics can strengthen consistency and reduce coverage errors (*United Nations Statistics Division*, 2019).

Third, technological integration challenges may arise. Information systems used by different government agencies may lack interoperability, and data formats may vary. Building an e-demography system often requires updating existing infrastructure and implementing interoperability standards, which entails significant time and financial investment. Fourth, there may be a shortage of skilled personnel: specialists such as data scientists and demographic statisticians who can work effectively with big data and AI/ML technologies are essential to ensure that collected data are analysed productively. Without such expertise, even the most advanced technologies may fail to realise their full potential (*Bosco et al.*, 2022).

Methodological challenges are also notable. New digital data sources may not fully represent the entire population; for example, elderly cohorts who use the internet infrequently leave fewer digital traces. This introduces potential bias in big data analyses, and results must be generalised with caution (*Cesare et al.*, 2018). At the same time, algorithmic transparency becomes a concern: complex "black-box" ML models may produce predictions that are difficult to interpret. For demographic policymaking, the explainability of forecasting models is crucial, so that decision-makers can understand the basis of the model's outputs (*Civelek*, 2023). Accordingly, triangulation with official statistics (for example, CRVS, censuses, and surveys) is recommended to improve validity and interpretability (*Weber – State*, 2017). Finally, the lack of international standardisation presents a challenge. As countries develop disparate systems, the comparability of their statistics becomes problematic. Accordingly, methodological guidelines, harmonised definitions, and measurement standards should be established under the auspices of international organisations (*Bosco et al.*, 2022).

Despite these challenges, the benefits of e-demography can outweigh its difficulties when the obstacles are addressed through appropriate legal, technical, and governance measures, and when public support is secured, thereby enabling the full potential of e-demography.

CONCLUSION

This study demonstrates that, within an e-government context, national population registers provide new opportunities for conducting in-depth demographic research. Consequently, the establishment of an e-demography system based on a central population register is essential for the effective management of demographic processes, the analysis of demographic behaviours, and the execution of related research. We reviewed international best practices for developing e-demography systems and analysed research on the operational performance of unified registers. In addition, the Azerbaijani case was discussed as a practical context by outlining the population register and the ASAN Service model as enabling components for e-demography-oriented applications. Note that digital transformation has revitalised the use of both statistical methods and administrative data sources, such as electronic registers, in demographic research. However,

the validity of e-demography applications depends on clear separation between the integration/collection of data and subsequent statistical evaluation and modelling, as well as on data quality, representativeness, and governance safeguards. Future research will focus on expanding socio-demographic analyses across diverse domains and applying advanced analytical methods, while ensuring alignment with official demographic sources such as civil registration and vital statistics.

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