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The changing geography of birth registration in Nigeria: a decomposition analysis of the 2013, 2018, and 2024 Demographic and Health Surveys

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Research Article

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Abstract

Birth registration establishes a child's legal identity. In Nigeria, fewer than half of children under five are registered: the registered share rose from 29.8% in 2013 to 42.6% in 2018, then fell to 39.7% in 2024 (−2.9 percentage points, standard error 1.6). This paper asks where the change came from and who it left out, using the 2013, 2018, and 2024 Nigeria Demographic and Health Surveys (87,392 de jure children under five) to build, to our knowledge, the first registration series spanning the three rounds, and decomposing change over time and gaps across regions. First, the change was selective: certificate-holding rose throughout, from 14.8% to 27.5%, while registration without a certificate fell from 20.7% to 12.2%, so the share with certificates grew while the share with any registration did not. Second, a decomposition attributes most of the 2018-2024 decline to the under-five population shifting toward low-registration northern zones (−2.1 points), with rate declines concentrated in the North East and North West; state changes ranged from −24 points in Imo to +29 in Osun. Third, wealth and head's education dominate the gradients, the wealth gradient steepened across waves, and the urban advantage within the North East has nearly disappeared. Fourth, unlike the change over time, the 29.7-point South-North gap is largely compositional: wealth, education, and residence explain 78%. Because the under-five population is shifting toward the zones where registration is lowest, national progress toward universal registration now depends on raising northern registration rates.

1. Introduction

Birth registration underpins proof of age and nationality, school enrolment, access to health and social protection, and, increasingly, enrolment in digital identity systems [1]; Sustainable Development Goal 16.9 commits governments to legal identity for all, including birth registration, by 2030 [2]. Globally, an estimated 166 million children under five were unregistered at the end of the last decade [3], and certificate coverage runs lower still across low- and middle-income countries [4]. Fewer than half of Nigeria's children under five are registered.

Existing evidence on Nigeria stops before the country's most recent household survey. Makinde et al. [5] track registration completeness across the 2007 and 2011 Multiple Indicator Cluster Surveys; Anaduaka [6] analyses birth certification with pooled 2008–2018 Demographic and Health Survey (DHS) data; Aboagye et al. [7] and Ebbers and Smits [8] place Nigeria in multi-country sub-Saharan comparisons using surveys collected to 2021. Wealth, education, and residence recur as the dominant correlates. The 2024 Nigeria DHS (NDHS), with fieldwork from December 2023 to May 2024, has not yet appeared in this literature. The intervening years saw sustained federal investment in digital identity and civil registration reform, so whether the registration gains recorded to 2018 continued is a question with direct policy stakes.

This paper harmonises the household rosters of the 2013, 2018, and 2024 NDHS rounds, 87,392 de jure children under five in total, into a single registration series and asks four questions. How did registration and certification move across the decade? Where did the change happen, across zones and states, and

how much of the national change is the changing geography of Nigerian children rather than changing registration rates? Which household characteristics predict registration, and did those gradients shift? And how much of the large North-South registration gap is explained by household composition?

The paper makes two contributions. It provides what is, to our knowledge, the first three-wave national account of birth registration reaching the 2024 survey. And it separates two questions that single-wave studies conflate, why registration differs across places and why it changed over time, showing that the answers differ: the cross-sectional gap is largely compositional, the recent change largely is not.

2. Data and methods

2.1 Surveys and the registration measure

The analysis uses the person-level household rosters (PR recodes) of the 2013, 2018, and 2024 NDHS rounds [9–11]. Following the published reports, the base is de jure (usually resident) children under age five: 29,861 children in 2013, 31,101 in 2018, and 26,430 in 2024 (unweighted). All estimates use household weights.

The registration measure requires harmonisation, because it is stored differently in every wave. In the 2024 file the standard DHS variable hv140 carries the World Health Organization (WHO)-aligned coding (has a birth certificate; registered without a certificate; neither). In the 2018 file hv140 is empty, and registration is stored in country-specific variables: sh20a records whether the birth is registered and sh20c whether a certificate was seen. In the 2013 file hv140 records only a combined registered category, and the certificate split comes from sh32 (certificate seen); the published table counts as registered those children with a non-missing certificate response, a convention we follow. The zone identifier also changed: the 2013 and 2018 files code North Central as 1 and North West as 3, and the 2024 file swaps them, an inversion confirmed against the files' value labels. Pooling raw codes across waves without these corrections misassigns the two zones and loses the 2018 outcome entirely.

As a check on the harmonisation, we compared the resulting estimates with the birth-registration tables of the three final reports. The national, urban, rural, and zone rates of certification and registration match the published values to the decimal in every wave (2013 report Table 2.9; 2018 report Table 2.11; 2024 report Table 2.10). One comparability limit remains: 2013 and 2018 record a certificate seen by the interviewer, and 2024 records certificate possession as reported, so the certification series mixes two instruments and we read its level shift in 2024 with caution. The registered series is definitionally consistent across waves.

Household covariates come from the same rosters: child age and sex, urban residence, household size, and the household head's educational attainment taken from the head's own roster row. Wealth uses a cross-wave comparable asset index: a pooled principal-component score over thirteen asset and housing indicators measured identically in all three waves, with quintiles defined on the pooled weighted distribution, constructed to avoid the mechanical incomparability of the survey's within-wave wealth

quintiles (Rutstein and Johnson [12] describe the standard within-survey index). The index covers over 98% of children in each wave. Cross-wave comparisons of the wealth gradient carry the caveat that the item set includes technologies whose ownership fell with obsolescence over the period.

2.2 Statistical methods

Trends and spatial patterns are weighted shares, with standard errors for national rates clustered on primary sampling units (896 to 1,389 per wave); ignoring strata, this if anything overstates variance. The change in the national rate between waves is decomposed exactly into zone contributions: rate effects (zone rates moving, weighted by midpoint child shares) and share effects (the under-five population shifting across zones, weighted by midpoint rates).

Household gradients are weighted linear probability models of registration on child age and sex, urban residence, head's education, household size, and the comparable wealth quintile, with zone fixed effects, estimated separately by wave; standard errors are clustered on state (CR1, the cluster-adjusted variance estimator with a small-sample correction; 37 clusters) with a t(36) reference distribution. The same model runs within each zone in 2024, where clusters are the five to seven states of the zone and the small-cluster count means error bands are wide by construction.

The 2024 South-North registration gap is decomposed with a twofold Oaxaca-Blinder decomposition on the same covariates, using the pooled coefficient vector including a group indicator as reference; detailed contributions are grouped into demographics, residence, education, and wealth, and the explained component's standard error comes from a cluster bootstrap resampling primary sampling units within group (200 replications). Contributions of dummy-variable groups depend on the omitted base category [13]; the education detail is read with that in mind. All results are associations estimated from repeated cross-sections; no causal interpretation is attached.

Data-pipeline code, verification tooling, and prose editing were assisted by a large language model (Claude, Anthropic); the author reviewed and validated all code and text and takes full responsibility for the analysis and the article.

3. Results

3.1 National trends

Table 1 and Fig. 1 report the harmonised series. Registration of under-fives rose from 29.8% in 2013 (SE 1.1) to 42.6% in 2018 (SE 1.1), then fell to 39.7% in 2024 (SE 1.1). The 2018–2024 change is − 2.9 percentage points with a standard error of 1.6: a decline at the margin of conventional significance, and in any reading a halt to the 12.7-point gain of the previous five years.

Table 1
Children under five whose births are registered, by residence and zone (per cent)

Area	2013	2018	2024	Change 2018–2024 (pp)
National	29.8	42.6	39.7	-2.9
Urban	49.8	59.6	59.1	-0.5
Rural	18.6	31.5	27.3	-4.2
North Central	27.8	33.5	36.5	+ 3.0
North East	20.4	35.9	28.0	-7.9
North West	19.5	35.1	32.7	-2.4
South East	51.8	59.0	57.3	-1.7
South South	37.3	50.0	59.2	+ 9.2
South West	51.2	63.1	67.7	+ 4.6

Notes: weighted per cent of de jure children under age five; source: NDHS 2013/2018/2024 person recodes, harmonised by the author (Section 2.1). National PSU-clustered standard errors are 1.1pp in each wave. pp = percentage points.

The composition beneath the total moved sharply (Table 2). Certificate-holding rose in every wave, from 14.8% to 21.9% to 27.5%. Registration without a certificate rose from 15.1% to 20.7%, then fell to 12.2%. The net decline sits in the partially documented category: the registration system issued more certificates to the children it reached while the number registered without a certificate contracted. Part of this reallocation may be the instrument change itself, since certificates that existed but were not shown to the interviewer move categories in 2024; the registered total is immune to this, and it is the series that stalled. Registration also continues to happen late or not at all: in 2024, 31.2% of infants under one were registered against 41.6% of children aged one to four.

Table 2
Composition of national registration (per cent of children under five)

Status	2013	2018	2024
Registered with a certificate	14.8	21.9	27.5
Registered without a certificate	15.1	20.7	12.2
Total registered	29.8	42.6	39.7
Weighted children	30,108	31,785	28,015

Notes: base and source as Table 1. Certificate is interviewer-seen in 2013 and 2018 and reported in 2024 (Section 2.1); the total-registered row is definitionally consistent across waves. Components may not sum to totals because of rounding.

The survey's wealth tables add a distributional detail. Registration in the poorest within-wave quintile fell from 15.9% in 2018 to 12.3% in 2024 while the richest quintile rose from 74.8% to 76.7%; the decline was concentrated among the children already least likely to be registered.

3.2 Zones and states

Registration levels diverge widely across the country (Table 1). In 2024 the three southern zones stood at 57.3% (South East), 59.2% (South South), and 67.7% (South West); the three northern zones at 36.5% (North Central), 32.7% (North West), and 28.0% (North East). The urban rate was more than twice the rural rate (59.1% against 27.3%). State rates ranged from 15.7% in Jigawa to 81.1% in Osun.

Table 3 decomposes the − 2.9-point national change between 2018 and 2024. Zone rate movements contribute only − 0.8 points, because the zones moved in opposite directions: the North East fell from 35.9% to 28.0% (contributing − 1.5 points) and the North West from 35.1% to 32.7% (− 0.9), but the South South rose from 50.0% to 59.2% and the South West from 63.1% to 67.7%. The larger contribution, − 2.1 points, is demographic: the under-five population shifted toward the northern zones, where registration is lowest, and away from the southern zones, where it is highest. Most of the national stall, in other words, reflects where Nigerian children increasingly are, compounded by real deterioration in the conflict-affected North East and North West.

Table 3
Zone decomposition of the change in national registration, 2018–2024

Zone	Rate 2018	Rate 2024	Child share 2018	Child share 2024	Rate effect (pp)	Share effect (pp)
North Central	33.5	36.5	13.6	16.9	+ 0.46	+ 1.13
North East	35.9	28.0	18.4	19.5	-1.49	+ 0.36
North West	35.1	32.7	35.3	38.9	-0.90	+ 1.20
South East	59.0	57.3	10.3	7.3	-0.15	-1.74
South South	50.0	59.2	9.1	7.6	+ 0.76	-0.81
South West	63.1	67.7	13.3	9.9	+ 0.53	-2.24
Total					-0.79	-2.10

Notes: exact decomposition of the national change (− 2.89pp) into zone rate movements at midpoint child shares and child-population shifts at midpoint rates (Section 2.2). pp = percentage points.

State-level movement underneath is far larger than the national numbers suggest (Fig. 2). Between 2018 and 2024, registration fell by 24.3 points in Imo, 23.8 in Adamawa, 19.0 in Abia, 18.9 in Kaduna, and 18.4 in Katsina; it rose by 29.2 points in Osun, 23.8 in Ondo, 22.1 in Rivers, 19.4 in Zamfara (from a 2018 base of 9.7%), and 17.4 in Bayelsa. Registration systems in Nigeria are state-administered in practice, and

swings of this size in both directions within six years are more consistent with administrative than with household drivers.

3.3 Household gradients

Table 4 reports the wave-by-wave models, in which wealth and the head's education dominate. A one-quintile step on the comparable index is associated with 8.3 points of additional registration probability in 2013 (SE 0.5), 9.0 in 2018 (0.8), and 9.6 in 2024 (0.5): the gradient steepened as the national rate stalled. A head with higher education is associated with 27.1 points in 2024 against a no-education base. The conditional urban advantage is 6 to 9 points across waves, far smaller than the raw urban-rural gap, most of which the covariates absorb. Girls and boys are registered at indistinguishable rates.

Table 4
Correlates of registration, weighted LPM by wave

Variable	2013	2018	2024
Child age 1	+ 0.056 (0.011)	+ 0.077 (0.009)	+ 0.075 (0.017)
Child age 2	+ 0.046 (0.011)	+ 0.095 (0.010)	+ 0.107 (0.015)
Child age 3	+ 0.068 (0.012)	+ 0.114 (0.013)	+ 0.127 (0.017)
Child age 4	+ 0.051 (0.009)	+ 0.121 (0.015)	+ 0.113 (0.019)
Female child	-0.000 (0.006)	-0.012 (0.007)	-0.010 (0.006)
Urban residence	+ 0.082 (0.017)	+ 0.061 (0.022)	+ 0.088 (0.016)
Head: primary	+ 0.074 (0.015)	+ 0.120 (0.020)	+ 0.099 (0.015)
Head: secondary	+ 0.111 (0.016)	+ 0.200 (0.019)	+ 0.170 (0.019)
Head: higher	+ 0.211 (0.022)	+ 0.294 (0.026)	+ 0.271 (0.020)
Household size	-0.002 (0.002)	-0.001 (0.002)	+ 0.001 (0.002)
Wealth quintile (comparable)	+ 0.083 (0.005)	+ 0.090 (0.008)	+ 0.096 (0.005)
n	29,062	31,081	26,370

Notes: weighted linear probability models of registration with zone fixed effects; omitted categories are child age under one and head with no education. Standard errors (in parentheses) clustered on state (CR1, 37 clusters), t(36) reference distribution. LPM = linear probability model.

Within zones in 2024 (Table 5), the wealth gradient is positive everywhere, from 7.9 points per quintile in the North East to 11.5 in the North Central: wealth is associated with registration in every part of the country, whatever the zone's baseline. The one deviation is the urban coefficient: the conditional urban advantage inside the North East is 2.5 points, against 6 to 13 points elsewhere; in the zone with the region's longest-running insecurity, town residence no longer predicts registration.

Table 5
Selected correlates within zones, 2024

Zone	Wealth quintile	Urban residence	Head: higher education	n	States
North Central	+ 0.1145 (0.0096)	+ 0.108 (0.027)	+ 0.239 (0.039)	4,902	7
North East	+ 0.0793 (0.0100)	+ 0.025 (0.024)	+ 0.330 (0.043)	5,513	6
North West	+ 0.0863 (0.0118)	+ 0.133 (0.029)	+ 0.266 (0.024)	7,990	7
South East	+ 0.1007 (0.0183)	+ 0.061 (0.024)	+ 0.117 (0.042)	2,943	5
South South	+ 0.0922 (0.0161)	+ 0.079 (0.040)	+ 0.234 (0.047)	2,608	6
South West	+ 0.0877 (0.0115)	+ 0.097 (0.066)	+ 0.238 (0.085)	2,414	6

Notes: the 2024 model of Table 4 estimated within each zone without zone fixed effects; clusters are the states of the zone, so reference distributions are t(4) to t(6) and error bands are wide by construction. Full coefficient sets are in the underlying result file.

3.4 Decomposition of the North-South gap

The 2024 gap between the three southern and three northern zones is 29.7 points (Table 6). The Oaxaca-Blinder decomposition explains 23.1 points of it, 78% (bootstrap SE 1.3): wealth contributes 13.4 points, head's education 7.0, and urban residence 3.2, with child demographics near zero. The sharper South West-North West comparison repeats the pattern: a 35.0-point gap, 85% explained, wealth again the largest component. Most of the spatial registration gap corresponds to differences in household wealth and education.

Table 6
Oaxaca-Blinder decomposition of 2024 registration gaps

Component	South vs North	South West vs North West
Gap (pp)	29.7	35.0
Explained (pp)	23.08	29.88
Explained, bootstrap SE	1.27	2.36
of which wealth	+ 13.37	+ 15.24
of which education	+ 6.97	+ 8.20
of which urban residence	+ 3.19	+ 7.64
of which demographics	-0.44	-1.21

Notes: twofold decomposition, pooled coefficient vector including a group indicator; covariates as Table 4. Bootstrap resamples primary sampling units within group (200 replications). Detailed dummy-group contributions depend on the omitted base category [13]. pp = percentage points.

The two decompositions answer different questions. The gap between places is largely compositional; the change over time is not. Registration fell between 2018 and 2024 without any corresponding change in measured household characteristics, through demographic shift and through rate declines not accounted for by those characteristics. Policies aimed at household composition, poverty and education address the level gap; they do not explain, and will not by themselves reverse, the recent change.

4. Discussion

We read the results in three ways. The first concerns the composition of the change. Total registration fell while certification rose, so the system did not weaken uniformly: it deepened for the children it reached and narrowed at the margin. The children exiting the system's reach were those registered without documentation, a category that historically captured informal or incomplete contact with the registration apparatus. A system formalising itself, issuing certificates at registration rather than leaving the paperwork incomplete, would raise the certificate share; a system losing its outreach margin would lower the registered total. The data are consistent with both happening at once.

The second reading concerns geography. Most of the national change is compositional: Nigeria's under-five population is increasingly located in the northern zones where registration is weakest, so even static zone rates would have pulled the national number down. This compounding is mechanical but consequential, because it means national progress toward SDG 16.9 now requires northern registration rates to rise faster than before merely to hold the national rate constant. In addition, rates declined in the North East and North West, and there is the near-disappearance of the urban registration advantage within the North East, a pattern consistent with the region's protracted insecurity disrupting the state and local administration that registration requires, though our data cannot show that mechanism directly.

The state-level swings, the declines in Imo and Adamawa alongside the gains in Osun, Ondo, and Zamfara, are too large and too bidirectional to reflect household change, and mirror the finding of Anaduaka [6] that community-level factors carry much of the variation in certification.

The third reading concerns what composition does and does not explain. Household wealth and education explain most of the North-South gap, in line with the sub-Saharan pattern in Aboagye et al. [7] and Ebbers and Smits [8], and the wealth gradient runs through every zone. Over time, the same characteristics explain little: gradients steepened slightly while the national rate stalled. Registration inequality is therefore socioeconomic in the cross-section but administrative in the recent trend, and the two patterns require different policy responses.

Five limitations bound these conclusions. The data are repeated cross-sections of different children, so net changes bound but do not trace individual registration histories. The certification series mixes certificate-seen (2013, 2018) with certificate-reported (2024) instruments. The 2.9-point national decline carries a standard error of 1.6 points, and its statistical significance is marginal, although the stall relative to the prior trajectory, the compositional shift, and the zone-level declines do not depend on the sign of the national point estimate. The decompositions are accounting exercises over observed covariates; unobserved determinants, distance to registration points, facility birth, parental documentation, load onto the unexplained components. And the 2024 sample excluded 20 clusters in seven states for security reasons, which the survey's weighting addresses nationally; estimates for the worst-affected states, the same states where registration is weakest, should be read with caution.

5. Conclusions and policy implications

Registration of under-fives in Nigeria, which rose from 30% in 2013 to 43% in 2018, stood at 40% in 2024. The increase of the earlier period did not continue; certificate-holding kept rising while the share of children with any registration at all ceased growing. Most of the national change reflects Nigeria's children being increasingly born in the low-registration north; the rest reflects declines concentrated in the North East and North West, net of continued southern gains.

We draw four implications for policy. First, the headline number understates the task: because the child population is shifting toward the weakest-registering zones, holding the national rate constant now requires northern rates to improve, and reaching SDG 16.9 requires them to improve quickly. Second, the decline of the registered-without-certificate category suggests the system's informal outreach margin is disappearing as certification formalises; if so, the priority is not more documentation for the already-registered but restoring the first contact, registration itself, for the children now missed entirely, who are concentrated in the poorest quintile, where registration fell even as the national certificate share rose. Third, the state-level swings show registration performance is movable within a few years in both directions; the gains in Osun, Ondo, Zamfara, and Rivers are as informative as the declines in Imo and Adamawa, and understanding what those administrations did differently is the most direct route to improvement that these data identify. Fourth, wealth and education explain most of the North-South gap,

so registration drives that lower the effective cost to poor households (registration at birth in health facilities, fee removal, mobile registration in rural areas) address the composition half of the problem; the administrative half, visible in the North East's erosion, requires the registration apparatus itself to function where insecurity has degraded it.

The next survey round will show whether the 2018–2024 pattern persisted. The series assembled here gives that assessment a baseline.

Declarations

Author contributions: PO: conceptualisation, data curation, formal analysis, investigation, methodology, software, validation, visualisation, writing (original draft), writing (review and editing).

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Data availability: NDHS microdata are available from the DHS Program (https://dhsprogram.com) subject to registration; the data-use terms prohibit redistribution. Analysis code is available from the author on reasonable request.

Ethics approval: This study is a secondary analysis of de-identified, public-use NDHS microdata obtained from the DHS Program under its data-use terms. The original surveys' protocols were approved by the National Health Research Ethics Committee of Nigeria and the ICF Institutional Review Board, and informed consent was obtained from all respondents by the survey implementers at the point of interview. No new data were collected and no additional ethical review was required.

Competing interests: The author is a staff member of the National Population Commission, which implemented the NDHS surveys analysed here. The analysis is the author's own and does not represent the position of the Commission.

Clinical trial number: not applicable.

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Figures

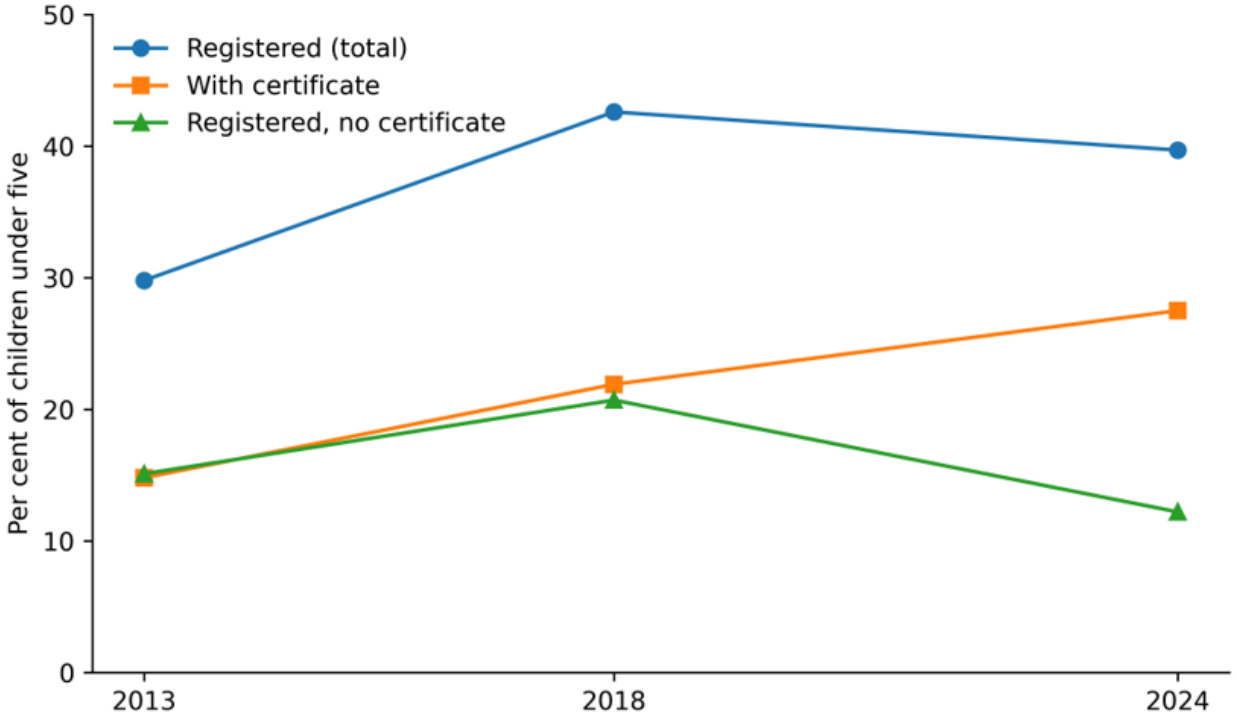


Figure 1

National birth registration of children under five and its composition, 2013-2024. Weighted per cent of de jure children under five who are registered in total, registered with a certificate, and registered without a certificate. Certificate is interviewer-seen in 2013 and 2018 and reported in 2024. Source: harmonised NDHS 2013/2018/2024 person recodes

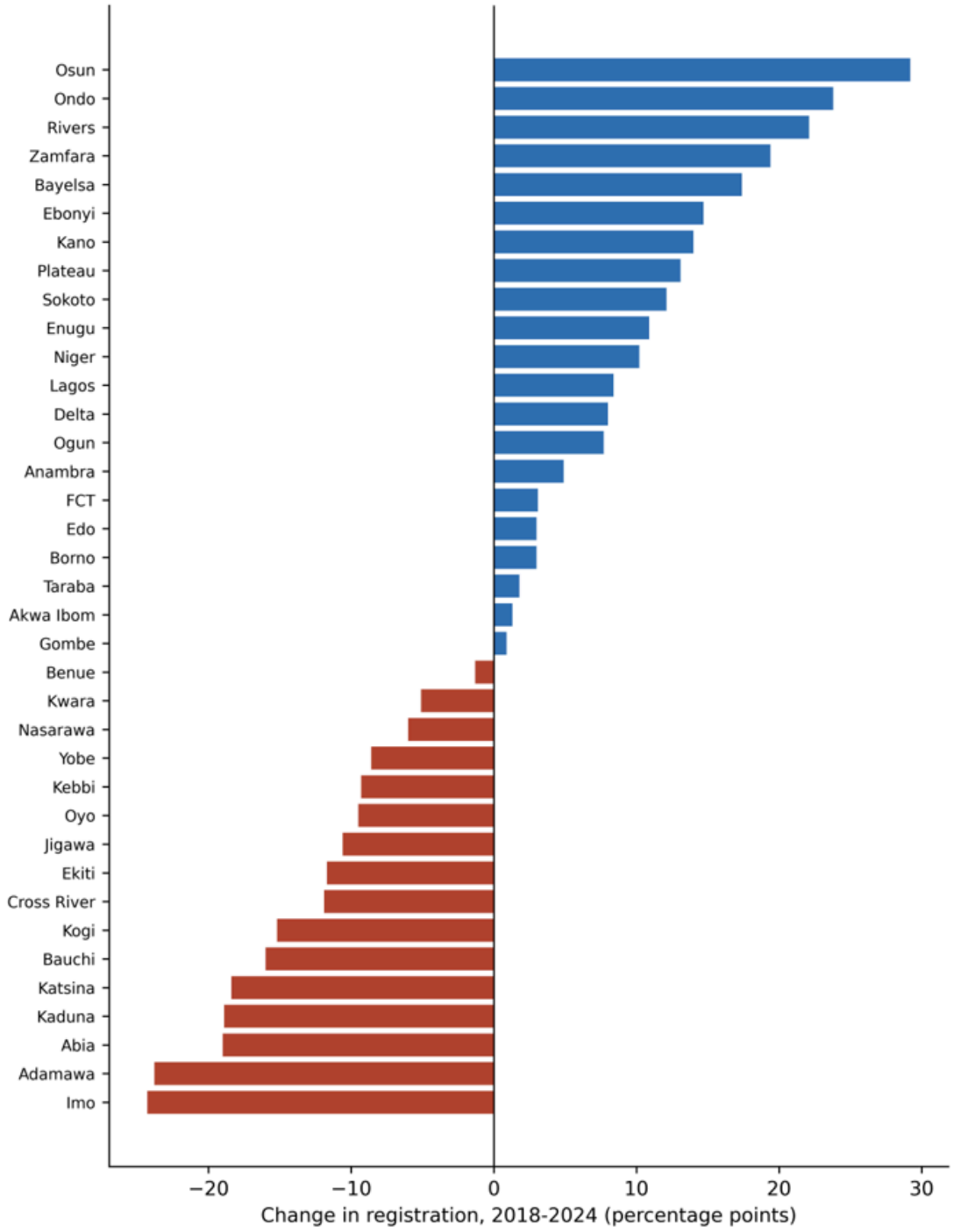


Figure 2

Change in birth registration by state, 2018-2024. Percentage-point change in the registered share of de jure children under five, all 36 states and the Federal Capital Territory, sorted. Source: as Fig. 1