Inequality of Opportunity in Asia and the Pacific: The case of birth registration in Fiji

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1. Introduction

The ESCAP *Leaving No One Behind (LNOB)* workstream places children, women, and men at the heart of sustainable and inclusive development. The ESCAP LNOB Platform[3] identifies areas where inequality jeopardizes a person's prospects, namely: education; access to sexual and reproductive health care; malnutrition; access to electricity and information and communication technologies; basic water and sanitation; access to clean energy; and financial inclusion. Each of these opportunities is covered by specific commitments outlined in the 2030 Agenda for Sustainable Development and addressed in separate thematic reports covering up to 30 countries throughout Asia and the Pacific.[4]

This paper aims to extend the application of ESCAP's LNOB methodology to an SDG indicator that has not yet been analyzed in the LNOB platform. Specifically, *the paper explores inequality in birth registration (or SDG 16.9.1 – Proportion of children under 5 years of age whose births have been registered with a civil authority, by age) and aims* to identify the shared circumstances of children that are left behind and excluded from civil registration. To this end, the Classification and Regression Tree (CART) methodology is employed as an empirical strategy that efficiently disaggregates outcomes through a machine learning algorithm that can identify those who are left behind. Fiji's latest Multiple Indicator Cluster Survey (2021), specifically the recode for children under 5 years of age is the main data source.

The preliminary results[5] indicate that household wealth along with maternal age and education and age of the child are critical factors explaining variation in birth registration across different groups in Fiji. While on average 87 per cent for children under 5 years of age have their birth registered, this figure drops as low as 59 per cent among furthest behind groups. Among furthest ahead groups, prevalence can be complete at 100 per cent indicating that no one is left behind in certain groups. The analysis finds that children who are less than one year old have particularly low birth registration rates, as do children living in poorer households where mothers have lower education especially in i-Taukei community.

Ultimately, these findings are of direct use for generating discussion on transformations needed to reach the "furthest behind first" as pledged in the 2030 Agenda for Sustainable Development. Recent policies introduced by the government are actions taken in the right direction. Our analysis finds that children born around 2018-2019 may have benefited from the the Parenthood Assistance Payment Programme.

The paper is organized as follows. Section 2 makes the case for the importance of birth registration and briefly reviews relevant literature. Section 3 introduces the ESCAP LNOB methodology along with the data used for the LNOB analysis. Section 4 presents the regression trees and identifies furthest behind groups at

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[3] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP). Leave No One Behind Platform. 2022. Accessed 16 February 2022. www.lnob.unescap.org.

[4] All policy papers follow the same methodology using the latest publicly available DHS and MICS data where slight modifications are due to the use of a different dataset.

[5] The preliminary results were presented during the LNOB training held in Suva, Fiji on March 6th, 2023 attended by over 30 participants from line Ministries, CSOs and UN entities. Authors are also grateful for excellent comments by Patrik Andersson and the two peer reviewers.

national level following different empirical specifications, whilst extending the analysis with the inclusion of language of mothers as an additional circumstance. Section 5 concludes with policy recommendations.

2. The Importance of Civil Registration in Asia and the Pacific

Birth registration is a fundamental human right enshrined in the Convention on the Rights of Child (General Assembly Resolution 44/25), with profound implications for development. Birth registration provides legal acknowledgement of a person's existence, which is the foundation for one's entitlement and access to basic services such as healthcare, social protection, and freedom of movement, among others. Birth registration is also critical from the perspective of national statistical systems. Birth registration also enables governments to keep abreast of their demographic developments, which will subsequently lead to better informed and better tailored policy decisions.

Being left behind in CRVS often imply omissions of people's legal personhood, which will exert reverberant negative implication throughout one's life course, including denial of citizenship, access to social protection and health services, ineligibility to education, and cross-generational undocumented status.[6] Inequalities in the civil registration coverage of hard-to-reach and marginalized populations, such as those living in rural, remote, isolated, or border areas, minorities, indigenous people, migrants, non-citizens, asylum seekers, refugees, stateless people, and people without documentation, are acknowledged by ESCAP member States in the Ministerial Declaration on CRVS in Asia and the Pacific in 2014.

Asia and the Pacific as a region is on right track in achieving universal birth registration. The number of unregistered children under the age of 5 has more than halved from 135 million in 2012 to 64 million in 2019, with 8 member States achieving universal registration.[7] Progress must continue at the same pace to leave no one behind. Given that the furthest behind groups are often most marginalized, more tailored, and agile policies that are equipped with monitoring and evaluation components will be needed moving forward.

Fiji has achieved significant progress in strengthening its Civil Registration and Vital Statistics, particularly through intra-ministry coordination.[8] Birth registration for newborns is a mandatory legal requirement in Fiji and free of charge within the 12 months of the birth[9]. According to UNICEF[10] The State of the World's Children Report 2021, 87 per cent of Fijian children under the age of 5 has completed birth registration. Furthermore, the Parenthood Assistance Payment Programme was introduced in 2018 to boost the rate of birth registration. Under this programme, a $1,000 cash transfer is distributed to households providing they

[6] Harbitz, Mia, M. Tamargo, and C. Del. The significance of legal identity in situations of poverty and social exclusion. Technical Note. Inter-American Development Bank, Washington DC; 2009.

[7] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP). Getting everyone in the picture: a snapshot of progress midway through the Asian and Pacific civil registration and vital statistics decade. ESCAP, Bangkok; 2021.

[8] Naidu, S., M. Buttsworth, and A. Aumura. Strengthening civil registration and vital statistics systems in the Pacific: the Fijian experience. Working Paper No. 35. 2013.

[9] Fiji Ministry of Justice, accessible at: https://www.justice.gov.fj/births-death-marriages/birth-services/

[10] United Nations Children's Fund. The State of the World's Children 2021: On My Mind – Promoting, protecting and caring for children's mental health. UNICEF, New York; October 2021.

had registered their newborn to the registrar of births, deaths and marriages (BDM).[11] From August 2021, birth and death certificate are issued free of charge.

Barriers to birth registrations include lack of awareness,[12] prohibitive registration fees,[13] long distances to registration facilities,[14][15] and lack of incentives for registration.[16] Parental education and socioeconomic conditions of households therefore can be critical factors explaining variation in birth registration. Socio-cultural factors like language, ethnicity, religion, and local customs may also play a role. For instance, stigmatization of children born out of marriage could deter parents from registering births.[17] Statistical analyses from a recent UNICEF report has discovered that unregistered children tend to come from poorer households, living in rural areas and have mothers with lower education attainments.[18] To the extent that data are available, the empirical methodology described in detail below will include these variables.

3. Data and Methodology

3.1 Multiple Indicator Cluster Survey for Fiji (2021)

Our empirical analysis uses primarily the Child Recode from Fiji's latest MICS (2021). A few variables are merged to child recode from women's recode (i.e. mother's age and marital status) and household recode (i.e. number of children under 5). In doing so, a final sample of 2,009 children are obtained among whom information on birth registration is complete.[19] Table 1 below provides descriptive statistics for all the variables that are used in the empirical analysis. In line with the final report of MICS for Fiji, about almost 87 per cent of children in Fiji as of 2021 have their birth registered. The average child in the sample is 2 years old with 52 per cent boys and 48 per cent girls. Educational attainment of mothers is in general high with 93 per cent having completed at least secondary education.

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[11] Government of Fiji, accessible at: https://www.fiji.gov.fj/Media-Centre/News/Parenthood-Assistance-Payment-Outline

[12] United Nations Children's Fund. Birth registration for every child by 2030: are we on track?. UNICEF, New York; 2019.

[13] Bennouna C, Feldman B, Usman R, Adiputra R, Kusumaningrum S, Stark L. Using the Three Delays Model to examine civil registration barriers in Indonesia. *PLoS One*. 2016;11(12):e0168405. doi:10.1371/journal.pone.0168405

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[15] United Nations Children's Fund. Advantage or paradox? The challenge for children and young people of growing up urban. UNICEF, New York; 2019.

[16] Oomman N, Mehl G, Berg M, Silverman R. Modernising vital registration systems: why now? *Lancet*. 2013;381(9875):1336-1337. doi:10.1016/s0140-6736(13)60847-8

[17] Australia Indonesia Partnership for Justice (AIPJ). Indonesia's missing millions: AIPJ baseline study on legal identity. 2014.

[18] United Nations Children's Fund. Birth registration for every child by 2030: are we on track?. UNICEF, New York; 2019.

[19] Child recode has birth registration variable available for 2,115 children. As women and household recodes are merged with child recode, we lose 106 observations. National average on birth registration is not affected by loss of information.

Table 1 Descriptive Statistics

Variable	N	Mean	St Dev	Min	Max
Birth Registered	2,009	0.865	0.342	0	1
Child Age	2,012	1.961	1.412	0	4
Birth Order	2,032	1.356	0.613	1	4
Child Sex: Male	2,032	0.524	0.500	0	1
Maternal Education: Primary or lower	2,032	0.071	0.257	0	1
Maternal Education: Secondary	2,032	0.544	0.498	0	1
Maternal Education: Tertiary or vocational	2,032	0.384	0.487	0	1
Maternal Age: 15-24	2,009	0.164	0.370	0	1
Maternal Age: 25-29	2,009	0.312	0.463	0	1
Maternal Age: 30-34	2,009	0.251	0.434	0	1
Maternal Age: 35-39	2,009	0.171	0.376	0	1
Maternal Age: 40-49	2,009	0.103	0.304	0	1
Maternal Marital Status: Currently Married	2,032	0.906	0.292	0	1
Maternal Language: English	2,012	0.055	0.227	0	1
Maternal Language: i-Taukei	2,012	0.765	0.424	0	1
Maternal Language: Hindu	2,012	0.170	0.376	0	1
Maternal Language: Other	2,012	0.010	0.099	0	1
Number of Children under 5	2,032	1.709	0.799	1	4
Only Child in Household	2,032	0.478	0.500	0	1
Poorer Household: Bottom 40 in Wealth	2,032	0.528	0.499	0	1
Richer Household: Top 60 in Wealth	2,032	0.472	0.499	0	1
Urban	2,032	0.512	0.500	0	1

Notes: The level of analysis is children. Unweighted descriptive statistics for the sample are presented. Merging women's recode in MICS which include mother's marital status and age with children's recode leads to a loss of 100 observations from children's recode with valid responses to birth registration.

Almost half of the children have mothers who are less than 30 years old. Majority of children have their mothers currently married or in union. Over three-quarters of children have mothers whose native language is i-Taukei. Just about half of the children live in poorer households. Children are almost equally split between rural and urban households.

3.2 The Classification and Regression Tree (CART)

The primary goal of using CART[20] methodology is to identify the groups with the lowest and highest access to an opportunity, in this case, *birth registration*. To identify the groups with the greatest difference in their

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[20] Breiman, L., Friedman, J., Olshen, R., & Stone, C. "Classification and regression trees. Wadsworth Int." Group 37.15 (1984): 237-251.

birth registration, a binary regression tree is constructed using "rpart" package in R, an open-source statistical software. A tree is an analytical structure that represents groups of the sample population that have significantly different response values, or *birth registration.* The starting point of the tree, also known as the root node, refers to the average birth registration among all children under 5 years of age in Fiji. The tree method algorithm starts by searching for the first split (or "partition") of the tree. It does so by looking at each circumstance (i.e., explanatory variable) and separating the sample in two groups, so that it best satisfies a certain splitting criterion which in the case of this paper is Analysis of Variance (ANOVA). The main idea is to choose the split that maximizes the between-groups sum of squares in a simple analysis of variance.

The CART algorithm applies this ANOVA test to each possible split, or partition, of the sample population given by the circumstances. After comparing all the available partitions, the algorithm is able to identify the single partition that would decrease variance the most for the combined sum of squares of the child nodes compared to the parent node. This is how CART uses ANOVA to identify the best possible split for each node down the tree. The CART algorithm that generates the nodes for each partition works step-by-step, starting with the entire sample. Each time the sample is partitioned, new nodes are generated and the ANOVA is calculated and compared to the ANOVA before the new partition. This stepwise process of building nodes and branches of a tree is also known as "recursive partitioning[21]." Each partition (and hence the new pair of nodes) is kept when the decrease of variance exceeds a preset threshold also known as a "complexity parameter." When the best available partition fails to satisfy the complexity parameter, the algorithm ceases to make additional partitions. To avoid a too small sub-sample size, the analysis ceases to make additional partitions if the resultant nodes would fail to contain either 5 per cent of the total sample population or an absolute value of 49 survey respondents. The analysis is also limited to 6 levels of nodes (encompassing 5 partitions), as additional partitions past that point have diminishing returns for the purpose of identifying population groups experiencing inequality of opportunity.[22]

In exploring differences in *birth registration in Fiji*, the following circumstances are selected in the baseline model: respondent's **wealth of the household** (belonging to the top 60 or the bottom 40 of the income distribution); **place of residence** (urban or rural) and **maternal educational attainment** (lower, secondary and tertiary education). Wealth, as used in this policy paper, is a composite index reflecting a household's cumulative living standard that is developed by the DHS and MICS researchers and combines a range of household circumstances. For robustness checks other circumstances are also used including **age** and **sex of the child**; **marital status** and **native language of the mother** (i.e. i-Taukei, Hindi, English and Others). Subnational analysis is also conducted (but not reported due to space limitation) particularly for Central and Western Fiji which have sufficient sample size. It is important to note that circumstances should not be interpreted as "causes" of inequality. The association found does not imply causality.

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[21] Therneau, Terry M., and Elizabeth J. Atkinson. *An introduction to recursive partitioning using the RPART routines*. Vol. 61. Mayo Foundation: Technical report, 1997.

[22] For more technical details about CART methodology, explore the LNOB platform at https://lnob.unescap.org/help
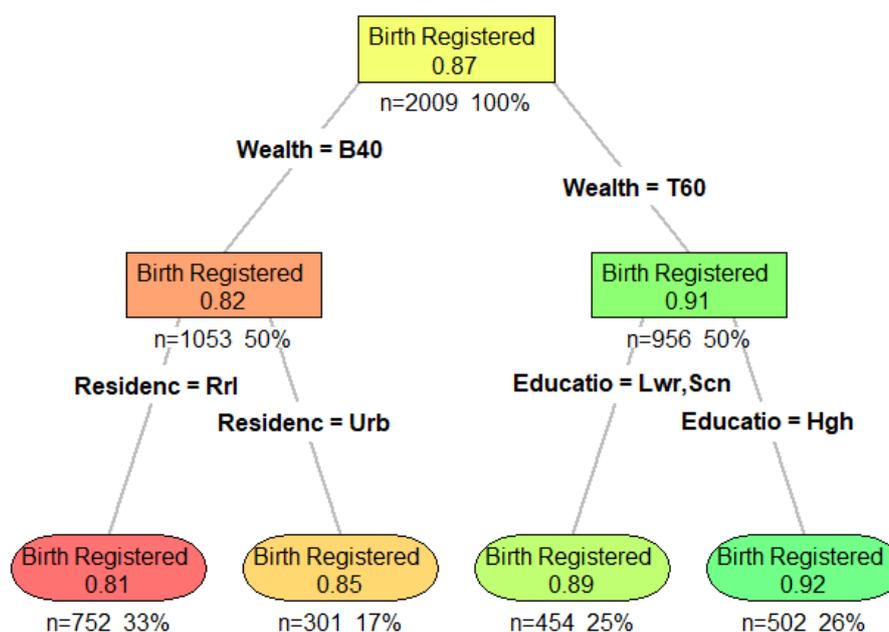
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4. Results

4.1 Identifying the furthest behind in Fiji

Figure 1 below presents the baseline LNOB tree for Fiji which efficiently disaggregates the prevalence of birth registration at national level based on three circumstances, namely residence and wealth of households and maternal education. Total sample size is 2,009 children under 5 years of age. The parent node (in yellow) shows the prevalence of birth registration in Fiji as of 2021 (weighted). The algorithm then considers all three circumstances and finds that wealth of the household matters the most. In other words, it performs better than residence and maternal education in generating two groups with largest difference in birth registration. While the proportion of children whose birth has been registered by civil authorities is 82 per cent among households at the bottom 40 per cent of the wealth distributions, this figure reaches up to 91 per cent among households at the top 60 per cent of the wealth distribution.

Figure 1. Baseline LNOB Tree – Fiji (2021)

Notes: Authors' calculation based on MICS 2021. The figure is a standard output of "rpart" package. Numbers inside boxes refer to birth registration. Numbers below boxes refer to sample size starting with 2,009 as total sample.

The algorithm recursively attempts to split from these two wealth-driven nodes. Among children living poorer households, it finds that there is significant variation by residence. Children living in poorer households located in the rural areas have the lowest birth registration at 81 per cent. Note that there is no other population group that has lower prevalence in this model. Hence, in ESCAP LNOB methodology, this node is called the furthest behind. This is also a terminal node whereby no further splits are made even
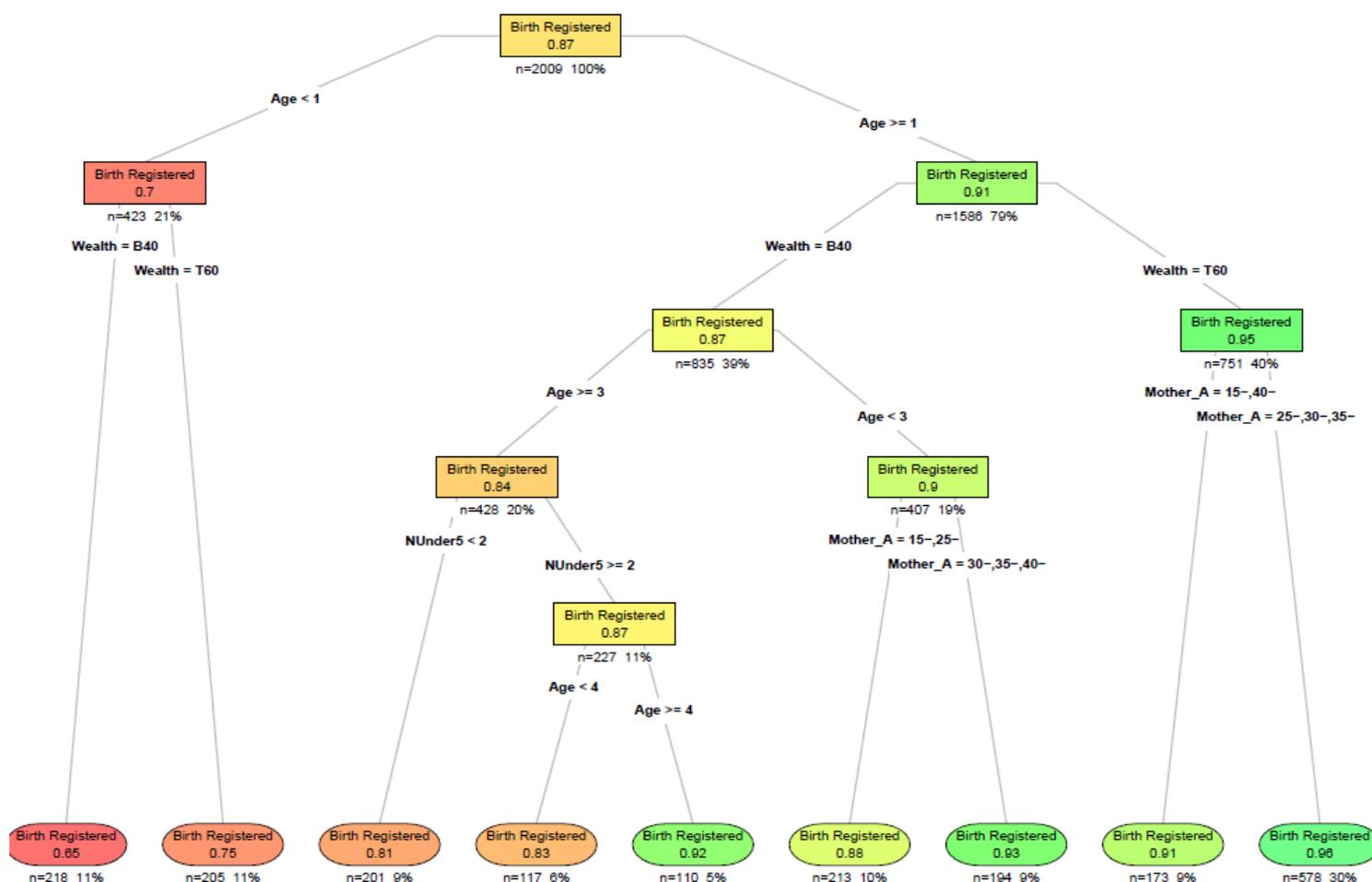
though sufficient observations exist (i.e., 33 per cent of the population). This means, for example, that maternal education is not contributing to any variation in birth registration among poorer households residing in rural areas. Among children living richer households, maternal education emerges as a distinguishing factor. Children whose mothers have completed tertiary education is slightly better off than children whose mothers have completed primary and secondary education. Furthest ahead group consequently consists of children living in richer households with their mothers having completed tertiary education. Among this group, 92 per cent of the children have their birth registered.

Figure 2 below builds on this baseline model and adds several other circumstances that are highlighted in the literature as potential factors that influence birth registration including mother's age and marital status, age and sex of children and number of children in the household. Inclusion of child and mother related circumstances fundamentally alter the results presented in Figure 1.

Figure 2. Extended LNOB Tree for Birth Registration in Fiji (2021)

Notes: Authors' calculation based on MICS 2021. The figure is a standard output of "rpart" package. Numbers inside boxes refer to birth registration. Numbers below boxes refer to sample size starting with 2,009 as total sample.

Notably, many circumstances do not show up on the tree including residence, maternal education from the baseline model and maternal marital status and sex of child. Instead, child's age emerges as the most important circumstance leading to the first split. The LNOB tree immediately identifies a more vulnerable population group as furthest behind relative to Figure 1, namely children who are younger than 1 and living in poorer households. Among them, only two-thirds have their birth registered, while three-quarters of children in richer households are registered.

On average, birth registration is above 90 per cent for children older than 1 year old. For those who live in richer households and whose mothers are between 25 and 40, 96% have their birth registered. Mother's and child's age along with number of children in the household shape the remaining terminal nodes in the extended LNOB tree. It is worth noting that among children above 1, the lowest prevalence is again for children living in poorer households but there is an important cut-off around age 3 who were born around 2018. While children older than 3 years of age and who are the only child in the household have lowest prevalence (81%), children who younger than 3 year of age and whose mothers are older than 30 are relatively better off (93%). This finding may be related to the policy change in 2018 which incentivized birth registration especially among poorer households.

The policy implication that emerges from Figure 2 is clearly that parents of children under 1 year of age in poorer households should be targeted with tailored information campaigns and support mechanisms to encourage birth registration. It is worth noting that almost all deliveries in 2019-2021 period took place in government hospitals, government clinics or health centres in Fiji. Information campaigns should therefore start at point of delivery.

As a robustness check, the extended model is re-estimated for children under 1 years of age and above separately. To a large extent, results are similar with two notable differences. First, among children older 1 year of age, birth registration is particularly high for those 12-23 months old. These children are benefiting from parenthood assistance payment. There is also some evidence for gender gap for children 12-35 months in favour of girls with 97 per cent birth registration among girls and 89 per cent birth registration among boys. Second, among children younger than 1 year of age, a new furthest behind group is identified based on household wealth and mother's age. Birth registration is 59 per cent in this group. Among children living in poorer households, a gender gap is also captured in favour of boys with birth registration at 63 per cent among girls and 75 per cent among boys.

4.2 Does language matter for identifying the furthest behind?

In many countries, the furthest behind groups also belong to a minority ethnic, caste, linguistic or religious group. Since MICS include information on the native language of respondents, it is possible to add this variable as a circumstance to our baseline and extended models. In Fiji, native language of respondents includes predominantly i-Taukei followed by Hindu, English and others.
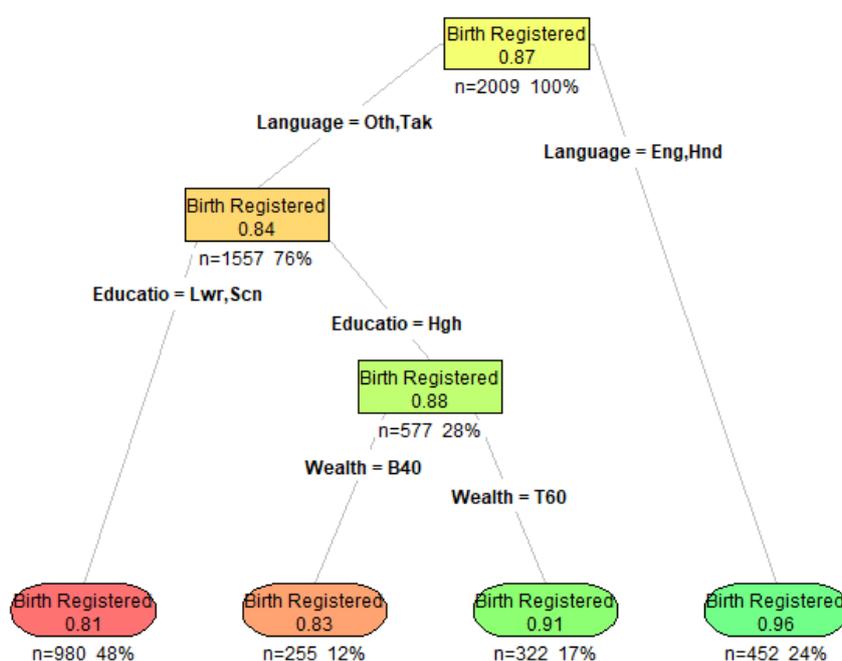
Figure 3 below shows the baseline model with language as an additional circumstance. We see that furthest behind group now consists of children whose mothers speak i-Taukei and completed lower or secondary

education. Birth registration increases to 88 per cent for children whose mothers speak i-Taukei and completed tertiary education. Furthest ahead group with 96 per cent birth registration comprises for children whose mothers speak Hindi and English.

Figure 3. Extended LNOB Tree for All Children with Language Circumstance

Notes: Authors' calculation based on MICS 2021. Numbers inside boxes refer to birth registration. Numbers below boxes refer to sample size starting with 2,009 as total sample.

When language circumstance is added to our extended model, it appears as a determining factor only for furthest ahead households. Specifically, for children above 1 year of age, birth registration is 100 per cent if they are living in richer households where their mothers speak Hindi.

5. Conclusion and Policy Recommendations

This paper has shed light on the layers of disadvantage that the furthest behind groups share in prevalence of birth registration in Fiji. While this SDG indicator exhibits good progress at national level partly thanks to recent policies introduced by the government, the LNOB analysis unmasked those furthest behind through various empirical specifications.

Many circumstances affect the prevalence of birth registration in Fiji. The LNOB analysis conducted through CART methodology has identified age of children, wealth of households along with maternal age and education as key factors that shape the furthest behind groups of birth registration in Fiji. Despite almost universal access to skilled birth assistance in hospitals and health clinics, children under 12 months. Higher maternal education is an important variable that is associated with higher birth registration. While sex of child is not associated with birth prevalence at national level, our analysis for different age groups found some gender disparities which may be worth investigating further. Additionally, i-Taukei speaking households need more attention.

The following policy recommendations can help policymakers improve birth registration among furthest behind groups in Fiji.

1) **Make concerted efforts to support the timely registration of newborns within their first year of life.** Delayed birth registration appears to be prevalent across Fiji, further to the disincentivizing late registration fee currently in place (after 1 year of birth). Information campaigns tailored toward furthest behind groups that raise awareness of Parenthood Assistance Payment Programme can help improve birth registration moving forward. Language used in these campaigns should be accessible for i-Taukei speakers.

2) **Address potential geographical barriers in timely birth registration.** Birth registration tend to be lower in rural areas in Fiji, with the Northern region exhibiting a slightly lower prevalence. Mobile registration points and more digitalized Birth, Death and Marriages (BDM) services can help. The Birth Registration Application launched in 2019 is a great entry point, for instance. Digital inclusion, however, is a key requirement for furthest behind groups to take advantage of such solutions.

3) **Strengthen data collection efforts with approaches founded in UN values and human rights.** Fiji's recent MICS is the most comprehensive nationally representative household survey that can set the baseline for future evaluations. Regularly collected data in the next couple of years can help understand how government policies are increasing the national average while decreasing the overall inequality and leaving no one behind.

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