

WHERE ARE THE POOR IN LAO PDR?

Small Area Estimation:
Province and District Level Results



Foreword

The commitment to poverty reduction is central to the national development agenda of the Lao People's Democratic Republic, as reflected in the 9th National Socio-Economic Development Plan (2021–2025). The Lao Statistics Bureau (2020) published a poverty profile based on the Lao Expenditure and Consumption Survey conducted in 2018–2019. The report presented poverty estimates at the national, regional, and provincial levels. It showed a major shift in the geography of poverty and an increase in disparities within each province compared to the previous five years.

The changing geography of poverty emphasizes the need for updating and improving knowledge of poverty at lower administrative levels. This information is essential for the poverty eradication strategy and pro-poor policymaking. This knowledge can be used to prioritize the poorest districts and increase the targeting efficiency of projects and programs aiming to reduce poverty. To this end, the Lao Statistics Bureau has conducted a study to assess the poverty incidence at the district level based on a method called Small Area Estimation (SAE) using data from the Lao Expenditure and Consumption Survey 2018–2019 and the Population and Housing Census 2015. This report presents poverty estimates and maps at the district level.

This report is a product of a collaborative effort between the Lao Statistics Bureau and the World Bank. The Lao Statistics Bureau greatly appreciates the technical and financial support received from the World Bank and the close collaboration that ensued. I express my hopes for a continued fruitful collaboration to expand our statistical products and disseminations that serve the needs of statistics users.

I believe the results presented in this report will provide useful insights to policymakers, inform planning and serve as a benchmark for monitoring progress in reducing poverty during the implementation of the 9th National Socio-Economic Development Plan (2021–2025), especially in the area of rural development and poverty eradication. Finally, I would like to thank in advance all those who will make use of this report. We welcome suggestions to assist the Lao Statistics Bureau in improving our analysis and reporting in the future.



Mme. Phonesaly Souksavath
Head of Lao Statistics Bureau



Supervisors

1. Mme. Phonsaly Souksavath, Head of Lao Statistics Bureau, Ministry of Planning and Investment.
2. Mme. Phetsamone Sone, Deputy Head of Lao Statistics Bureau, Ministry of Planning and Investment.
3. Mme. Thirakha Chanthalanouvong, Director General, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
4. Mr. Vilaysouk Sisoulath, Deputy Director General, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.

Lao Statistics Bureau

1. Mrs. Vongdeun Vongdala, Director General, Research and Analysis Division, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
2. Ms. Phuangmala Rasasy, Deputy Director General, Research and Analysis Division, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
3. Mr. Phangkham Thikey, Deputy Director General, Research and Analysis Division, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
4. Mr. Daosamdong Luangsisomebath, Deputy Director General, Administrative Division, National Mapping Department, Ministry of Home Affairs.
5. Mr. Nousone Nammaninh, Technical Officer, Research and Analysis Division, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
6. Ms. Phetsakhone Bounyavong, Technical Officer, Research and Analysis Division, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
7. Mr. Beeyang, Technical Officer, Research and Analysis Division, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
8. Mrs. Khamkhounheuan Phimphan, Technical Officer, Research and Analysis Division, Department of Social Statistics Bureau, Ministry of Planning and Investment.
9. Mr. Somphanid Vongdeun, Technical Officer, Research and Analysis Division, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
10. Mr. Thongxay Norlavong, Technical officer, Research and Analysis Division, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
11. Mr. Viengoudom Vongphomkong, Technical Officer, Research and Analysis Division, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
12. Mrs. Manilath Chanthabounxay, Technical Officer, Research and Analysis Division, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
13. Mrs. Kaysone Phokhay, Technical Officer, Research and Analysis Division, Department of Social Statistics, Lao Statistics Bureau, Ministry of Planning and Investment.
14. Mr. Yangxiong, Technical Officer, Methodology and Training Division, Department of Data Service, Lao Statistics Bureau, Ministry of Planning and Investment.

World Bank

1. Minh Cong Nguyen, Senior Data Scientist, Poverty and Equity Global Practice.
2. Tanida Arayavechkit, Economist, Poverty and Equity Global Practice.

Table of Contents

Foreword	i
Abstract	vi
I. Introduction	1
II. Overview of Poverty in Laos	2
Poverty methodology	2
Poverty trends	2
III. Small Area Estimation Methodology	3
Small area estimation	3
Data sources	5
IV. Modeling	7
Variable selection	7
Model selection and diagnostics	8
V. Poverty Mapping Results	23
Poverty headcount rate by province and district	23
Poverty gap index by province and district	23
Poverty severity index by province and district	23
Distribution of the poor across provinces and districts	23
VI. Conclusions and Recommendations	32
VII. References	33
Appendix 1: Survey and Census Mean Comparison	34
Appendix 2: Small Area Estimation Model	66
Appendix 3: Poverty Rate and Poor Population by District	82

TABLE

TABLE 1	Poverty Trends in Laos, 1992–1993 to 2018–2019	2
TABLE 2	Comparison of census-based poverty estimates, MSE, standard error, CV across models and transformations	13
TABLE 3	Variable selection for each province	16
TABLE A1	Vientiane Capital	34
TABLE A2	Phongsaly	36
TABLE A3	Luang Namtha, Bokeo, Huaphan	38
TABLE A4	Oudomxay	40
TABLE A5	Luang Prabang	42
TABLE A6	Xayaboury	44
TABLE A7	Xieng Khuang	46
TABLE A8	Vientiane Province	48
TABLE A9	Borikhamxay	50
TABLE A10	Khammuan	52
TABLE A11	Savannakhet	54
TABLE A12	Saravan	56
TABLE A13	Sekong	58
TABLE A14	Attapeu	60
TABLE A15	Champassak	62
TABLE A16	Xaysomboun	64
TABLE A17	Model Estimates based on LECS 6 — Vientiane Capital (Beta Model)	66
TABLE A18	Model Estimates based on LECS 6 — Phongsaly (Beta Model)	67
TABLE A19	Model estimates based on LECS 6 — Bokeo, Huaphan, Luang Namtha (Beta Model)	68
TABLE A20	Model estimates based on LECS 6 — Oudomxay (Beta Model)	69
TABLE A21	Model estimates based on LECS 6 — Luang Prabang (Beta Model)	70
TABLE A22	Model estimates based on LECS 6 — Xayaboury (Beta Model)	71
TABLE A23	Model Estimates based on LECS 6 — Xieng Khuang (Beta Model)	72
TABLE A24	Model estimates based on LECS 6 — Vientiane Province (Beta Model)	73
TABLE A25	Model estimates based on LECS 6 — Borikhamxay (Beta Model)	74
TABLE A26	Model estimates based on LECS 6 — Khammuan (Beta Model)	75
TABLE A27	Model estimates based on LECS 6 — Savannakhet (Beta Model)	76
TABLE A28	Model estimates based on LECS 6 — Saravan (Beta Model)	77
TABLE A29	Model estimates based on LECS 6 — Sekong (Beta Model)	78
TABLE A30	Model Estimates based on LECS 6 — Champassak (Beta Model)	79
TABLE A31	Model estimates based on LECS 6 — Attapeu (Beta Model)	80
TABLE A32	Model estimates based on LECS 6 — Xaysomboun (Beta Model)	81



FIGURE

FIGURE 1 Kernel density plot for residuals with a normal density overlaid	10
FIGURE 2 Standardized normal probability	11
FIGURE 3 Quantiles of a variable against the quantiles of a normal distribution	12
FIGURE 4 Percentile distribution of means of log predicted consumption	21
FIGURE 5 Percentage point differences at each percentile where poverty line falls	22
FIGURE 6 Poverty headcount rate by province	24
FIGURE 7 Poverty headcount rate by district	25
FIGURE 8 Poverty gap index by province	26
FIGURE 9 Poverty gap index by district	27
FIGURE 10 Poverty severity index by province	28
FIGURE 11 Poverty severity index by district	29
FIGURE 12 Distribution of the poor across provinces	30
FIGURE 13 Distribution of the poor across districts	31



Abstract

The lack of poverty data at local administrative levels has hindered effective poverty reduction policy planning. The Lao Expenditure and Consumption Survey (LECS), a national representative survey, is a primary source of poverty data in the Lao PDR. Based on the LECS sampling methodology, poverty rates can be estimated at national, regional, and provincial levels. This report updates district-level poverty maps for Laos using the small area estimation (SAE) technique and the most recent Lao Expenditure and Consumption Survey 2018–2019 (LECS 6) and the Population and Housing Census 2015 (PHC 4). On the one hand, LECS collects detailed information on household expenditures required for estimating monetary poverty but limits poverty estimation below the provincial level. On the other hand, PHC collects data from every household but does not include household expenditures as this data is generally too costly and time consuming to include. The SAE technique combines two sources of data and produces monetary poverty indicators at the district level. This report presents the SAE results as well as poverty estimates and poverty maps at district level. The three key findings are: i) there is a large variation in poverty rates across districts within the same province; ii) poverty is high in districts located in mountainous areas bordering Vietnam and low in districts located on the Mekong River plain and areas bordering China; and iii) districts with the highest number of poor people are mainly located in Savannakhet, Oudomxay, and Saravan.

I. Introduction

The Lao Expenditure and Consumption Survey (LECS), a national representative survey, has been conducted at five-year intervals since 1992–1993 and is a primary source of poverty data. In total, six rounds of LECS have been implemented: LECS 1 in 1992–1993; LECS 2 in 1997–1998; LECS 3 in 2002–2003; LECS 4 in 2007–2008; LECS 5 in 2012–2013; and LECS 6 in 2018–2019. Information from LECS is used for estimating official poverty statistics, identifying poor and vulnerable groups, and monitoring progress in poverty reduction. Based on the LECS sampling methodology, poverty estimates are reported at the national, regional, and provincial levels.

A lack of poverty data at local administrative levels has hindered effective poverty reduction policy planning. According to the poverty profile report 2018–2019 (LSB and World Bank, 2020), disparities within a province significantly increased between 2012–2013 and 2018–2019, explaining 83 percent of the nation’s inequality. Using provincial poverty estimates likely masks the existence of poverty pockets in relatively well-off provinces and the existence of well-off areas in relatively poor provinces, leading to poorly targeted programs. Information at lower administrative levels could help minimize leaks and permit more cost-effective and efficient poverty reduction programs.

To improve our knowledge of poverty at lower administrative levels, a method called small area estimation (SAE) can be applied using data from LECS and the Population and Housing Census (PHC). On the one hand, LECS collects detailed information on household expenditures required for estimating monetary poverty, but it limits poverty estimation below the provincial level. On the other hand, PHC collects data from every household but does not include household expenditures for which data collection is generally too costly and time consuming to include. The SAE combines two sources of data and produces monetary poverty indicators at a lower administrative level, namely district.

Updated information on spatially disaggregated indicators can inform policymakers by prioritizing the poorest districts and improving the targeting efficiency of projects and programs aimed at reducing poverty. In Laos, the SAE technique was used to produce poverty maps based on PHC 2005 and LECS 2002–2003 (Epprecht et al. 2008). The maps were updated in 2016 using the PHC 2015 and LECS 5 (Coulombe et al. 2016). Since then, LECS 6 has been made available and the poverty methodology has been revised. This report updates the poverty maps using data from LECS 6 and PHC 2015 and the revised poverty methodology to estimate poverty indicators at the district level. The SAE method adopted here increases the precision and reduces the bias of small area estimates. The method was developed by Corral, Molina, and Nguyen (2021) and builds on the pioneer method developed by Elbers, Lanjouw and Lanjouw (2003).

In this report Section 2 provides an overview of poverty in Laos. The SAE methodology and data sources are described in Section 3. Section 4 explains model selection and diagnostics. Section 5 presents poverty mapping results. Section 6 concludes with policy implications.

II. Overview of Poverty in Laos

Poverty methodology

The poverty methodology in Laos was first established in 1997–1998 and revised in 2018–2019 to better reflect changes in living standards and spending patterns. The revised poverty methodology updated the consumption aggregate to include housing rents and a wider variety of durable goods to reflect the growing importance and availability of household appliances and assets. The new national poverty line was estimated based on the ‘cost of basic needs’ approach at LAK 280,910 per month per person at 2019 prices.¹

Poverty trends

Poverty in Laos has consistently declined over the past three decades. Table 1 shows the poverty headcount rate, the poverty gap index, and the poverty severity index between 1992–1993 and 2018–2019. The poverty headcount rate is the percentage of the population living below the national poverty line. The poverty gap index, defined as the ratio by which the mean consumption by the poor falls below the poverty line, is a measure of the intensity of poverty. The poverty severity index is the squared poverty gap, measuring inequality among the poor. Over time, the poverty headcount rate in Laos fell from 46.0 percent to 18.3 percent between 1992–1993 and 2018–2019. During the same period, the poverty gap index declined from 11.2 percent to 3.9 percent while the poverty severity index dropped from 3.9 percent to 1.3 percent. It is important to note that poverty indicators in 2018–2019 are not strictly comparable with indicators in the previous years owing to a revision in the poverty methodology in 2018–2019 (LSB and World Bank, 2020).

TABLE 1 Poverty Trends in Laos, 1992–1993 to 2018–2019

Poverty indicator	1992/93	1997/98	2002/03	2007/08	2012/13	2018/19
Poverty headcount rate	46.0	39.1	33.5	27.6	23.2	18.3
Poverty gap index	11.2	10.3	8	6.5	5.5	3.9
Poverty severity index	3.9	3.9	2.8	2.3	1.9	1.3

Source: LECS 1–LECS 6

Note: Indicators for 1992–1993 are based on the 1997–1998 poverty methodology. Indicators for 2018–2019 are based on the 2018–2019 poverty methodology.

¹ In 2019, the Lao Kip fluctuated between 8,560 to 8,661 per US dollar.



III. Small Area Estimation Methodology

Small area estimation

There are numerous methods for implementing poverty mapping (Bigman and Deichmann 2000). Selecting a specific poverty mapping methodology is a critical first step in deriving poverty maps. When sufficient data are available, a small area estimation method developed by Elbers, Lanjouw and Lanjouw (2003), hereafter ELL, has gained wide popularity among development practitioners. Improvements have also been made to the ELL method to increase precision and reduce the bias of small area estimates. Most recently, Corral, Molina, and Nguyen (2021) built on the ELL model and introduced a new method by employing a Monte Carlo simulation for the point estimates and bootstrapping for the mean squared error (MSE). This method is referred to as the Census-EB method.

For this report, poverty maps were produced using the Census-EB method with the assumption that errors are assumed to be normally distributed. The poverty mapping exercise relies on the unit-level Census-EB model, which uses household-level data from the LECS 6 2018–2019 and the PHC 4 2015. The model relies on detailed consumption information from a household survey to estimate a welfare model, given a set of observable household characteristics. The parameter estimates from that model are then applied to the same set of characteristics in the population census to predict missing welfare information and then estimate expected levels of poverty across locations in the census through Monte Carlo simulation and bootstrap procedures. Although these poverty rates are estimated based on imputed consumption and are thus subject to imputation errors, they can be reasonably precise for purposes of informing policy choices (Bedi, Coudouel, and Simler 2007).

The Census-EB method can be modeled as the log of per capita household consumption

$$y_{ch} = X'_{ch} \beta + u_{ch} \quad (\text{Eq. 1})$$

where y_{ch} is the per capita consumption of household h residing in area c ; X_{ch} includes household and area characteristics; and $u_{ch} = \mu_c + \varepsilon_{ch}$ represents the residual, which is composed of the area component μ_c and the household component ε_{ch} . These two residual components have expected values of zero and are independent of each other. It is assumed that $E(u_c^2) = \sigma_\mu^2 + \sigma_\varepsilon^2$.

To estimate variance parameters, Henderson's Method III is adopted. This is a commonly used estimator for the variance parameters of a nested error model (Henderson 1953; Searle, Casella, and McCulloch 1992). The idea of EB estimation is that the residuals for households sampled in area c , $e_{ch} = y_{ch} - X'_{ch} \beta$, are informative of the latent area error μ_c . This means that conditioning on the residuals observed for sampled households should enable us to tighten the distributions from which to simulate μ_c . It should be noted that EB only concerns the drawing of the area errors, and only areas that have been sampled in the LECS benefit from the improvement offered by EB. For areas not sampled in the survey, errors are still drawn from the unconditional distribution.

The variance of the remaining residual ε_{ch} is modeled using a logistic transformation as a function of household and area characteristics

$$E[\varepsilon_{ch}^2] = \sigma_{\varepsilon, ch}^2 = \left[\frac{A e^{Z'_{ch} \alpha}}{1 + e^{Z'_{ch} \alpha}} \right] \quad (\text{Eq. 2})$$

and an estimate of the variance $\hat{\sigma}_{\varepsilon, ch}^2$ can be obtained by

$$\ln \left[\frac{\varepsilon_{ch}^2}{A - \varepsilon_{ch}^2} \right] = Z'_{ch} \alpha + \epsilon \quad (\text{Eq. 3})$$

where Z_{ch} are household and area characteristics and $A = 1.05 \max \varepsilon_{ch}^2$. Note that this approach allows for heteroskedasticity, such that the model is subsequently re-estimated to get a generalized least squares (GLS) estimate of β and of the variance-covariance matrix.

Small area point estimates are obtained through Monte Carlo simulations while noise estimates are obtained from the parametric bootstrap simulation, where under each bootstrap replicate, we obtain a 'true' rate and an estimated poverty rate from a new Monte Carlo simulation. The mean square error is obtained as the mean squared difference between the true and estimated values.

For a large number of Monte Carlo simulations, the Census-EB estimate takes the form

$$\hat{\tau}_c^{CEB} = \frac{1}{M} \sum_{m=1}^M \tau_c^{*(m)} \quad (\text{Eq. 4})$$

where $\tau_c^{*(m)}$ is an indicator function of a simulated welfare vector $y_c^{*(m)}$ under the model where we fix the beta estimates and draw location effects and a household-specific residual from their distributions.

$$y_c^{*(m)} = X'\hat{\beta} + \tilde{\mu}_c^m + \varepsilon_{ch}^m \quad (\text{Eq. 5})$$

To measure the noise of this Census-EB estimator, we apply a parametric bootstrap. Under this bootstrap method, the initial parameter estimates from the main model are fixed. For each bootstrap, one can simulate a vector of welfare in the census to obtain a ‘true’ estimate $\tau_{c,b}^*$. The same parameter estimates are used to obtain a new simulated survey sample on the same covariates X . Then, we can run a new model on this simulated survey and apply a Monte Carlo simulation to obtain a new Census-EB estimator ($\hat{\tau}_{c,b}^{CEB*}$). This new estimation is then compared with the true estimate under a simulated census vector to get a bias and bootstrap estimator of the mean squared error (MSE).

$$mse_B(\hat{\tau}_c^{CEB}) = \frac{1}{B} \sum_{b=1}^B (\hat{\tau}_{c,b}^{CEB*} - \tau_{c,b}^*)^2 \quad (\text{Eq. 6})$$

In this report, the Census-EB method is employed with 100 Monte Carlo replications and 200 bootstraps. Finally, the point estimates are obtained from the Monte Carlo simulation and their corresponding standard errors are obtained from the bootstrapped MSE. Corral, Molina, and Nguyen (2021) and Corral et al. (2022) provide greater detail on this method.

Data sources

Lao Expenditure and Consumption Survey conducted in 2018–2019 (LECS 6)

LECS 6 was a national representative survey conducted for 12 months between June 1, 2018 and May 31, 2019. Using PHC 4 as a sampling frame, the sample size of LECS 6 consisted of 10,176 households from 634 villages, of which 10,028 households were interviewed. The sample selection was conducted in two steps. The first stage was a selection of sample villages using the probability proportional to size sampling method. Villages are grouped by province and village type (urban, rural area with road access, and rural area without road access). The number of sampled villages in each province was between 25 and 46 and depended on the number of villages and the number of households in every survey area. In the second-stage sampling, 16 households were selected in every sample village. Of the total of 10,028 interviewed households, the consumption expenditure of 8,457 households was recorded using a 14-day diary, and consumption expenditure of 1,576 households was recorded using a 30-day diary. Official poverty numbers and thus SAE in this report are based on data from 8,457 households whose expenditure was recorded using a 14-day diary. Estimates from the survey are reported at the provincial and urban/rural levels.

LECS 6 consisted of five main sets of questions: i) a diary collecting the daily expenditure and consumption data of the household; ii) a household questionnaire collecting data on household situation, including employment, health, income, housing, and business activities; iii) the time used collecting information on the time allocation of the household; iv) price data in the market and village shops; and v) a village questionnaire collecting information from the village chief. The household questionnaire, which is the main data set used for SAE, comprises 15 modules, including household composition, the parents of each household member, education, employment, migration, nutrition, asset ownership, housing conditions, construction activities, household business, agriculture, health, purchases of durable goods, income and transfers, and borrowing and lending.

Population and Housing Census 2015 (PHC 4)

PHC 4 was conducted over seven days, from March 1–7, 2015. However, due to challenges in field operations, particularly in major urban cities such as Vientiane Capital, the PHC period was extended until May 10, 2015 to ensure everyone was counted. The questionnaire comprised 63 questions in 10 parts designed to capture a wide range of information about a household and its members, including demographic, socioeconomic and cultural data, disability status, fertility, internal and international migration, mortality, and housing characteristics. The total population of Laos was found to be 6,492,228 people residing in 1,198,272 households, of which 214,636 were institutional populations residing in 14,886 institutional households. An ‘institutional population’ includes residents of dormitories or boarding houses, such as students and company workers, monks living in temples, prisoners in jailhouses, orphanages, military camps, and similar places of abode. They are excluded from the SAE and poverty maps presented in this report.

IV. Modeling

Variable selection

The small area estimation modeling setup relies on estimating a consumption model based on the household survey data (LECS 6) and applying it to the census data (PHC 4) for prediction purposes. Therefore, one of the key parts of the model setup is the similarity between the variables in LECS 6 and PHC 4. As part of building a welfare model, a two-stage process was undertaken:

Step 1: Comparison of the LECS 6 and PHC 4 questionnaires to identify candidate variables present in both the survey and the census and which are generated from identical or similar questions; and

Step 2: Comparison of the distributions of the candidate variables identified in Step 1 to examine whether they appear to capture the same underlying phenomena or whether, despite similar questions, their empirical distributions differ in any important ways.

While the goal of model construction is to build a descriptive statistical model that explains the variation in per capita household consumption, the choice of candidate variables is based on a heuristic model of per capita household consumption. The per capita household consumption is often assumed to be a function of demographic characteristics of the household (for example, if it contains young children, working-age adults, or elderly people), characteristics of members of the household (such as, the maximum level of education in the household, the education level and employment status of household members, and the type of employment for those who are employed).

In addition, the household dwelling type, access to basic service, and asset ownership are assumed to describe or reflect the income level of the household and thus its consumption. Furthermore, household consumption may also vary based on the household location and its characteristics, for example, if it is rural or urban, its proximity to cities, and if it is in an area with low or high employment rates. This list is neither unique nor exhaustive, but the choice of characteristics is typically constrained by the overlap between the survey and census questionnaires. Based on the information available in the survey and census, they share common variables:

- **Demographic characteristics:** Gender, age, marital status, household size, number of children, adults, and elderly in the household, dependency ratio
- **Education:** Education level of the household head, highest level of education by any household member
- **Occupation:** Employment status, occupation, sector of employment of household head
- **Housing characteristics:** Type of housing unit, main construction material of walls, total area of land and dwelling, ownership and occupancy status of dwelling, source of drinking water and electricity, type of sewage and toilet

- **Productive and durable assets:** Ownership of a cooler, refrigerator, freezer, electrical generator, cooker, television, washing machine, dishwasher, water heater, heater, electric fan, air conditioner, vacuum cleaner, motorcycle, car, and personal computer

The level at which regression models are run must be chosen carefully. If a single model is specified for the entire country, the implicit assumption is that the parameter estimates on the regressors are the same for all regions of the country. In other words, a national model assumes that the relationship between household expenditure and household characteristics are uniform throughout the country. This may not be a tenable assumption in a country like Laos, which has wide spatial heterogeneity in incidence of poverty, endowment of natural resources, and robustness of factor markets. For example, returns on education are likely higher in capital areas where the formal job market is more robust than in the poorest regions with thin labor markets.

For Laos, fitting separate models by province allows the relationship between expenditure and the explanatory variables to vary, and it reduces the standard error of poverty prediction due to modeling error. An alternative way to allow the coefficients to vary by province is to interact the variables with provincial dummy variables in the regression. This approach is flexible enough to allow differential relationships across provinces and minimizes the chances of overfitting. One concern with running multiple models is the loss in degrees of freedom and the risk of overfitting (that is, the models are forced to explain the noise in the data in a small sample). To avoid the problem of overfitting, researchers recommended that the sample size be no smaller than 300 for each regression (Ahmed et al. 2014).

Assignment of candidate variables for matching was done using both automatic procedures (percentage point differences less than 5 or 15) and manual selection, comparing regionally representative means in the two data sources. Those variables deemed acceptable were included in the model selection process. For those that were shown to differ too greatly from one another—due, for instance, to slight differences in the wording of the question or the choice of respondent—the variable was excluded and not used in the model development process. Tables with survey and census means for each province can be found in Appendix 1.

Model selection and diagnostics

From the pool of variables that were not excluded for comparability concerns, a variety of model selection techniques were used to determine the best performing model and to evaluate performance based on several alternative criteria. The poverty map for Laos uses a stepwise model (an automated variable selection routine borrowed from the machine learning literature), to minimize overfitting by incorporating degrees of freedom into the evaluation.

Stepwise regression uses a threshold value to determine which variables are included in the model. There are three main approaches to stepwise regression for model selection: forward, backward, and bidirectional. In this case, backward stepwise was used (the

default option in the Stata software). The process begins with all variables included in the model and removes those with p-values greater than the threshold value of 0.2. As stepwise is particularly sensitive to collinearity, an additional preprocessing step was taken to remove these variables from the model. The variance inflation factor (VIF) is a measure of multicollinearity between variables in an ordinary least squares regression (OLS). Although a VIF of 10 or higher indicates the presence of collinearity, here a more conservative threshold of 5 is used to exclude variables.²

The modeling procedure for SAE can be summarized as follows:³

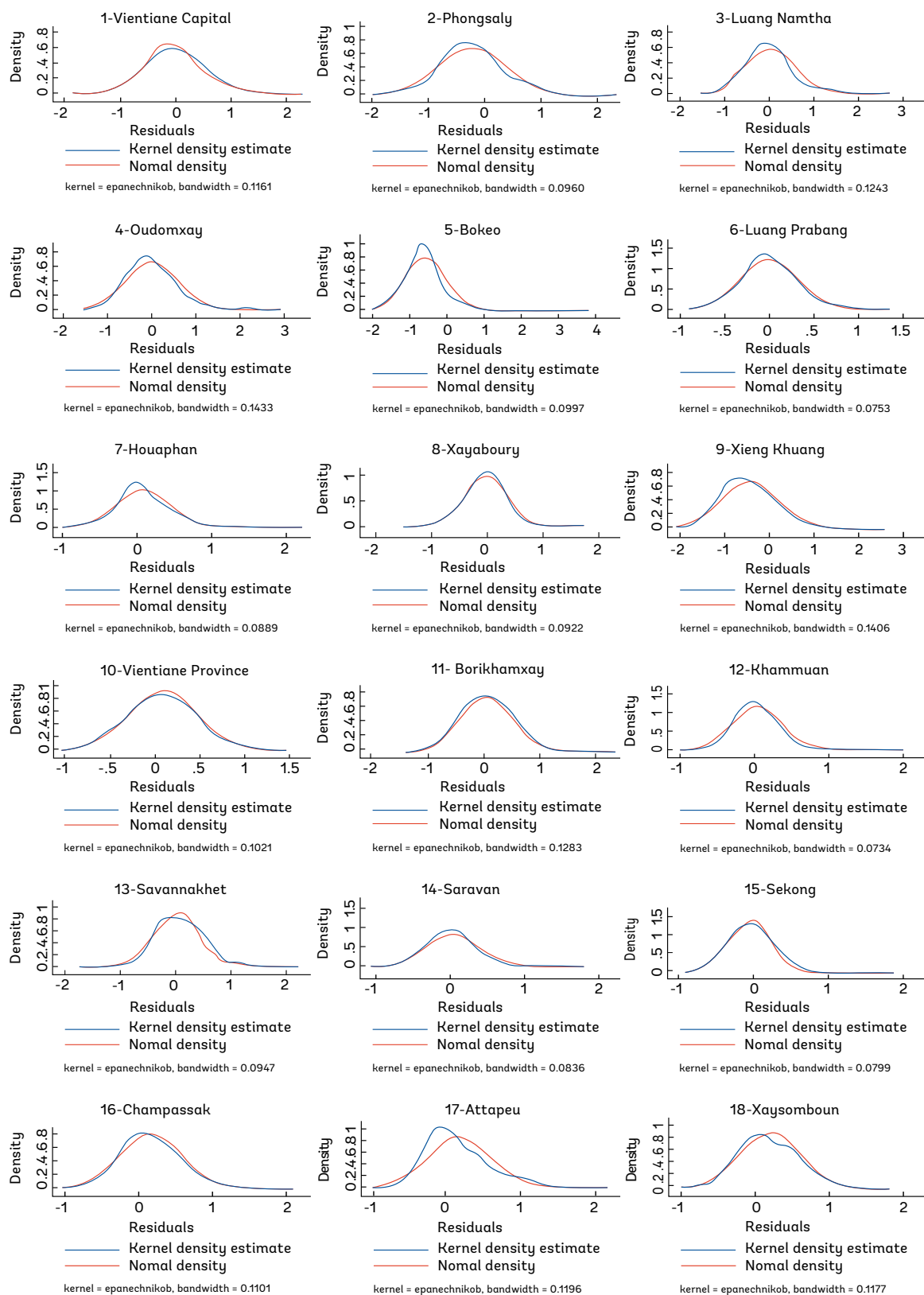
- a. Variable selection process starts with a step-by-step VIF (using a threshold of 5) check and stepwise based on the list of comparable variables. This step produces a list of variables.
- b. SAE takes this variable list and run with OLS, a stepwise for alpha mode, then finally GLS.
- c. The most insignificant variable in the GLS estimates is removed, and the process restarts from step a).
- d. This process stops when all the variables in the final GLS model are all significant at the 5 percent level.

The SAE models often assume normality. In simulation studies that seek to validate SAE methods, based on actual data, data-driven transformations may reduce bias and noise due to departures from normality (see Corral et al. 2021 and Tzavidis et al. 2018 among others). For example, Figures 1, 2 and 3 show the linearity and normality of the residuals in each province before any transformation. In each provincial graph, the assumptions hold although some distributions are skewed to the right, suggesting transformation is needed.

² See Thompson (1995) for more information about the potential drawbacks to stepwise procedures for modeling.

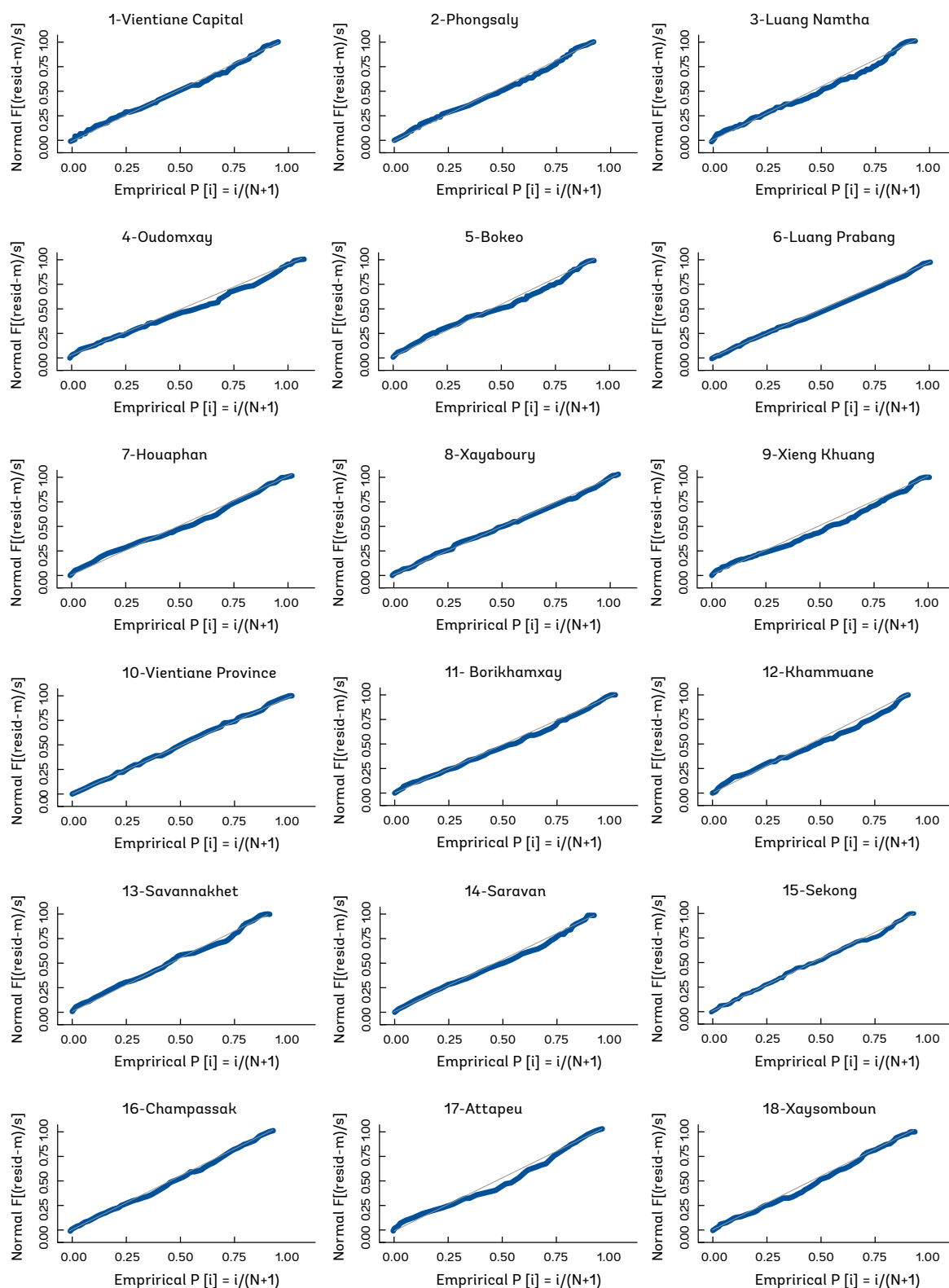
³ The steps are implemented in `sae_auto_model` procedure (Stata ado).

FIGURE 1 Kernel density plot for residuals with a normal density overlaid



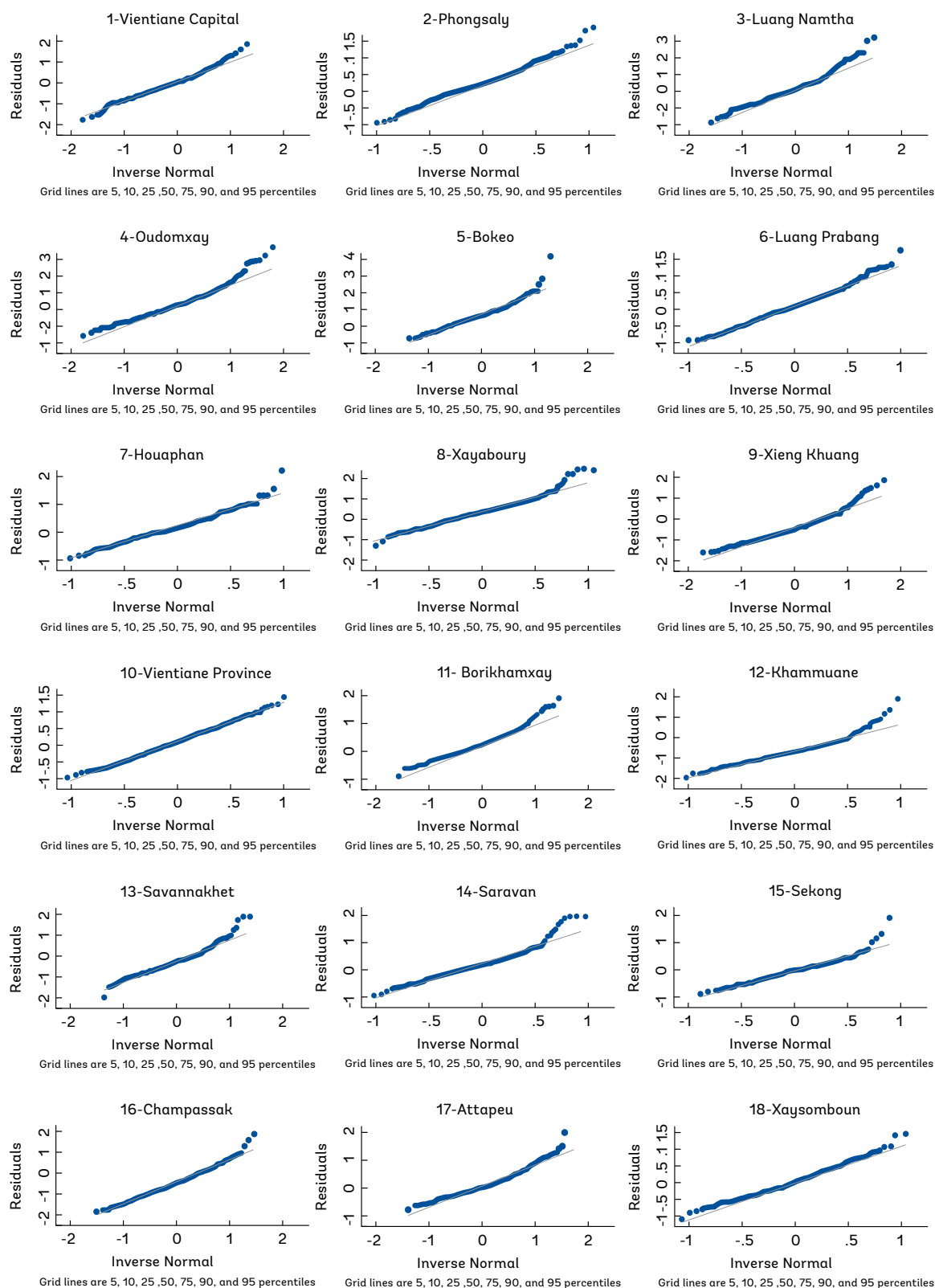
Source: Authors' calculations based on LECS 6.

FIGURE 2 Standardized normal probability



Source: Authors' calculations based on LECS 6.

FIGURE 3 Quantiles of a variable against the quantiles of a normal distribution



Source: Authors' calculations based on LECS 6.

In the validation exercises conducted in this report, bias and MSEs are reduced for some provinces when using a Box-Cox (bcox) or a log-shift transformation (lnskew). Table 2 reports the final variable selections across provinces resulting from applying backward stepwise and iterative GLS procedures to the list of comparable variables with 5, 10, and 15 percentage point differences between survey and census, together with options for transformation (Box-cox, log-shift transformation, and no transformation). The final selection is based on the comparison of poverty estimates at the provincial level from the survey, mean squared error, coefficient of variation across all three results sets, while also taking into account the distribution of residuals. Table 3 lists the variables included in the final model selected for each province. Estimation results of the final model are shown in Appendix 2.

TABLE 2 Comparison of census-based poverty estimates, MSE, standard error, CV across models and transformations

Province	Survey estimates	Final selected models		
		bcox	lnskew	no
1-Vientiane Capital				
Poverty rate	5.00	5.07	5.12	5.55
Mean squared error (MSE)*10000		1.34	1.39	1.25
Standard error	1.41	1.16	1.18	1.12
Coefficient of variation (CV)		22.85	23.05	20.13
2-Phongsaly				
Poverty rate	8.09	NA	7.84	9.41
Mean squared error (MSE)*10000			1.91	2.04
Standard error	1.78		1.38	1.43
Coefficient of variation (CV)			17.64	15.18
3-Luang Namtha				
Poverty rate	10.57	NA	11.78	11.13
Mean squared error (MSE)*10000			3.30	3.15
Standard error	5.88		1.82	1.77
Coefficient of variation (CV)			15.42	15.95
4-Oudomxay				
Poverty rate	29.16	NA	28.59	26.19
Mean squared error (MSE)*10000			3.70	2.68
Standard error	3.72		1.92	1.64
Coefficient of variation (CV)			6.73	6.25

Province	Survey estimates	Final selected models		
		bcox	lnskew	no
5-Bokeo				
Poverty rate	19.37	NA	21.42	20.56
Mean squared error (MSE)*10000			2.95	2.88
Standard error	3.20		1.72	1.70
Coefficient of variation (CV)			8.01	8.26
6-Luang Prabang				
Poverty rate	20.39	NA	20.69	20.55
Mean squared error (MSE)*10000			1.90	2.16
Standard error	8.10		1.38	1.47
Coefficient of variation (CV)			6.67	7.14
7-Huaphan				
Poverty rate	26.61	28.13	29.11	27.85
Mean squared error (MSE)*10000			3.18	3.14
Standard error	7.33		1.78	1.77
Coefficient of variation (CV)			6.12	6.37
8-Xayaboury				
Poverty rate	21.13	21.21	21.37	21.23
Mean squared error (MSE)*10000		2.53	2.86	3.01
Standard error	2.13	1.59	1.69	1.74
Coefficient of variation (CV)		7.50	7.91	8.18
9-Xieng Khuang				
Poverty rate	26.03	25.74	27.91	26.65
Mean squared error (MSE)*10000		3.41	4.21	4.03
Standard error	5.74	1.85	2.05	2.01
Coefficient of variation (CV)		7.17	7.35	7.53
10-Vientiane Province				
Poverty rate	5.27	8.26	8.36	8.15
Mean squared error (MSE)*10000		1.68	1.76	1.47
Standard error	2.20	1.30	1.33	1.21
Coefficient of variation (CV)		15.71	15.87	14.86
11-Borikhamxay				
Poverty rate	20.61	25.41	25.08	22.78
Mean squared error (MSE)*10000		3.29	3.67	4.13
Standard error	7.33	1.82	1.92	2.03
Coefficient of variation (CV)		7.46	8.15	8.93

Province	Survey estimates	Final selected models		
		bcox	lnskew	no
12-Khammuan				
Poverty rate	25.52	NA	28.98	24.05
Mean squared error (MSE)*10000			5.89	5.89
Standard error	7.01		2.43	2.43
Coefficient of variation (CV)			8.37	10.09
13-Savannakhet				
Poverty rate	27.54	29.30	29.36	28.45
Mean squared error (MSE)*10000		3.10	3.97	3.55
Standard error	4.93	1.76	1.99	1.88
Coefficient of variation (CV)		6.01	6.79	6.62
14-Saravan				
Poverty rate	24.89	31.17	31.20	30.48
Mean squared error (MSE)*10000		3.45	5.00	4.92
Standard error	6.03	1.86	2.24	2.22
Coefficient of variation (CV)		5.96	7.17	7.27
15-Sekong				
Poverty rate	30.62	NA	29.80	29.37
Mean squared error (MSE)*10000			5.69	6.00
Standard error	8.32		2.38	2.45
Coefficient of variation (CV)			8.00	8.34
16-Champassak				
Poverty rate	8.74	12.33	15.06	14.15
Mean squared error (MSE)*10000		2.13	3.26	2.70
Standard error	2.50	1.46	1.80	1.64
Coefficient of variation (CV)		11.83	11.99	11.61
17-Attapeu				
Poverty rate	27.84	25.83	26.75	25.53
Mean squared error (MSE)*10000		3.56	4.29	4.64
Standard error	5.13	1.89	2.07	2.15
Coefficient of variation (CV)		7.30	7.74	8.44
18-Xaysomboun				
Poverty rate	8.17	10.79	9.96	11.29
Mean squared error (MSE)*10000		2.14	2.64	2.87
Standard error	2.91	1.46	1.62	1.69
Coefficient of variation (CV)		13.56	16.30	15.00

Note: bcox = Box-Cox; lnskew = log-shift transformation; NA: not available, the model did not converge.

TABLE 3 Variable selection for each province

Variable	Description	Province																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Demographics																			
hhsiz_e_1	Household with one member															x			
hhsiz_e_2	Household with two members															x			
hhsiz_e_3	Household with three members									x		x	x			x	x	x	
hhsiz_e_4	Household with four members		x	x		x		x	x							x			x
hhsiz_e_5	Household with five members															x			
hhsiz_e_6	Household with six members									x	x	x	x	x	x		x	x	
age1t14_sm	Number of household members aged 1-14	x																	
age15t24_sm	Number of household members aged 15-24	x																	
age25t64_sm	Number of household members aged 25-64						x									x			
age65pl_sm	Number of household members aged 65 and older						x											x	
age1t14_mn	Share of household members aged 1-14			x		x		x											
age15t24_mn	Share of household members aged 15-24						x												
age25t64_mn	Share of household members aged 25-64			x		x		x	x	x			x						
depratio	Dependency ratio	x					x								x	x	x	x	
age1t14_yn	Household with at least one child aged 0–14				x					x									
age15t24_yn	Household with at least one individual aged 15–24	x													x	x	x	x	x
age25t64_yn	Household with at least one individual aged 25-64			x		x		x	x										
child_1	Household with one member aged 1 to 14			x		x		x	x	x						x			
child_2	Household with two members aged 1 to 14									x			x	x					
child_3	Household with three members aged 1 to 14									x			x	x					

Variable	Description	Province																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
male_mn	Share of male household members	x																	
male_yn	Household with at least one male member			x		x		x	x		x	x			x			x	
female_yn	Household with at least one female member	x		x		x		x	x		x								
married_sm	Number of household members who are married															x			
widowed_sm	Number of household members who are widowers				x											x			
widowed_mn	Share of household members who are widowers			x		x	x	x	x										
single_mn	Share of household members who are single		x	x	x	x		x	x			x							
married_yn	Household with at least one married member		x	x		x		x	x			x							x
widowed_yn	Household with at least one widowed member																	x	
single_yn	Household with at least one single member	x					x			x	x		x	x	x		x		x
ethnicity2_mn	Share of Hmong-lumien household members				x														
ethnicity1_yn	Household with at least one Lao-Tai member						x								x				
ethnicity2_yn	Household with at least one Mon-Khmher member			x		x		x	x										
age_head	Age of household head			x		x		x	x										x
ln_hdage	Log of household head age				x											x			
age25t64_head	Household head aged 25–64	x										x							
male_head	Household head is male											x							x
married_head	Household head is married									x			x						
widowed_head	Household head is a widower		x																
ethnicity3_head	Household head from Hmong-lumien ethno-linguistic group										x								
ethnicity4_head	Household head from Chinese-Tibetan ethno-linguistic group		x																

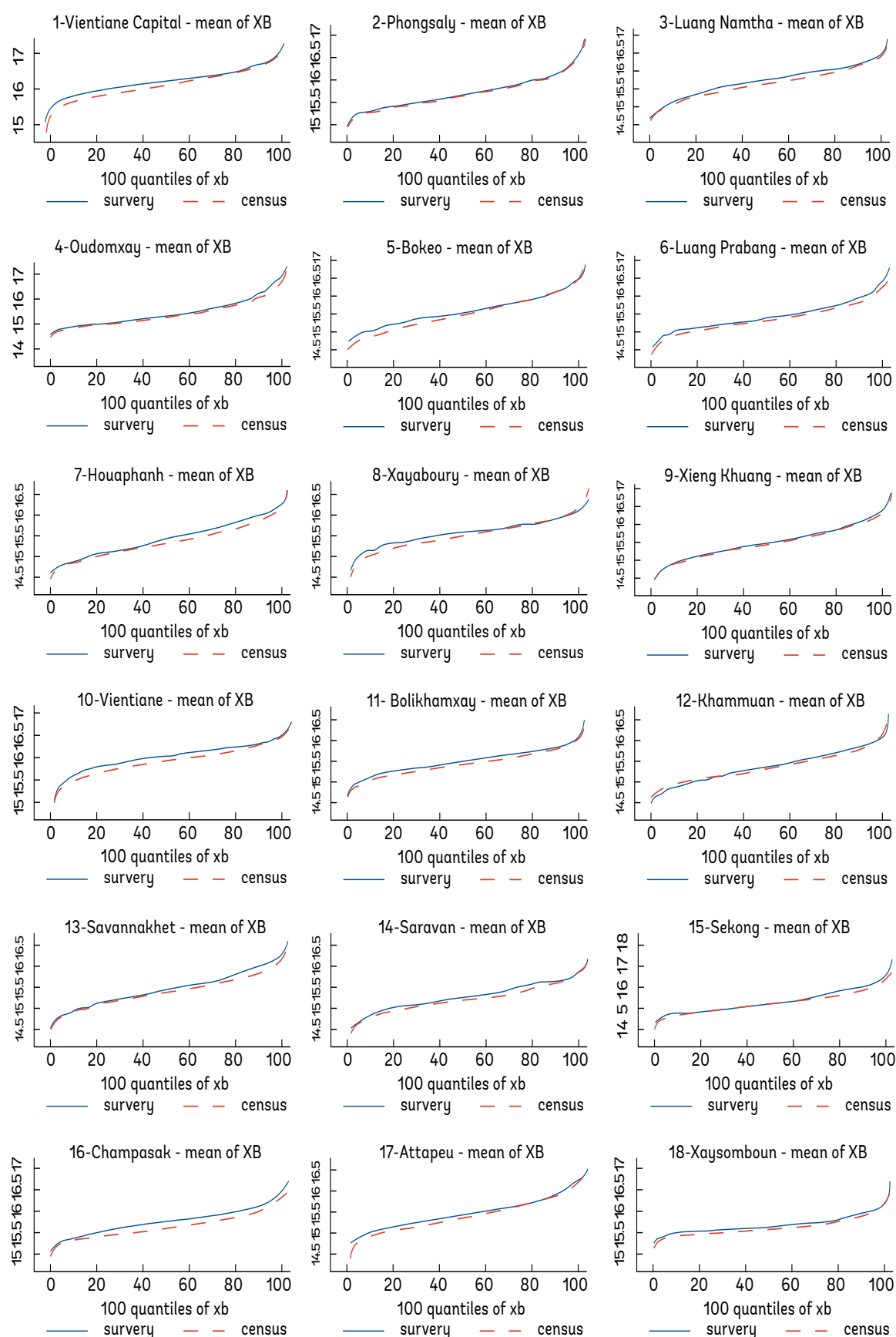
Variable	Description	Province																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Education																			
linschool_share	Share of enrollment among children aged 6-18									x			x	x		x			
literacy_mn	Share of literate household members	x	x	x		x	x	x	x			x							
pri_com_mn	Share of household members with completed primary education		x	x		x		x	x										
usec_com_mn	Share of household members with completed upper secondary education																		x
evereduc_share	Share of ever educated among adults aged 15-64			x		x		x	x		x					x			
literacy_share	Share of literacy among adults aged 15-64														x	x	x	x	
usecedu_share	Share of lower secondary and above among adults aged 15-64	x	x																
pri_com_sm	Number of household members with completed primary education						x												
literacy_yn	Household with at least one literate member			x		x		x											
pri_com_yn	Household with at least one member with completed primary education															x			
pri_com_head	Household head with completed primary education															x			
lsec_com_head	Household head with completed lower secondary education									x			x	x					
lsec_abv_head	Household head with completed lower secondary education and above									x	x		x	x	x		x	x	
usec_abv_head	Household head with completed upper secondary education and above				x														
everattd_head	Household head used to attend school									x			x	x					

Variable	Description	Province																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Dwelling and access to services																			
village_type	Village type	x		x	x	x	x	x	x										
urban	Urban																x	x	
urb_loghhsz	Urban x Log of household size			x		x	x	x	x										x
rur_road	Rural with road access											x				x			
floor_area	Household living areas									x			x	x					
nrooms	Number of rooms	x	x	x	x	x	x	x	x		x	x	x	x		x			
roof_mat2	Roof made of zinc	x														x	x	x	
wall_mat3	Wall made of bamboo															x			
floor_mat3	Floor made of wood				x														
floor_mat4	Floor made of other materials				x								x	x					
grid_elec	Household with access to grid electricity															x			
gen_elec	Household with owned electricity generator															x			
ene_gas	Household mainly using gas for cooking												x	x					
ene_wood	Household mainly using wood for cooking		x	x	x	x	x	x				x				x			x
ene_charcoal	Household mainly using charcoal for cooking	x																	
nat_water	Household with access to natural water: well, spring, rainwater															x			
toilet_flush	Household with flush toilet									x			x	x		x			
Asset ownership																			
tractor	Household with tractor															x			
car	Household with car															x			
motorbike	Household with motorbike									x	x			x					
bicycle	Household with bicycle															x			
radio	Household with radio			x		x		x			x								
tv	Household with TV	x		x		x		x	x	x	x			x					
cellphone	Household with cellphone		x				x			x			x		x		x		x
computer	Household with computer						x										x		
washmach	Household with washing machine															x			
ac	Household with air conditioning (AC)															x			
agri_land	Household with agricultural land									x			x	x					

Variable	Description	Province																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Province and district level																			
hhsizem_d_s	Household size, district average			x		x		x	x										
ethnicity4_m_p_s	Share of Chinese-Tibetan household members, provincial average			x		x		x	x										
ethnicity2_m_d_s	Share of Mon-Khmer household members, provincial average											x							
rur_road_m_d_s	Households in rural villad with road access, district average											x							
floor_area_m_p_s	Household living areas, provincial average									x			x	x					
nrooms_m_p_s	Number of rooms, provincial average			x		x		x	x										
roof_mat1_m_d_s	Roof made of tile/sipax/concrete, district average											x							
wall_mat2_m_p_s	Wall made of wood, provincial average									x			x	x					
toilet_oth_m_p_s	Household with neither flush nor pit-latrine toilet, provincial average														x		x	x	
toilet_oth_m_d_s	Household with neither flush nor pit-latrine toilet, district average						x												
tractor_m_d_s	Household with tractor, district average			x		x		x	x										
fan_m_d_s	Household with fan, district average		x																

Note: 1-Vientiane Capital; 2-Phongsaly; 3-Luang Namtha; 4-Oudomxay; 5-Bokeo; 6-Luang Prabang; 7-Huaphan; 8-Xayaboury; 9-Xieng Khuang; 10-Vientiane Province; 11-Borikhamxay; 12-Khammuan; 13-Savannakhet; 14-Saravan; 15-Sekong; 16-Champassak; 17-Attapeu; 18-Xaysomboun
*Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * p <.1 ** p <.05 *** p <.01*

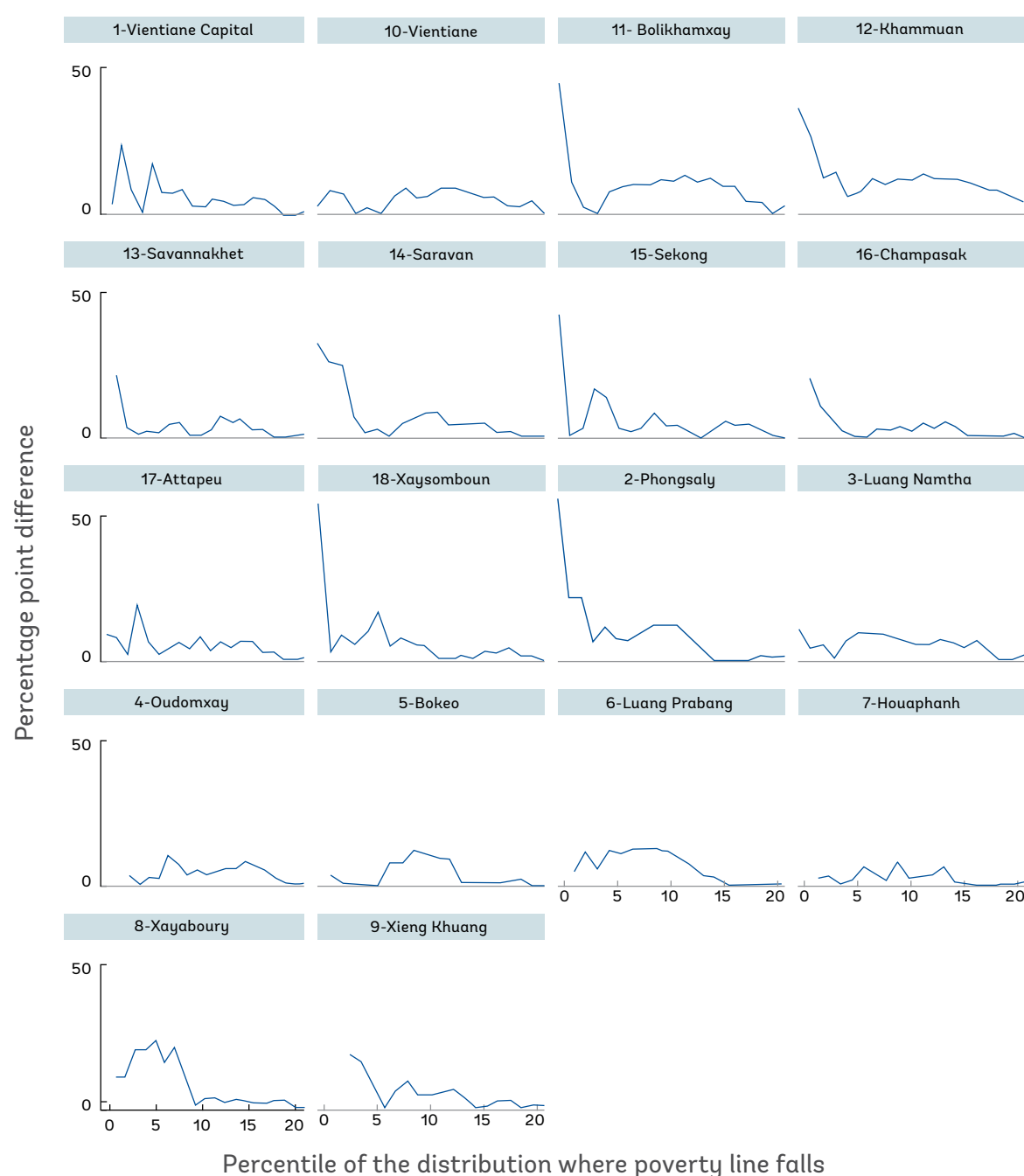
Given the final model selection, Figure 4 shows the level of comparability between the survey and census data from all parts of the distributions. The figures show means of log of predicted consumption simply based on the set of coefficients from the ordinary least squares (OLS) models and the covariates in the survey and the census. It shows the regional data are comparable at all parts of the distributions, without controlling for the heteroskedasticity of households and different locations and areas.

FIGURE 4 Percentile distribution of means of log predicted consumption

Source: Authors' calculations based on LECS 6 and PHC 4.

To measure how good a model is within the SAE setting, we ran the models and imputed into the same survey data at all percentiles of the distributions where the poverty line falls (i.e., 5th percentile corresponds to a poverty line defined for each region with the poverty rate of 5 percent). Figure 5 shows how large the percentage point differences are from the survey estimates for each province calculated at all percentile-equivalent poverty lines. In a theoretical setting, one would see a small percentage point difference across all parts of the distribution, however, with real-world data, this is hard to achieve. In some provinces, in the lower part of the distributions, the percentage point difference is large.

FIGURE 5 Percentage point differences at each percentile where poverty line falls



Source: Authors' calculations based on LECS 6 and PHC 4.

V. Poverty Mapping Results

Poverty headcount rate by province and district

Figure 6 and Figure 7 show the poverty headcount rate by province and district. The poverty incidence is highest in northern and southern provinces, namely, Oudomxay, Huaphan, Saravan and Sekong. Vientiane Capital shows the lowest poverty headcount rate. At a more disaggregated level, poverty is high in districts located in mountainous areas bordering Vietnam and low in districts located on the Mekong River plain and those bordering China. Luang Prabang and Savannakhet exhibit substantial variations in poverty. In Luang Prabang Province, the poverty headcount rate ranges from 3.3 percent in Luang Prabang District to 54.4 percent in Ngoy District. In Savannakhet, the poverty headcount rate ranges from 7.0 percent in Kaysone Phomvihane District to 60.0 percent in Nong District. Appendix 3 reports the district-level poverty headcount rates with their standard errors.

Poverty gap index by province and district

Figure 8 and Figure 9 show the poverty gap index by province and district. The poverty gap is highest in Xieng Khuang and Saravan, and lowest in Vientiane Capital, Phongsaly, Xaysomboun and Sekong. Vientiane capital shows the lowest poverty headcount rate. However, results at a district level shows that high poverty gap districts do not necessarily belong to Xieng Khuang and Saravan. In fact, they spread across Xieng Khuang (Mok May District), Borikhamxay (Viengthong District, Xaichamphon District), Khammuan (Boulapha District), Luang Prabang (Ngoy District, Phonthong District), Huaphan (Kone District), Oudomxay (Nga District), Xayaboury (Xaisathan District), Saravan (Ta Oy District, Toumlane District, Sa Mouay District), Savannakhet (Sepohn District, Nong District, Assaphone District), and Attapeu (Sanxay District).

Poverty severity index by province and district

Figure 10 and Figure 11 show the poverty severity index by province and district. Similar to the poverty gap index, the poverty severity index is highest in Xieng Khuang and Saravan. Moreover, districts with relatively high poverty gaps tend to have relatively high poverty severity.

Distribution of the poor across provinces and districts

Figure 12 and Figure 13 show the poor are concentrated in Savannakhet, Saravan, Khammuan, and Luang Prabang. These provinces exhibit high poverty headcount rates and large populations. Districts with the highest number of poor are spread across Oudomxay (Xay District, Nga District, Houne District), Xayaboury (Sainyabuli District), Savannakhet (Outhoumphone District, Champhone District, Xonaboury District, Songkhone District, Phine District, Sepohn District, Nong District, Assaphone District), Saravan (Saravane District, Toumlane District, Lao Ngam District), and Champassak (Khong District).

FIGURE 6 Poverty headcount rate by province

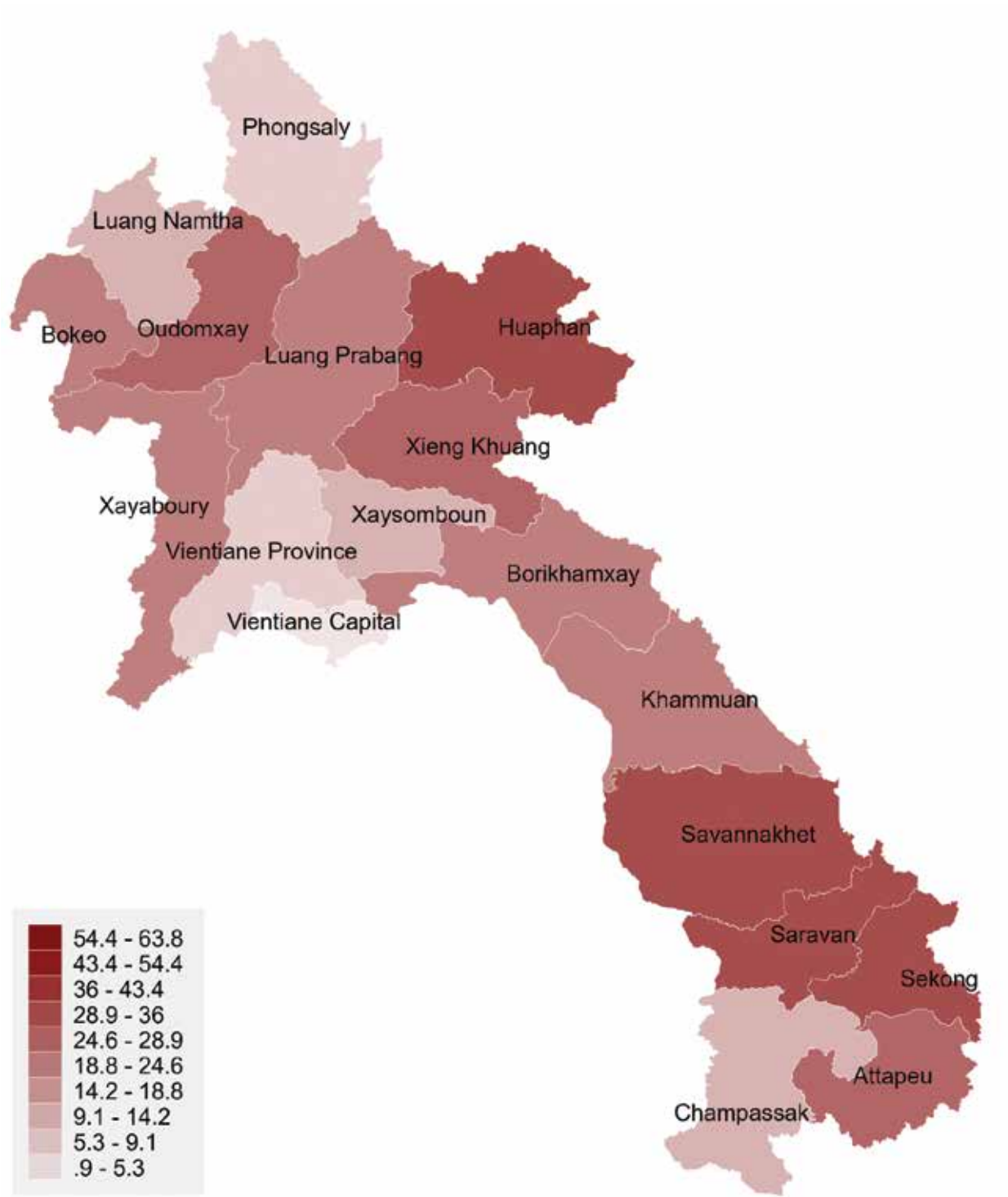


FIGURE 7 Poverty headcount rate by district

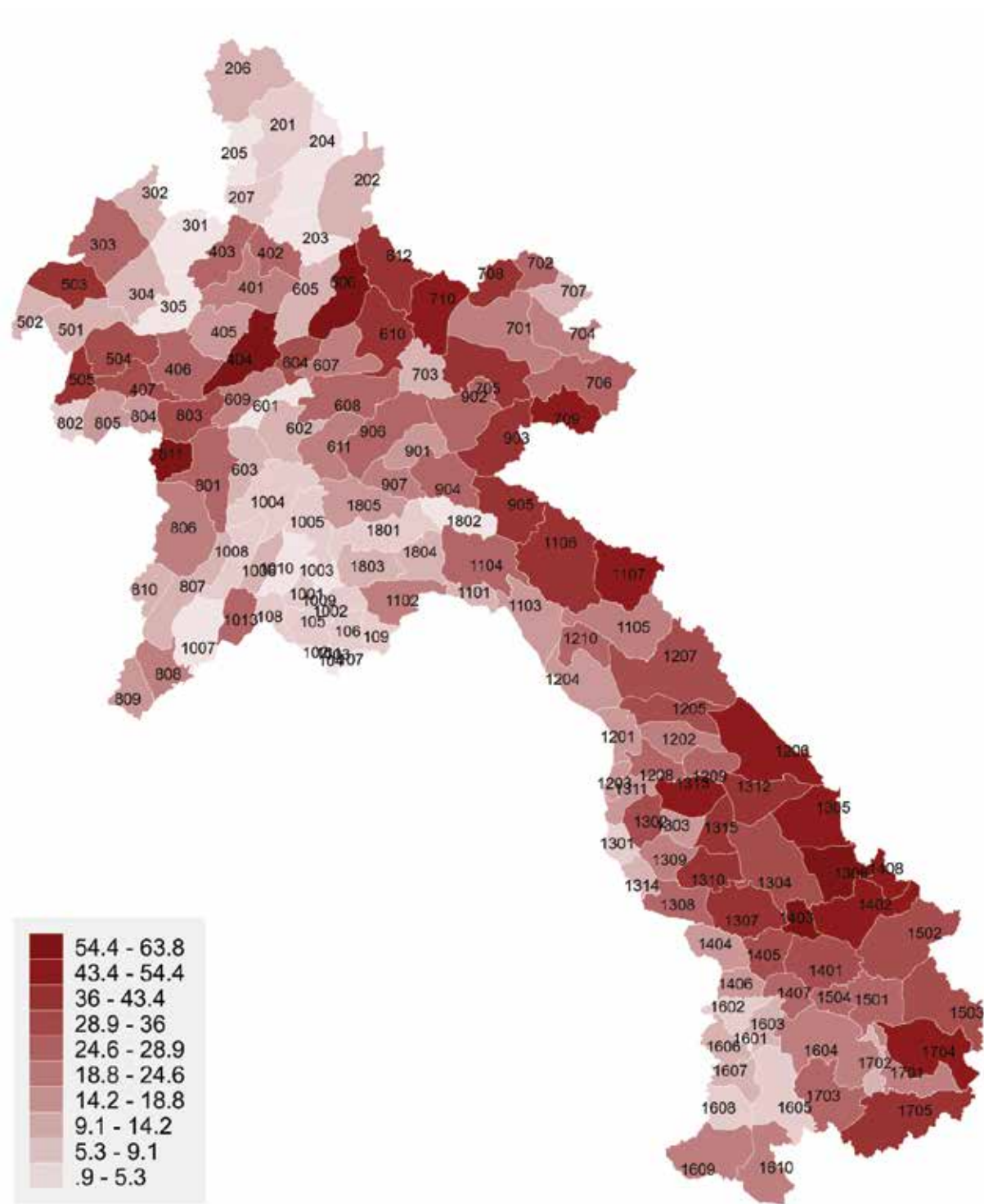


FIGURE 8 Poverty gap index by province

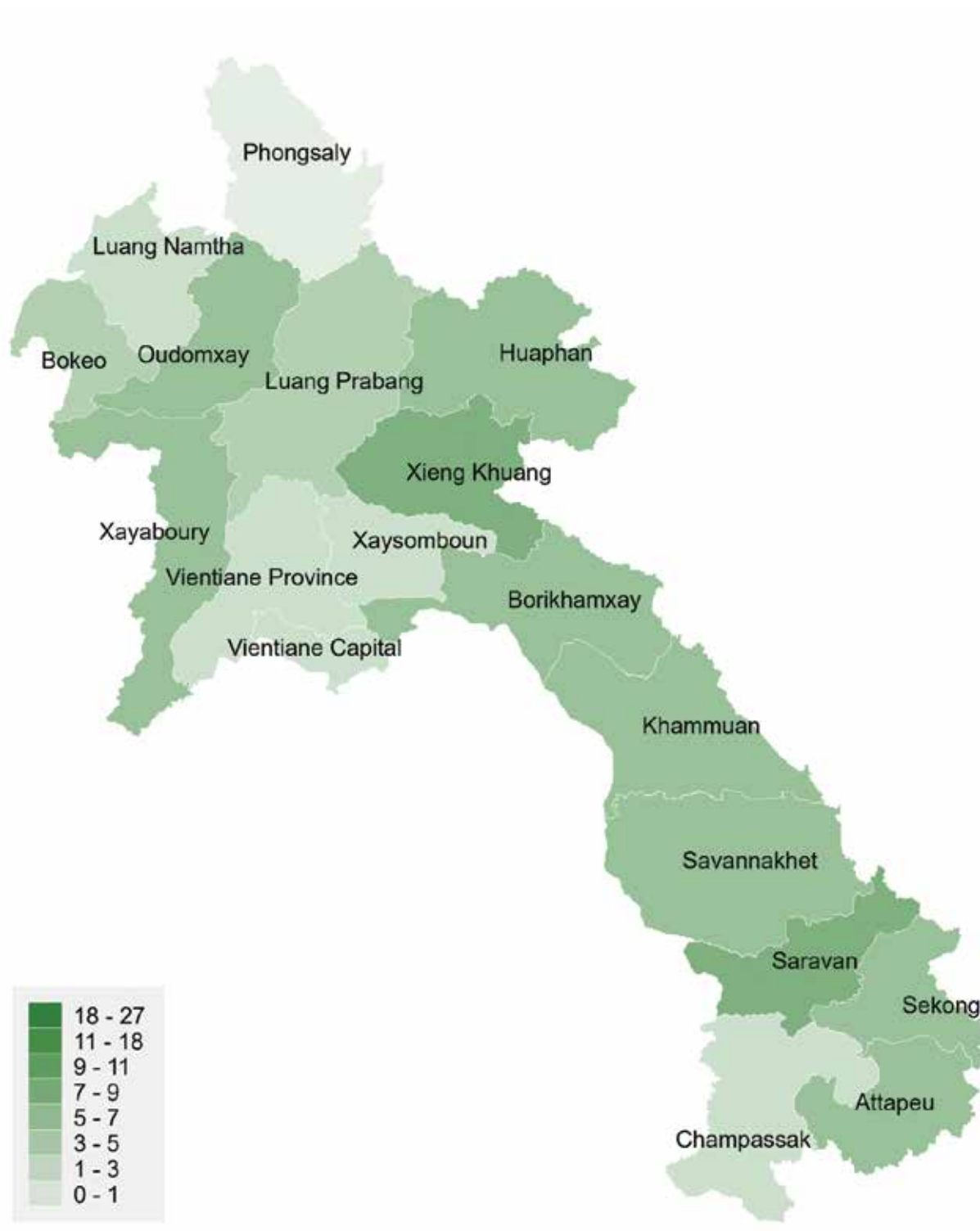


FIGURE 9 Poverty gap index by district

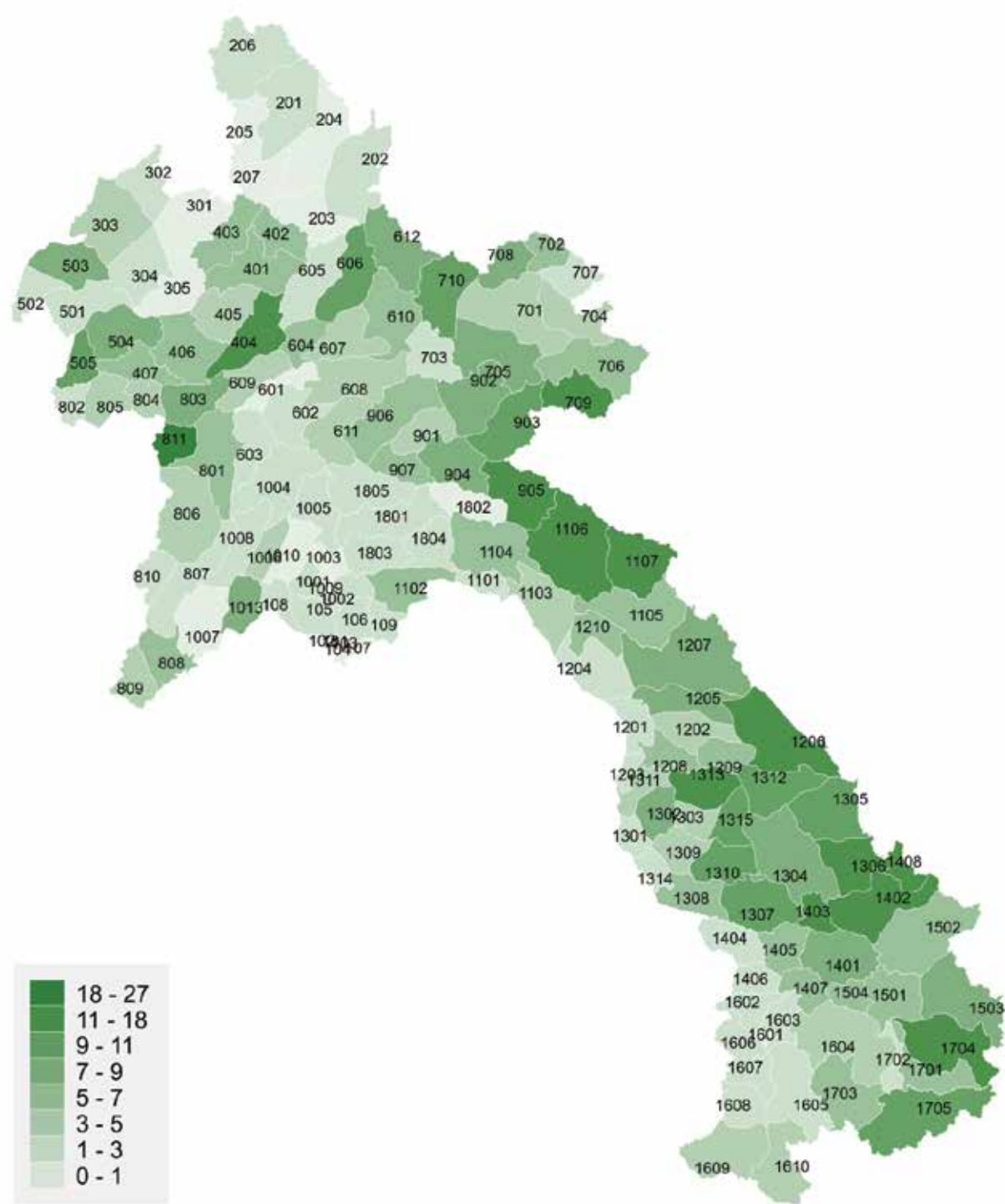


FIGURE 10 Poverty severity index by province

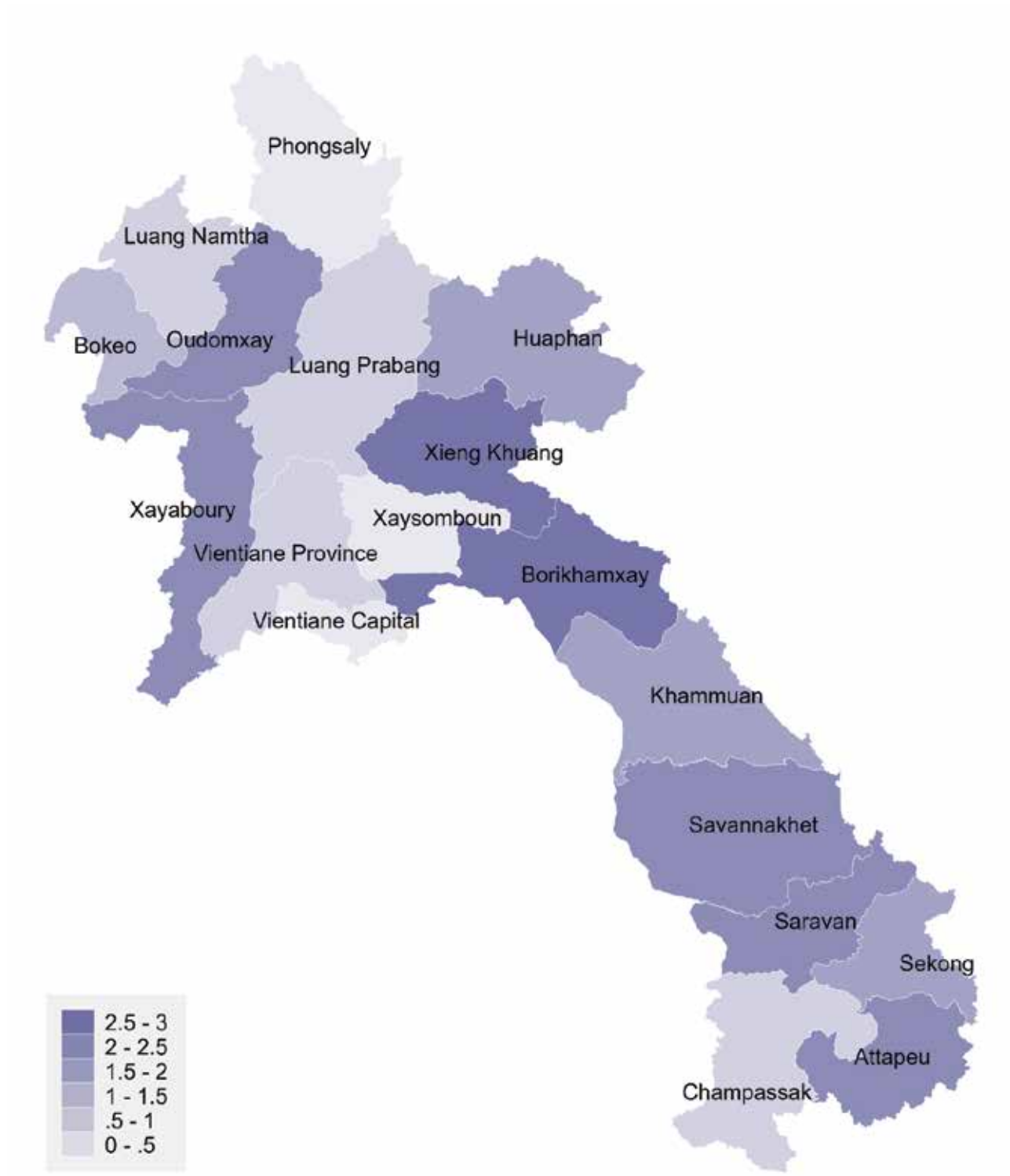


FIGURE 11 Poverty severity index by district

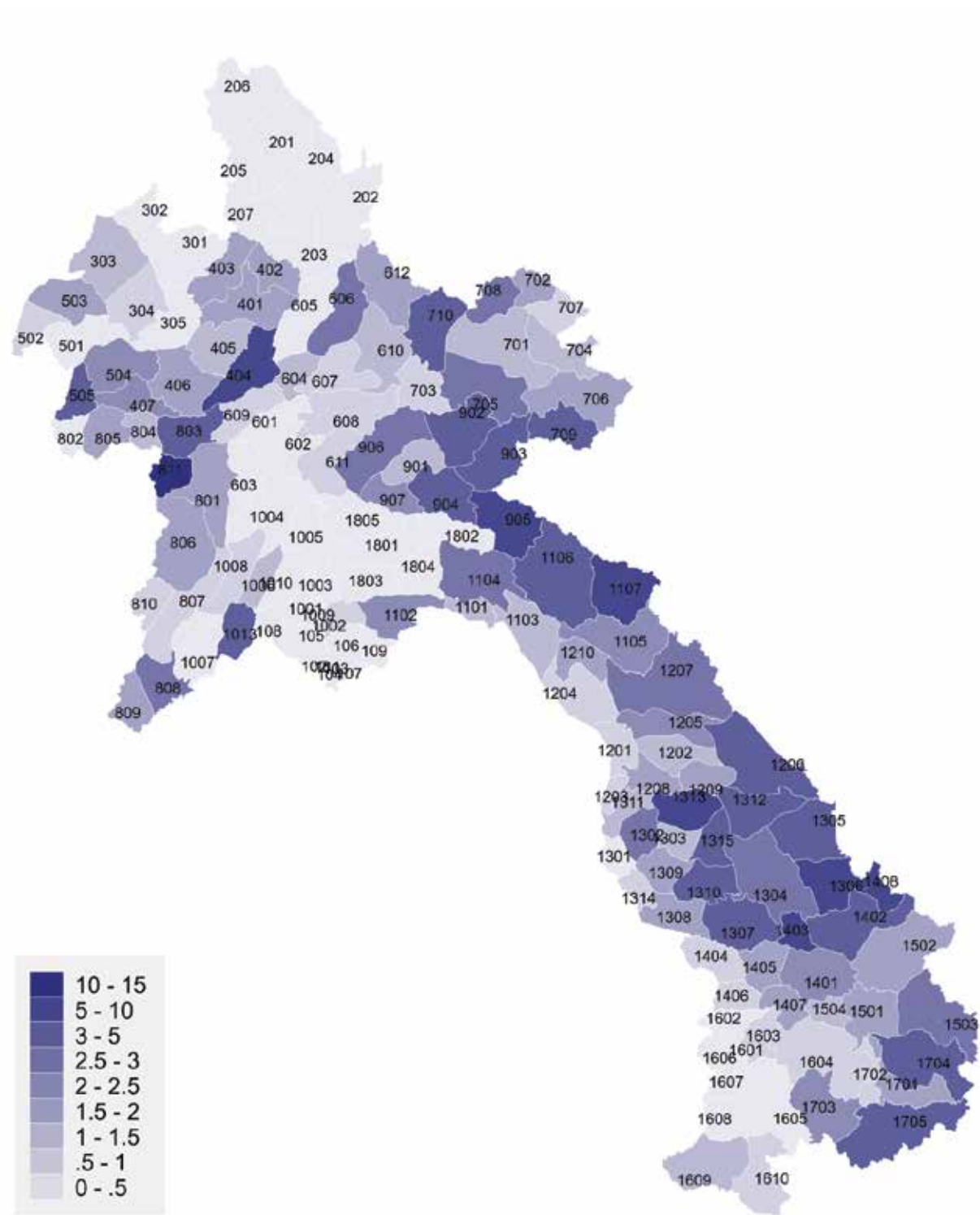
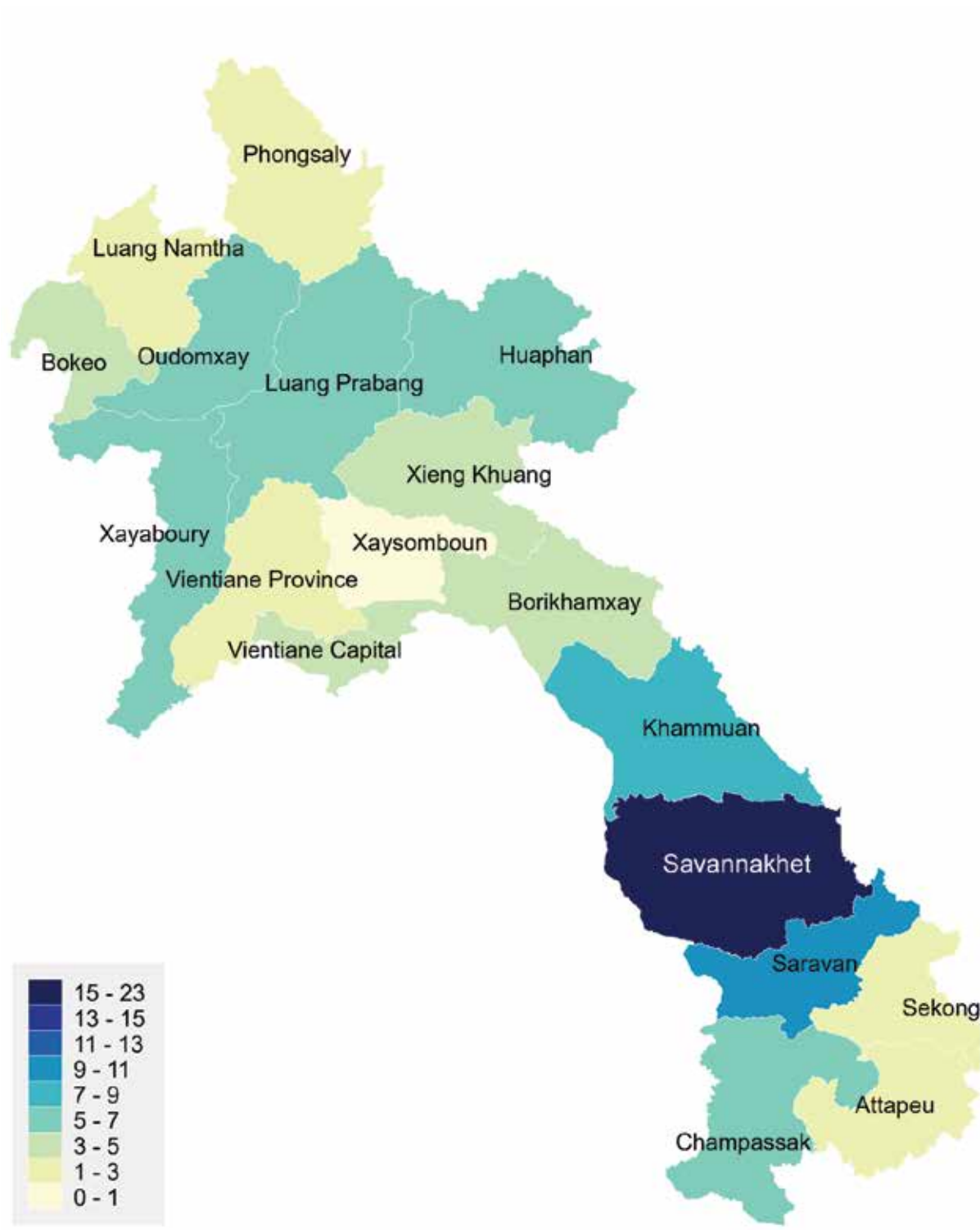


FIGURE 12 Distribution of the poor across provinces



VI. Conclusions and Recommendations



This report updates the province- and district-level poverty maps for Laos using the small area estimation technique and the most recent Lao Expenditure and Consumption Survey 2018–2019 (LECS 6) and Population and Housing Census 2015 (PHC 4). Three key findings of the report are: i) poverty is high in districts located in mountainous areas bordering Vietnam and low in districts located on the Mekong River plain and those bordering China; ii) there is a large variation in poverty rates across districts within the same province; and iii) districts with the highest number of the poor are primarily in Savannakhet, Oudomxay, and Saravan.

These results can be used to design budget allocations to maximize the impact of poverty reduction programs by allocating more budget to districts with higher poverty headcount rates, poverty gap index, poverty severity index, and number of poor. Moreover, by integrating poverty maps with other spatial information, these results can be used to analyze the relationships between poverty and other development indicators such as infrastructure access, market access, public service delivery, exposure to natural hazards, climate change vulnerability, and agricultural production.

VII. References

- Ahmed, Faizuddin; Dorji, Cheku; Takamatsu, Shinya and Yoshida, Nobuo. *Hybrid survey to improve the reliability of poverty statistics in a cost-effective manner (English)*. Policy Research Working Paper; No. WPS 6909 Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/364691468014449485/Hybrid-survey-to-improve-the-reliability-of-poverty-statistics-in-a-cost-effective-manner>
- Bedi, Tara; Coudouel, Aline and Simler, Kenneth. 2007. "More Than a Pretty Picture : Using Poverty Maps to Design Better Policies and Interventions". Washington, D.C.: World Bank.
- Bigman, David and Deichmann, Uwe. 2000. "Geographic targeting for poverty alleviation". In David Bigman and Hippolyte. Fofack, eds. *Geographic targeting for poverty alleviation: Methodology and application*. Washington, DC: World Bank.
- Coulombe, Harold; Epprecht, Michael; Pimhidzai, Obert and Sisoulath, Vilaysouk. 2016. "Where are the poor? Lao PDR 2015 census-based poverty map: Province and district level results." Vientiane Capital, Lao PDR: Lao Statistics Bureau and World Bank.
- Corral, Paul; Molina, Isabel and Nguyen, Minh. 2021. "Pull Your Small Area Estimates up by the Bootstraps." *Journal of Statistical Computation and Simulation* 91 (16): 3304–57. <https://doi.org/10.1080/00949655.2021.1926460>.
- Corral, Paul; Molina, Isabel; Cojocaru, Alexandru and Segovia, Sandra. 2022. *Guidelines to Small Area Estimation for Poverty Mapping*. Washington, DC : World Bank. <https://openknowledge.worldbank.org/handle/10986/37728> License: CC BY 3.0 IGO.
- Elbers, Chris, Jean O. Lanjouw, and Lanjouw, Peter. 2003. "Micro-Level Estimation of Poverty and Inequality." *Econometrica* 71 (1): 355–64. <https://doi.org/10.1111/1468-0262.00399>.
- Epprecht, Michael.; Minot, Nicholas; Dewina, Reno; Messerli, Peter and Heinemann, Andreas. 2008. *The Geography of Poverty and Inequality in the Lao PDR*. Swiss National Center of Competence in Research (NCCR) North-South, University of Bern, and International Food Policy Research Institute (IFPRI), Bern: Geographica Bernensia.
- Henderson, C.R. 1953. "Estimation of Variance and Covariance Components." *Biometrics* 9 (2): 226. <https://doi.org/10.2307/3001853>.
- Lao Statistics Bureau and World Bank. 2020. *Poverty Profile in Lao PDR: Poverty Report for the Lao Expenditure and Consumption Survey 2018–2019*. Lao Statistics Bureau and World Bank: Vientiane Capital, Lao PDR.
- Searle, Shayle R.; Casella, George and McCulloch, Charles E. 1992. *Variance components*. Wiley Series in Probability and Statistics, Wiley-Interscience Paperback Series, Wiley & Sons NY. DOI:10.1002/9780470316856
- Tzavidis, Nikos; Zhang, Li Chun; Hernandez, Angela Luna; Schmid, Timo and Rojas-Perilla, Natalia. 2018. "From start to finish: a framework for the production of small area official statistics." *Journal of the Royal Statistical Society. Series A: Statistics in Society*, 181 (4): 927–979.

Appendix 1: Survey and Census Mean Comparison

TABLE A1 Vientiane Capital

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.4866	0.4809	1.1644
usecedu_share	Share of lower secondary and above among adults aged 15-64	0.3305	0.3410	3.1784
literacy_share	Share of literacy among adults aged 15-64	0.9718	0.9687	0.3194
evereduc_share	Share of ever educated among adults aged 15-64	0.9697	0.9640	0.5843
male_head	Household head is male	0.7861	0.8078	2.7589
age_head	Age of household head	47.2178	52.7341	11.6827
age 25t64_head	Household head aged 25-64	0.8335	0.8202	1.5927
married_head	Household head is married	0.7725	0.8030	3.9489
pri_com_head	Household head with completed primary education	0.3606	0.3757	4.1737
lsec_com_head	Household head with completed lower secondary education	0.1522	0.1395	8.3758
lsec_abv_head	Household head with completed lower secondary education and above	0.4828	0.4573	5.2874
usec_abv_head	Household head with completed upper secondary education and above	0.3306	0.3178	3.8654
everattd_head	Household head used to attend school	0.9651	0.9333	3.2999
male_mn	Share of male household members	0.4837	0.4897	1.2283
age1t14_mn	Share of household members aged 1-14	0.2197	0.2130	3.0220
age15t24_mn	Share of household members aged 15-24	0.1965	0.1723	12.3310
age25t64_mn	Share of household members aged 25-64	0.5363	0.5561	3.6799
single_mn	Share of household members who are single	0.4850	0.4658	3.9589
literacy_mn	Share of literate household members	0.8832	0.8993	1.8230
pri_com_mn	Share of household members with completed primary education	0.3122	0.3244	3.9096
usec_com_mn	Share of household members with completed upper secondary education	0.1827	0.1616	11.5433
age1t14_sm	Number of household members aged 1-14	1.1288	1.1607	2.8275
age15t24_sm	Number of household members aged 15-24	0.8782	0.8780	0.0310
married_sm	Number of household members who are married	2.0549	2.2944	11.6522

Variable	Variable description	Mean		Percentage point
		Census	Survey	
pri_com_sm	Number of household members with completed primary education	1.4422	1.6526	14.5871
male_yn	Household with at least one male member	0.9346	0.9761	4.4451
female_yn	Household with at least one female member	0.9522	0.9888	3.8398
ethnicity1_yn	Household with at least one Lao-Tai member	0.9415	0.9832	4.4319
age1t14_yn	Household with at least one child aged 0–14	0.6371	0.6956	9.1867
age15t24_yn	Household with at least one individual aged 15–24	0.5355	0.5507	2.8436
age25t64_yn	Household with at least one individual aged 25–64	0.9514	0.9881	3.8493
married_yn	Household with at least one married member	0.8445	0.8975	6.2716
single_yn	Household with at least one single member	0.9163	0.9613	4.9107
literacy_yn	Household with at least one literate member	0.9961	0.9993	0.3230
pri_com_yn	Household with at least one member with completed primary education	0.6936	0.7834	12.9565
village_type	Village type	1.2216	1.2078	1.1350
urban	Urban	0.7793	0.7922	1.6565
rur_road	Rural with road access	0.2197	0.2078	5.4408
nrooms	Number of rooms	3.7505	3.5964	4.1081
roof_mat2	Roof made of zinc	0.2975	0.3008	1.1055
grid_elec	Household with access to grid electricity	0.9807	0.9977	1.7297
gen_elec	Household with owned electricity generator	0.0026	0.0023	8.0564
ene_wood	Household mainly using wood for cooking	0.2546	0.2370	6.8837
ene_charcoal	Household mainly using charcoal for cooking	0.4692	0.4439	5.3907
toilet_flush	Household with flush toilet	0.9607	0.9943	3.4951
tractor	Household with tractor	0.1392	0.1190	14.5201
motorbike	Household with motorbike	0.9251	0.9434	1.9683
tv	Household with TV	0.9362	0.9691	3.5145
cellphone	Household with cellphone	0.9706	0.9909	2.0926
washmach	Household with washing machine	0.5521	0.6220	12.6617
hhsiz_4	Household with four members	0.2412	0.2651	9.9243
child_2	Household with two members aged 1 to 14	0.2337	0.2466	5.4926
child_3p	Household with three members aged 1 to 14	0.1075	0.0914	14.9315
ln_hdage	Log of household head age	3.8064	3.9352	3.3839

TABLE A2 Phongsaly

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.7808	0.8317	6.5242
usededu_share	Share of lower secondary and above among adults aged 15-64	0.0888	0.0871	1.9046
literacy_share	Share of literacy among adults aged 15-64	0.626	0.558	10.8588
evereduc_share	Share of ever educated among adults aged 15-64	0.6151	0.5801	5.6905
ethnicity4_head	Household head from Chinese-Tibetan ethno-linguistic group	0.5222	0.5078	2.7665
male_head	Household head is male	0.9313	0.9612	3.2122
age_head	Age of household head	41.9417	43.1175	2.8035
age25t64_head	Household head aged 25-64	0.8889	0.9014	1.4039
married_head	Household head is married	0.9082	0.9408	3.5934
widowed_head	Household head is a widower	0.0404	0.0399	1.3215
pri_com_head	Household head with completed primary education	0.2763	0.2899	4.901
lsec_abv_head	Household head with completed lower secondary education and above	0.1221	0.1103	9.6555
everattd_head	Household head used to attend school	0.6249	0.6069	2.8798
male_mn	Share of male household members	0.5048	0.4973	1.4744
ethnicity2_mn	Share of Hmong-lumien household members	0.2105	0.2282	8.4203
age1t14_mn	Share of household members aged 1-14	0.3219	0.3444	6.9913
age15t24_mn	Share of household members aged 15-24	0.1655	0.1521	8.1246
age25t64_mn	Share of household members aged 25-64	0.4621	0.4519	2.2219
widowed_mn	Share of household members who are widowers	0.0356	0.0388	9.0679
single_mn	Share of household members who are single	0.4493	0.4589	2.1344
literacy_mn	Share of literate household members	0.5803	0.5551	4.3433
pri_com_mn	Share of household members with completed primary education	0.2225	0.2287	2.7921
usec_com_mn	Share of household members with completed upper secondary education	0.0506	0.045	11.1399
age1t14_sm	Number of household members aged 1-14	1.8207	2.0369	11.8717
age15t24_sm	Number of household members aged 15-24	0.8596	0.8103	5.7308
age25t64_sm	Number of household members aged 25-64	2.0912	2.3075	10.3431

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
married_sm	Number of household members who are married	2.3694	2.5922	9.4038
pri_com_sm	Number of household members with completed primary education	1.0573	1.1571	9.4431
male_yn	Household with at least one male member	0.9751	0.994	1.9369
female_yn	Household with at least one female member	0.9766	0.9944	1.818
ethnicity1_yn	Household with at least one Lao-Tai member	0.228	0.1975	13.3609
ethnicity2_yn	Household with at least one Mon-Khmher member	0.2326	0.2458	5.6688
age1t14_yn	Household with at least one child aged 0–14	0.7715	0.8186	6.1033
age15t24_yn	Household with at least one individual aged 15–24	0.5111	0.4955	3.0379
age25t64_yn	Household with at least one individual aged 25–64	0.9513	0.9702	1.9964
married_yn	Household with at least one married member	0.9285	0.9576	3.1284
single_yn	Household with at least one single member	0.8966	0.9466	5.5829
literacy_yn	Household with at least one literate member	0.8965	0.9555	6.578
pri_com_yn	Household with at least one member with completed primary education	0.5786	0.6566	13.4872
village_type	Village type	2.0533	2.0266	1.2978
floor_area	Household living areas	57.3444	59.4273	3.6323
nrooms	Number of rooms	2.9581	2.9283	1.0072
roof_mat2	Roof made of zinc	0.6802	0.6085	10.542
floor_mat4	Floor made of other materials	0.3704	0.3245	12.386
ene_wood	Household mainly using wood for cooking	0.9413	0.9368	0.47
cellphone	Household with cellphone	0.7602	0.7865	3.4517
ac	Household with air conditioning (AC)	0.0031	0.0029	7.5534
agri_land	Household with agricultural land	0.8626	0.9391	8.8783
hhsiz_4	Household with four members	0.2076	0.2123	2.2701
hhsiz_5	Household with five members	0.1803	0.2054	13.9334
child_2	Household with two members aged 1 to 14	0.2622	0.2973	13.3614
ln_hdage	Log of household head age	3.6887	3.7218	0.8968
urb_loghhsiz	Urban x Log of household size	0.2801	0.2428	13.3303

TABLE A3 Luang Namtha, Bokeo, Huaphan

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.7391	0.7386	0.0636
linschool_share	Share of enrollment among children aged 6-18	0.5610	0.6091	8.5704
literacy_share	Share of literacy among adults aged 15-64	0.7893	0.7688	2.5906
evereduc_share	Share of ever educated among adults aged 15-64	0.7858	0.7625	2.9637
ethnicity4_head	Household head from Chinese-Tibetan ethno-linguistic group	0.0942	0.0965	2.4241
male_head	Household head is male	0.9241	0.9396	1.6786
age_head	Age of household head	43.9549	46.0907	4.8590
age25t64_head	Household head aged 25-64	0.8897	0.8943	0.5106
married_head	Household head is married	0.9072	0.9315	2.6829
pri_com_head	Household head with completed primary education	0.4239	0.3978	6.1584
lsec_com_head	Household head with completed lower secondary education	0.0739	0.0660	10.6854
lsec_abv_head	Household head with completed lower secondary education and above	0.1828	0.1655	9.4594
everattd_head	Household head used to attend school	0.8002	0.7338	8.3032
male_mn	Share of male household members	0.4975	0.5015	0.7953
ethnicity2_mn	Share of Hmong-lumien household members	0.3294	0.3197	2.9448
age1t14_mn	Share of household members aged 1-14	0.3119	0.3110	0.3022
age15t24_mn	Share of household members aged 15-24	0.1802	0.1844	2.3170
age25t64_mn	Share of household members aged 25-64	0.4617	0.4574	0.9276
single_mn	Share of household members who are single	0.4585	0.4701	2.5487
literacy_mn	Share of literate household members	0.7093	0.7038	0.7827
pri_com_mn	Share of household members with completed primary education	0.3192	0.3111	2.5205
age1t14_sm	Number of household members aged 1-14	1.7746	1.9103	7.6460
age15t24_sm	Number of household members aged 15-24	0.9723	1.1101	14.1691
age25t64_sm	Number of household members aged 25-64	2.1717	2.4108	11.0075
age65pl_sm	Number of household members aged 65 and older	0.2211	0.2534	14.6165
married_sm	Number of household members who are married	2.3862	2.6349	10.4228
pri_com_sm	Number of household members with completed primary education	1.5854	1.7076	7.7065

Variable	Variable description	Mean		Percentage point
		Census	Survey	
male_yn	Household with at least one male member	0.9793	0.9928	1.3772
female_yn	Household with at least one female member	0.9851	0.9964	1.1510
ethnicity1_yn	Household with at least one Lao-Tai member	0.4627	0.4350	5.9749
ethnicity2_yn	Household with at least one Mon-Khmher member	0.3503	0.3358	4.1318
age1t14_yn	Household with at least one child aged 0–14	0.7874	0.8142	3.4010
age15t24_yn	Household with at least one individual aged 15–24	0.5616	0.6001	6.8627
age25t64_yn	Household with at least one individual aged 25–64	0.9650	0.9814	1.6965
married_yn	Household with at least one married member	0.9375	0.9646	2.8875
single_yn	Household with at least one single member	0.9245	0.9519	2.9679
literacy_yn	Household with at least one literate member	0.9604	0.9755	1.5723
pri_com_yn	Household with at least one member with completed primary education	0.7441	0.7835	5.2937
urban	Urban	0.2977	0.2794	6.1389
rur_road	Rural with road access	0.5481	0.5844	6.6103
floor_area	Household living areas	63.7970	67.9288	6.4766
nrooms	Number of rooms	2.9939	2.9026	3.0481
roof_mat2	Roof made of zinc	0.4291	0.4055	5.5058
floor_mat4	Floor made of other materials	0.2256	0.1920	14.9045
ene_wood	Household mainly using wood for cooking	0.9182	0.8912	2.9391
toilet_flush	Household with flush toilet	0.7099	0.7917	11.5233
radio	Household with radio	0.1526	0.1551	1.6243
tv	Household with TV	0.6711	0.7035	4.8194
cellphone	Household with cellphone	0.8268	0.8319	0.6195
computer	Household with computer	0.0776	0.0832	7.1588
agri_land	Household with agricultural land	0.8232	0.7008	14.8671
hhsiz_4	Household with four members	0.2188	0.2082	4.8388
hhsiz_5	Household with five members	0.1854	0.2060	11.0622
child_1	Household with one member aged 1 to 14	0.2683	0.2553	4.8597
child_2	Household with two members aged 1 to 14	0.2598	0.2749	5.7827
child_3p	Household with three members aged 1 to 14	0.2593	0.2841	9.5617
ln_hdage	Log of household head age	3.7376	3.7916	1.4457
urb_loghhsiz	Urban x Log of household size	0.4305	0.4406	2.3440

TABLE A4 Oudomxay

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.7908	0.8551	8.1330
linschool_share	Share of enrollment among children aged 6-18	0.5790	0.5754	0.6160
literacy_share	Share of literacy among adults aged 15-64	0.7232	0.6811	5.8278
evereduc_share	Share of ever educated among adults aged 15-64	0.7216	0.6618	8.2892
male_head	Household head is male	0.9290	0.9564	2.9546
age_head	Age of household head	43.0737	46.1412	7.1214
age25t64_head	Household head aged 25-64	0.8928	0.8960	0.3587
married_head	Household head is married	0.9071	0.9582	5.6387
lsec_abv_head	Household head with completed lower secondary education and above	0.1520	0.1320	13.1588
usec_abv_head	Household head with completed upper secondary education and above	0.0999	0.0907	9.2799
male_mn	Share of male household members	0.4951	0.4947	0.0733
ethnicity2_mn	Share of Hmong-lumien household members	0.5778	0.5642	2.3510
age1t14_mn	Share of household members aged 1-14	0.3357	0.3551	5.7857
age15t24_mn	Share of household members aged 15-24	0.1869	0.2005	7.2503
age25t64_mn	Share of household members aged 25-64	0.4386	0.4034	8.0251
single_mn	Share of household members who are single	0.4821	0.5136	6.5392
literacy_mn	Share of literate household members	0.6577	0.6140	6.6415
age25t64_sm	Number of household members aged 25-64	2.1357	2.4219	13.3998
widowed_sm	Number of household members who are widowers	0.1363	0.1431	5.0401
pri_com_sm	Number of household members with completed primary education	1.4399	1.4998	4.1600
male_yn	Household with at least one male member	0.9806	0.9976	1.7292
female_yn	Household with at least one female member	0.9860	0.9974	1.1644
ethnicity2_yn	Household with at least one Mon-Khmher member	0.6041	0.5900	2.3413
age1t14_yn	Household with at least one child aged 0-14	0.8170	0.8783	7.5003
age15t24_yn	Household with at least one individual aged 15-24	0.5804	0.6333	9.1221

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
age25t64_yn	Household with at least one individual aged 25-64	0.9638	0.9810	1.7836
married_yn	Household with at least one married member	0.9344	0.9731	4.1323
widowed_yn	Household with at least one widowed member	0.1306	0.1313	0.5593
single_yn	Household with at least one single member	0.9384	0.9709	3.4622
literacy_yn	Household with at least one literate member	0.9552	0.9657	1.0903
pri_com_yn	Household with at least one member with completed primary education	0.7214	0.7516	4.1963
village_type	Village type	1.9474	1.8813	3.3940
urban	Urban	0.2550	0.2674	4.8661
rur_road	Rural with road access	0.5426	0.5838	7.6071
nrooms	Number of rooms	2.6151	2.6877	2.7767
roof_mat2	Roof made of zinc	0.4333	0.4978	14.9017
floor_mat3	Floor made of wood	0.3974	0.3751	5.6316
floor_mat4	Floor made of other materials	0.2674	0.2497	6.5996
grid_elec	Household with access to grid electricity	0.7166	0.7602	6.0798
ene_wood	Household mainly using wood for cooking	0.9425	0.8930	5.2598
motorbike	Household with motorbike	0.6704	0.7391	10.2523
radio	Household with radio	0.1234	0.1343	8.8007
tv	Household with TV	0.6297	0.5742	8.8150
cellphone	Household with cellphone	0.7868	0.7753	1.4677
agri_land	Household with agricultural land	0.8537	0.8314	2.6138
hhsiz_5	Household with five members	0.1849	0.1920	3.8287
child_2	Household with two members aged 1 to 14	0.2706	0.2589	4.3339
ln_hdage	Log of household head age	3.7168	3.7933	2.0584

TABLE A5 Luang Prabang

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.7666	0.7817	1.9761
linschool_share	Share of enrollment among children aged 6-18	0.5830	0.6694	14.8095
literacy_share	Share of literacy among adults aged 15-64	0.8278	0.8308	0.3548
evereduc_share	Share of ever educated among adults aged 15-64	0.8225	0.8156	0.8421
ethnicity4_head	Household head from Chinese-Tibetan ethno-linguistic group	0.0020	0.0021	5.6947
male_head	Household head is male	0.9149	0.9220	0.7849
age_head	Age of household head	44.7348	45.7909	2.3607
age25t64_head	Household head aged 25-64	0.8749	0.9107	4.0949
married_head	Household head is married	0.8995	0.9124	1.4415
widowed_head	Household head is a widower	0.0552	0.0632	14.5550
pri_com_head	Household head with completed primary education	0.4187	0.3758	10.2283
lsec_com_head	Household head with completed lower secondary education	0.0714	0.0776	8.6150
lsec_abv_head	Household head with completed lower secondary education and above	0.1918	0.2110	10.0047
usec_abv_head	Household head with completed upper secondary education and above	0.1204	0.1334	10.8295
everattd_head	Household head used to attend school	0.8389	0.7680	8.4503
male_mn	Share of male household members	0.4975	0.5123	2.9832
age1t14_mn	Share of household members aged 1-14	0.3167	0.3259	2.8906
age15t24_mn	Share of household members aged 15-24	0.1799	0.1887	4.9200
age25t64_mn	Share of household members aged 25-64	0.4542	0.4431	2.4606
widowed_mn	Share of household members who are widowers	0.0341	0.0330	3.2067
single_mn	Share of household members who are single	0.4735	0.4986	5.3034
literacy_mn	Share of literate household members	0.7396	0.7461	0.8826
pri_com_mn	Share of household members with completed primary education	0.3158	0.3042	3.6620
age1t14_sm	Number of household members aged 1-14	1.7990	1.9768	9.8865
age15t24_sm	Number of household members aged 15-24	0.9568	1.0991	14.8745
age25t64_sm	Number of household members aged 25-64	2.1396	2.3164	8.2609

Variable	Variable description	Mean		Percentage point
		Census	Survey	
age65pl_sm	Number of household members aged 65 and older	0.2242	0.2154	3.9245
married_sm	Number of household members who are married	2.2965	2.4568	6.9773
pri_com_sm	Number of household members with completed primary education	1.5851	1.7041	7.5061
male_yn	Household with at least one male member	0.9772	0.9912	1.4366
female_yn	Household with at least one female member	0.9838	0.9940	1.0371
ethnicity1_yn	Household with at least one Lao-Tai member	0.4032	0.3878	3.8180
age1t14_yn	Household with at least one child aged 0–14	0.7827	0.8063	3.0133
age15t24_yn	Household with at least one individual aged 15–24	0.5608	0.6287	12.1120
age25t64_yn	Household with at least one individual aged 25–64	0.9616	0.9823	2.1552
married_yn	Household with at least one married member	0.9319	0.9572	2.7197
single_yn	Household with at least one single member	0.9262	0.9606	3.7092
literacy_yn	Household with at least one literate member	0.9755	0.9850	0.9760
pri_com_yn	Household with at least one member with completed primary education	0.7611	0.7730	1.5602
village_type	Village type	1.8243	1.8226	0.0940
urban	Urban	0.3249	0.2981	8.2694
rur_road	Rural with road access	0.5259	0.5813	10.5449
floor_area	Household living areas	64.5777	72.2149	11.8264
nrooms	Number of rooms	2.9033	2.7950	3.7284
roof_mat2	Roof made of zinc	0.4425	0.3833	13.3717
floor_mat4	Floor made of other materials	0.2438	0.2073	14.9954
ene_wood	Household mainly using wood for cooking	0.9243	0.8947	3.2058
toilet_flush	Household with flush toilet	0.6885	0.6885	0.0014
tv	Household with TV	0.6268	0.6685	6.6464
cellphone	Household with cellphone	0.7876	0.8091	2.7320
computer	Household with computer	0.0925	0.0998	7.8571
hhsize_4	Household with four members	0.2148	0.2102	2.1329
hhsize_5	Household with five members	0.1898	0.2102	10.7698
child_1	Household with one member aged 1 to 14	0.2541	0.2301	9.4284
child_2	Household with two members aged 1 to 14	0.2549	0.2563	0.5485
ln_hdage	Log of household head age	3.7531	3.7866	0.8914
urb_loghhsz	Urban x Log of household size	0.4830	0.4709	2.5062

TABLE A6 Xayaboury

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.6014	0.5873	2.3550
literacy_share	Share of literacy among adults aged 15-64	0.9397	0.9071	3.4765
evereduc_share	Share of ever educated among adults aged 15-64	0.9313	0.8987	3.5056
male_head	Household head is male	0.9276	0.9373	1.0477
age_head	Age of household head	45.2867	47.5523	5.0028
age25t64_head	Household head aged 25-64	0.8979	0.8864	1.2848
married_head	Household head is married	0.9176	0.9293	1.2835
widowed_head	Household head is a widower	0.0470	0.0535	13.8576
pri_com_head	Household head with completed primary education	0.5784	0.5806	0.3737
usec_abv_head	Household head with completed upper secondary education and above	0.1119	0.1027	8.2589
everattd_head	Household head used to attend school	0.9249	0.8582	7.2057
male_mn	Share of male household members	0.4943	0.4972	0.5941
ethnicity2_mn	Share of Hmong-lumien household members	0.1541	0.1490	3.3096
age1t14_mn	Share of household members aged 1-14	0.2697	0.2453	9.0424
age15t24_mn	Share of household members aged 15-24	0.1734	0.1549	10.6585
age25t64_mn	Share of household members aged 25-64	0.5066	0.5383	6.2477
single_mn	Share of household members who are single	0.4043	0.3882	4.0003
literacy_mn	Share of literate household members	0.8325	0.8301	0.2877
pri_com_mn	Share of household members with completed primary education	0.4413	0.4685	6.1520
age1t14_sm	Number of household members aged 1-14	1.3868	1.3437	3.1027
age15t24_sm	Number of household members aged 15-24	0.8877	0.8567	3.4922
married_sm	Number of household members who are married	2.5020	2.7725	10.8135
male_yn	Household with at least one male member	0.9819	0.9886	0.6890
female_yn	Household with at least one female member	0.9904	0.9980	0.7657
ethnicity1_yn	Household with at least one Lao-Tai member	0.7787	0.7654	1.7097
ethnicity2_yn	Household with at least one Mon-Khmher member	0.1723	0.1541	10.5491

Variable	Variable description	Mean		Percentage point
		Census	Survey	
age1t14_yn	Household with at least one child aged 0–14	0.7713	0.7762	0.6360
age15t24_yn	Household with at least one individual aged 15–24	0.5408	0.5405	0.0716
age25t64_yn	Household with at least one individual aged 25–64	0.9741	0.9920	1.8448
married_yn	Household with at least one married member	0.9521	0.9665	1.5146
single_yn	Household with at least one single member	0.9164	0.9237	0.7969
literacy_yn	Household with at least one literate member	0.9920	0.9958	0.3875
pri_com_yn	Household with at least one member with completed primary education	0.8436	0.9090	7.7420
village_type	Village type	1.5960	1.6136	1.1053
urban	Urban	0.4121	0.3864	6.2526
rur_road	Rural with road access	0.5797	0.6136	5.8469
floor_area	Household living areas	82.3324	75.6130	8.1613
nrooms	Number of rooms	3.4482	3.3537	2.7413
roof_mat2	Roof made of zinc	0.5211	0.4497	13.6997
floor_mat4	Floor made of other materials	0.0983	0.0873	11.1162
grid_elec	Household with access to grid electricity	0.8994	0.9908	10.1687
ene_wood	Household mainly using wood for cooking	0.8674	0.8790	1.3407
toilet_flush	Household with flush toilet	0.8843	0.9545	7.9372
bicycle	Household with bicycle	0.3673	0.3208	12.6604
tv	Household with TV	0.8118	0.8790	8.2853
cellphone	Household with cellphone	0.8977	0.9133	1.7368
agri_land	Household with agricultural land	0.9062	0.8347	7.8889
hhsiz_4	Household with four members	0.2585	0.2753	6.4777
hhsiz_5	Household with five members	0.1853	0.2111	13.9382
child_1	Household with one member aged 1 to 14	0.3738	0.4024	7.6417
child_2	Household with two members aged 1 to 14	0.2681	0.2674	0.2667
ln_hdage	Log of household head age	3.7712	3.8243	1.4077
urb_loghhsiz	Urban x Log of household size	0.5880	0.5691	3.2142

TABLE A7 Xieng Khuang

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.8399	0.8336	0.7583
linschool_share	Share of enrollment among children aged 6-18	0.6216	0.6581	5.8674
literacy_share	Share of literacy among adults aged 15-64	0.8995	0.8617	4.2109
evereduc_share	Share of ever educated among adults aged 15-64	0.8941	0.8511	4.8075
male_head	Household head is male	0.9315	0.9572	2.7680
age_head	Age of household head	43.6903	44.9453	2.8726
age25t64_head	Household head aged 25-64	0.8810	0.9047	2.6862
married_head	Household head is married	0.9369	0.9562	2.0587
pri_com_head	Household head with completed primary education	0.4620	0.5166	11.8169
everattd_head	Household head used to attend school	0.8988	0.8724	2.9318
male_mn	Share of male household members	0.4999	0.4937	1.2414
age1t14_mn	Share of household members aged 1-14	0.3340	0.3459	3.5664
age15t24_mn	Share of household members aged 15-24	0.1934	0.1854	4.1131
age25t64_mn	Share of household members aged 25-64	0.4231	0.4209	0.5261
single_mn	Share of household members who are single	0.4891	0.4818	1.4916
literacy_mn	Share of literate household members	0.7789	0.7465	4.1689
pri_com_mn	Share of household members with completed primary education	0.3397	0.3462	1.9161
age1t14_sm	Number of household members aged 1-14	1.9828	2.2565	13.8070
age15t24_sm	Number of household members aged 15-24	1.0897	1.2024	10.3481
age65pl_sm	Number of household members aged 65 and older	0.2639	0.2968	12.4321
pri_com_sm	Number of household members with completed primary education	1.8353	2.0487	11.6242
male_yn	Household with at least one male member	0.9826	0.9898	0.7313
female_yn	Household with at least one female member	0.9896	0.9969	0.7351
age1t14_yn	Household with at least one child aged 0-14	0.8063	0.8919	10.6125
age15t24_yn	Household with at least one individual aged 15-24	0.5925	0.6333	6.8850
age25t64_yn	Household with at least one individual aged 25-64	0.9592	0.9814	2.3182

Variable	Variable description	Mean		Percentage point
		Census	Survey	
married_yn	Household with at least one married member	0.9590	0.9717	1.3292
single_yn	Household with at least one single member	0.9437	0.9627	2.0065
literacy_yn	Household with at least one literate member	0.9888	0.9984	0.9717
pri_com_yn	Household with at least one member with completed primary education	0.7938	0.8706	9.6726
village_type	Village type	1.7889	1.7969	0.4452
urban	Urban	0.3084	0.3011	2.3810
rur_road	Rural with road access	0.5942	0.6010	1.1311
floor_area	Household living areas	66.9604	65.3857	2.3518
nrooms	Number of rooms	3.6445	3.3033	9.3639
roof_mat2	Roof made of zinc	0.2690	0.2789	3.6777
floor_mat3	Floor made of wood	0.3211	0.2840	11.5676
floor_mat4	Floor made of other materials	0.1995	0.1854	7.0995
grid_elec	Household with access to grid electricity	0.8566	0.9116	6.4167
ene_wood	Household mainly using wood for cooking	0.9440	0.8937	5.3245
toilet_flush	Household with flush toilet	0.8179	0.8827	7.9162
motorbike	Household with motorbike	0.8827	0.9031	2.3133
radio	Household with radio	0.1322	0.1190	9.9805
tv	Household with TV	0.7370	0.7541	2.3198
cellphone	Household with cellphone	0.8977	0.8439	5.9947
washmach	Household with washing machine	0.1073	0.1192	11.0700
agri_land	Household with agricultural land	0.8111	0.7982	1.5976
hhsiz_5	Household with five members	0.1868	0.2122	13.5976
child_1	Household with one member aged 1 to 14	0.2257	0.2198	2.6218
child_3	Household with three members aged 1 to 14	0.3159	0.3407	7.8316
ln_hdage	Log of household head age	3.7286	3.7651	0.9795
urb_loghhsiz	Urban x Log of household size	0.4575	0.5121	11.9431

TABLE A8 Vientiane Province

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.6856	0.6155	10.2204
linschool_share	Share of enrollment among children aged 6-18	0.5743	0.5985	4.2111
literacy_share	Share of literacy among adults aged 15-64	0.9136	0.9348	2.3243
evereduc_share	Share of ever educated among adults aged 15-64	0.9043	0.9038	0.0565
ethnicity3_head	Household head from Hmong-lumien ethno-linguistic group	0.1341	0.1229	8.3384
male_head	Household head is male	0.8864	0.9062	2.2360
age_head	Age of household head	46.8474	49.8545	6.4191
age25t64_head	Household head aged 25-64	0.8758	0.8576	2.0773
married_head	Household head is married	0.8847	0.9061	2.4189
widowed_head	Household head is a widower	0.0651	0.0630	3.3127
pri_com_head	Household head with completed primary education	0.4686	0.4864	3.7910
lsec_com_head	Household head with completed lower secondary education	0.1219	0.1224	0.4443
lsec_abv_head	Household head with completed lower secondary education and above	0.2734	0.2654	2.9116
usec_abv_head	Household head with completed upper secondary education and above	0.1515	0.1430	5.6102
everattd_head	Household head used to attend school	0.9033	0.8841	2.1318
male_mn	Share of male household members	0.4924	0.4864	1.2237
age1t14_mn	Share of household members aged 1-14	0.2882	0.2631	8.7173
age15t24_mn	Share of household members aged 15-24	0.1710	0.1631	4.6313
age25t64_mn	Share of household members aged 25-64	0.4858	0.5174	6.5015
single_mn	Share of household members who are single	0.4523	0.4535	0.2808
literacy_mn	Share of literate household members	0.8121	0.8475	4.3632
pri_com_mn	Share of household members with completed primary education	0.3753	0.3559	5.1565
age1t14_sm	Number of household members aged 1-14	1.5862	1.4533	8.3793
age15t24_sm	Number of household members aged 15-24	0.9247	0.9289	0.4440
age25t64_sm	Number of household members aged 25-64	2.2520	2.4746	9.8869
age65pl_sm	Number of household members aged 65 and older	0.2467	0.2527	2.4343
married_sm	Number of household members who are married	2.3349	2.4098	3.2074

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
widowed_sm	Number of household members who are widowers	0.1420	0.1373	3.2918
pri_com_sm	Number of household members with completed primary education	1.8490	1.7736	4.0797
male_yn	Household with at least one male member	0.9725	0.9793	0.7008
female_yn	Household with at least one female member	0.9845	0.9944	1.0073
ethnicity1_yn	Household with at least one Lao-Tai member	0.7139	0.8045	12.6974
age1t14_yn	Household with at least one child aged 0–14	0.7613	0.7462	1.9863
age15t24_yn	Household with at least one individual aged 15–24	0.5408	0.5209	3.6648
age25t64_yn	Household with at least one individual aged 25–64	0.9730	0.9837	1.1035
married_yn	Household with at least one married member	0.9297	0.9561	2.8478
single_yn	Household with at least one single member	0.9208	0.9316	1.1671
literacy_yn	Household with at least one literate member	0.9894	0.9926	0.3221
pri_com_yn	Household with at least one member with completed primary education	0.8149	0.8318	2.0727
village_type	Village type	1.6733	1.7375	3.8335
rur_road	Rural with road access	0.6573	0.7375	12.1926
floor_area	Household living areas	81.2130	89.5216	10.2307
nrooms	Number of rooms	3.5415	3.3465	5.5043
grid_elec	Household with access to grid electricity	0.9744	0.9910	1.6997
ene_wood	Household mainly using wood for cooking	0.8772	0.7497	14.5348
toilet_flush	Household with flush toilet	0.8841	0.9593	8.5044
tractor	Household with tractor	0.3859	0.4199	8.8019
motorbike	Household with motorbike	0.8631	0.9485	9.8915
radio	Household with radio	0.2882	0.2974	3.1857
tv	Household with TV	0.8974	0.9105	1.4695
cellphone	Household with cellphone	0.9269	0.9588	3.4381
hhsize_3	Household with three members	0.1465	0.1383	5.6308
hhsize_4	Household with four members	0.2352	0.2199	6.5276
hhsize_5	Household with five members	0.1938	0.2169	11.9456
hhsize_6	Household with six members	0.3362	0.3636	8.1429
child_2	Household with two members aged 1 to 14	0.2708	0.2409	11.0250
child_3	Household with three members aged 1 to 14	0.2054	0.1769	13.8705
ln_hdage	Log of household head age	3.8057	3.8745	1.8092
urb_loghhsize	Urban x Log of household size	0.4960	0.4223	14.8703

TABLE A9 Borikhamxay

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.7566	0.6948	8.1596
linschool_share	Share of enrollment among children aged 6-18	0.5712	0.6300	10.2998
literacy_share	Share of literacy among adults aged 15-64	0.8951	0.8706	2.7377
evereduc_share	Share of ever educated among adults aged 15-64	0.8869	0.8548	3.6097
ethnicity3_head	Household head from Hmong-lumien ethno-linguistic group	0.1548	0.1579	1.9756
male_head	Household head is male	0.8853	0.9164	3.5169
age_head	Age of household head	45.7470	48.2966	5.5732
age25t64_head	Household head aged 25-64	0.8771	0.8662	1.2398
married_head	Household head is married	0.8876	0.9192	3.5679
pri_com_head	Household head with completed primary education	0.5096	0.4510	11.4880
lsec_com_head	Household head with completed lower secondary education	0.0919	0.0864	5.9133
everattd_head	Household head used to attend school	0.8842	0.8104	8.3454
male_mn	Share of male household members	0.4920	0.4830	1.8161
age1t14_mn	Share of household members aged 1-14	0.3149	0.2908	7.6559
age15t24_mn	Share of household members aged 15-24	0.1883	0.1806	4.1155
age25t64_mn	Share of household members aged 25-64	0.4491	0.4733	5.3902
widowed_mn	Share of household members who are widowers	0.0336	0.0362	7.8002
single_mn	Share of household members who are single	0.4859	0.4630	4.7093
literacy_mn	Share of literate household members	0.7875	0.7808	0.8401
pri_com_mn	Share of household members with completed primary education	0.3925	0.3538	9.8493
usec_com_mn	Share of household members with completed upper secondary education	0.0605	0.0648	7.1405
age1t14_sm	Number of household members aged 1-14	1.8186	1.7233	5.2401
age15t24_sm	Number of household members aged 15-24	1.0586	1.0581	0.0493
age25t64_sm	Number of household members aged 25-64	2.1958	2.3875	8.7309
married_sm	Number of household members who are married	2.3293	2.5922	11.2888
pri_com_sm	Number of household members with completed primary education	2.0289	1.8463	8.9998

Variable	Variable description	Mean		Percentage point
		Census	Survey	
male_yn	Household with at least one male member	0.9752	0.9821	0.7100
female_yn	Household with at least one female member	0.9880	0.9947	0.6822
ethnicity1_yn	Household with at least one Lao-Tai member	0.7530	0.7897	4.8708
age1t14_yn	Household with at least one child aged 0–14	0.7914	0.7934	0.2431
age15t24_yn	Household with at least one individual aged 15–24	0.5844	0.5708	2.3187
age25t64_yn	Household with at least one individual aged 25–64	0.9693	0.9952	2.6693
married_yn	Household with at least one married member	0.9313	0.9511	2.1326
single_yn	Household with at least one single member	0.9387	0.9627	2.5602
literacy_yn	Household with at least one literate member	0.9847	0.9973	1.2771
pri_com_yn	Household with at least one member with completed primary education	0.8300	0.8421	1.4624
village_type	Village type	1.6884	1.6049	4.9427
rur_road	Rural with road access	0.6253	0.6049	3.2611
floor_area	Household living areas	79.6094	72.1662	9.3496
nrooms	Number of rooms	3.2784	3.1526	3.8378
grid_elec	Household with access to grid electricity	0.9299	0.9972	7.2324
ene_wood	Household mainly using wood for cooking	0.7343	0.7579	3.2186
ene_charcoal	Household mainly using charcoal for cooking	0.2069	0.1904	7.9704
toilet_flush	Household with flush toilet	0.9063	0.9961	9.9060
motorbike	Household with motorbike	0.8650	0.9524	10.0935
tv	Household with TV	0.8490	0.9228	8.6845
cellphone	Household with cellphone	0.9186	0.8751	4.7284
hhsiz3_3	Household with three members	0.1226	0.1344	9.6816
hhsiz4_4	Household with four members	0.2156	0.2093	2.9252
hhsiz6_6	Household with six members	0.3903	0.3924	0.5293
child_2	Household with two members aged 1 to 14	0.2670	0.2678	0.2871
ln_hdage	Log of household head age	3.7794	3.8408	1.6226

TABLE A10 Khammuan

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.7083	0.7930	11.9471
usededu_share	Share of lower secondary and above among adults aged 15-64	0.0928	0.0943	1.6179
literacy_share	Share of literacy among adults aged 15-64	0.8431	0.7216	14.4164
evereduc_share	Share of ever educated among adults aged 15-64	0.8419	0.7183	14.6824
male_head	Household head is male	0.8258	0.8892	7.6700
age_head	Age of household head	46.1427	46.5200	0.8178
age25t64_head	Household head aged 25-64	0.8639	0.8964	3.7595
married_head	Household head is married	0.8217	0.8871	7.9613
pri_com_head	Household head with completed primary education	0.4296	0.3761	12.4533
lsec_com_head	Household head with completed lower secondary education	0.0718	0.0810	12.8225
lsec_abv_head	Household head with completed lower secondary education and above	0.1665	0.1548	7.0610
male_mn	Share of male household members	0.4845	0.4978	2.7491
ethnicity2_mn	Share of Hmong-lumien household members	0.1574	0.1547	1.7554
age1t14_mn	Share of household members aged 1-14	0.3029	0.3229	6.5901
age25t64_mn	Share of household members aged 25-64	0.4541	0.4736	4.2898
single_mn	Share of household members who are single	0.4831	0.4982	3.1207
literacy_mn	Share of literate household members	0.7460	0.6714	10.0090
pri_com_mn	Share of household members with completed primary education	0.3453	0.3035	12.0955
age1t14_sm	Number of household members aged 1-14	1.6762	1.7349	3.5023
age25t64_sm	Number of household members aged 25-64	2.1550	2.2174	2.8955
age65pl_sm	Number of household members aged 65 and older	0.1983	0.1958	1.2455
married_sm	Number of household members who are married	2.1511	2.1858	1.6145
pri_com_sm	Number of household members with completed primary education	1.7640	1.5021	14.8478
male_yn	Household with at least one male member	0.9603	0.9866	2.7423
female_yn	Household with at least one female member	0.9822	0.9910	0.8913

Variable	Variable description	Mean		Percentage point
		Census	Survey	
ethnicity1_yn	Household with at least one Lao-Tai member	0.8366	0.8080	3.4231
ethnicity2_yn	Household with at least one Mon-Khmher member	0.1679	0.1574	6.2710
age1t14_yn	Household with at least one child aged 0–14	0.7707	0.7767	0.7775
age15t24_yn	Household with at least one individual aged 15–24	0.5746	0.5147	10.4249
age25t64_yn	Household with at least one individual aged 25–64	0.9591	0.9735	1.5022
married_yn	Household with at least one married member	0.8922	0.9277	3.9711
single_yn	Household with at least one single member	0.9218	0.9573	3.8459
literacy_yn	Household with at least one literate member	0.9674	0.9646	0.2888
pri_com_yn	Household with at least one member with completed primary education	0.7686	0.7643	0.5583
village_type	Village type	1.8512	1.8817	1.6485
urban	Urban	0.2294	0.1959	14.5897
rur_road	Rural with road access	0.6900	0.7265	5.2768
floor_area	Household living areas	75.2372	70.0338	6.9160
floor_mat3	Floor made of wood	0.6205	0.6960	12.1555
grid_elec	Household with access to grid electricity	0.8907	0.9697	8.8762
toilet_flush	Household with flush toilet	0.6294	0.7086	12.5706
car	Household with car	0.1328	0.1363	2.6110
tv	Household with TV	0.8127	0.8791	8.1673
cellphone	Household with cellphone	0.8216	0.8024	2.3340
washmach	Household with washing machine	0.1599	0.1804	12.8324
agri_land	Household with agricultural land	0.8174	0.8025	1.8241
hhsig_4	Household with four members	0.2066	0.2156	4.3955
hhsig_6	Household with six members	0.3692	0.3415	7.5060
child_1	Household with one member aged 1 to 14	0.2590	0.2432	6.1044
child_2	Household with two members aged 1 to 14	0.2643	0.2580	2.3679
child_3	Household with three members aged 1 to 14	0.2474	0.2755	11.3400
ln_hdage	Log of household head age	3.7857	3.8005	0.3919

TABLE A11 Savannakhet

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.7083	0.7731	9.1387
linschool_share	Share of enrollment among children aged 6-18	0.5026	0.5440	8.2370
literacy_share	Share of literacy among adults aged 15-64	0.7725	0.6760	12.4939
evereduc_share	Share of ever educated among adults aged 15-64	0.7760	0.6878	11.3742
male_head	Household head is male	0.8184	0.8441	3.1378
age_head	Age of household head	47.6853	50.2738	5.4281
age25t64_head	Household head aged 25-64	0.8529	0.8167	4.2396
married_head	Household head is married	0.8086	0.8484	4.9171
lsec_com_head	Household head with completed lower secondary education	0.0664	0.0689	3.7511
lsec_abv_head	Household head with completed lower secondary education and above	0.1537	0.1714	11.5333
everattd_head	Household head used to attend school	0.7561	0.6742	10.8302
male_mn	Share of male household members	0.4850	0.4891	0.8509
ethnicity2_mn	Share of Hmong-lumien household members	0.2320	0.2478	6.7990
age1t14_mn	Share of household members aged 1-14	0.3016	0.3292	9.1512
age15t24_mn	Share of household members aged 15-24	0.1996	0.1807	9.4552
age25t64_mn	Share of household members aged 25-64	0.4522	0.4339	4.0656
single_mn	Share of household members who are single	0.5049	0.4983	1.3100
literacy_mn	Share of literate household members	0.6890	0.6088	11.6373
age1t14_sm	Number of household members aged 1-14	1.9274	1.9712	2.2731
age15t24_sm	Number of household members aged 15-24	1.2426	1.0838	12.7792
age25t64_sm	Number of household members aged 25-64	2.5349	2.3870	5.8347
married_sm	Number of household members who are married	2.4236	2.4657	1.7351
male_yn	Household with at least one male member	0.9714	0.9784	0.7182
female_yn	Household with at least one female member	0.9858	0.9957	1.0059
ethnicity1_yn	Household with at least one Lao-Tai member	0.7622	0.7585	0.4823
ethnicity2_yn	Household with at least one Mon-Khmher member	0.2426	0.2659	9.5785

Variable	Variable description	Mean		Percentage point
		Census	Survey	
age1t14_yn	Household with at least one child aged 0–14	0.7999	0.8491	6.1492
age15t24_yn	Household with at least one individual aged 15–24	0.6220	0.6255	0.5510
age25t64_yn	Household with at least one individual aged 25–64	0.9720	0.9727	0.0700
married_yn	Household with at least one married member	0.9018	0.9246	2.5339
single_yn	Household with at least one single member	0.9488	0.9759	2.8587
literacy_yn	Household with at least one literate member	0.9352	0.9475	1.3120
pri_com_yn	Household with at least one member with completed primary education	0.7133	0.7116	0.2435
rur_road	Rural with road access	0.7180	0.7552	5.1733
floor_area	Household living areas	70.3600	73.5662	4.5569
nrooms	Number of rooms	2.6135	2.6570	1.6643
roof_mat2	Roof made of zinc	0.6659	0.6487	2.5905
floor_mat3	Floor made of wood	0.6528	0.5696	12.7476
grid_elec	Household with access to grid electricity	0.7880	0.8683	10.1928
ene_wood	Household mainly using wood for cooking	0.5352	0.5352	0.0146
toilet_flush	Household with flush toilet	0.5816	0.5731	1.4504
tractor	Household with tractor	0.5880	0.6642	12.9516
car	Household with car	0.1321	0.1304	1.3179
motorbike	Household with motorbike	0.8006	0.8153	1.8367
tv	Household with TV	0.7517	0.7503	0.1805
cellphone	Household with cellphone	0.8247	0.8306	0.7186
agri_land	Household with agricultural land	0.8335	0.8251	1.0087
hhsiz3_3	Household with three members	0.0950	0.0838	11.7548
hhsiz3_4	Household with four members	0.1592	0.1664	4.5381
hhsiz3_6	Household with six members	0.5067	0.4910	3.0925
child_1	Household with one member aged 1 to 14	0.2396	0.2137	10.8087
child_3p	Household with three members aged 1 to 14	0.3121	0.3334	6.8493
ln_hdage	Log of household head age	3.8213	3.8783	1.4920
urb_loghhsiz3	Urban x Log of household size	0.3557	0.3082	13.3428

TABLE A12 Saravan

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.8145	0.7654	6.0260
linschool_share	Share of enrollment among children aged 6-18	0.4802	0.4952	3.1308
literacy_share	Share of literacy among adults aged 15-64	0.7879	0.7131	9.4872
evereduc_share	Share of ever educated among adults aged 15-64	0.7873	0.6935	11.9125
male_head	Household head is male	0.8618	0.8907	3.3619
age_head	Age of household head	46.4972	49.2455	5.9106
age25t64_head	Household head aged 25-64	0.8476	0.8495	0.2181
married_head	Household head is married	0.8686	0.9170	5.5650
lsec_abv_head	Household head with completed lower secondary education and above	0.1195	0.1018	14.7857
male_mn	Share of male household members	0.4844	0.5028	3.7900
ethnicity2_mn	Share of Hmong-lumien household members	0.3510	0.3094	11.8517
age1t14_mn	Share of household members aged 1-14	0.3345	0.3265	2.4068
age15t24_mn	Share of household members aged 15-24	0.1929	0.1945	0.8180
age25t64_mn	Share of household members aged 25-64	0.4214	0.4339	2.9544
single_mn	Share of household members who are single	0.5018	0.5021	0.0678
literacy_mn	Share of literate household members	0.6896	0.6384	7.4318
age1t14_sm	Number of household members aged 1-14	2.1093	2.0448	3.0623
age15t24_sm	Number of household members aged 15-24	1.1971	1.2571	5.0140
age25t64_sm	Number of household members aged 25-64	2.2733	2.4644	8.4079
age65pl_sm	Number of household members aged 65 and older	0.2446	0.2630	7.5125
married_sm	Number of household members who are married	2.4457	2.6841	9.7457
male_yn	Household with at least one male member	0.9724	0.9927	2.0835
female_yn	Household with at least one female member	0.9871	0.9955	0.8483
ethnicity1_yn	Household with at least one Lao-Tai member	0.6611	0.7108	7.5159
ethnicity2_yn	Household with at least one Mon-Khmher member	0.3726	0.3306	11.2504
age1t14_yn	Household with at least one child aged 0-14	0.8244	0.8464	2.6663
age15t24_yn	Household with at least one individual aged 15-24	0.6070	0.6427	5.8830

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
age25t64_yn	Household with at least one individual aged 25-64	0.9620	0.9807	1.9360
married_yn	Household with at least one married member	0.9305	0.9693	4.1705
single_yn	Household with at least one single member	0.9388	0.9703	3.3605
literacy_yn	Household with at least one literate member	0.9527	0.9345	1.9117
pri_com_yn	Household with at least one member with completed primary education	0.7242	0.6983	3.5785
village_type	Village type	2.0200	1.9547	3.2341
urban	Urban	0.1256	0.1127	10.2728
rur_road	Rural with road access	0.7288	0.8199	12.5040
floor_area	Household living areas	65.8523	71.0927	7.9579
nrooms	Number of rooms	2.6792	2.3959	10.5750
roof_mat2	Roof made of zinc	0.8132	0.8633	6.1694
floor_mat3	Floor made of wood	0.7327	0.7112	2.9391
ene_wood	Household mainly using wood for cooking	0.6282	0.5615	10.6090
ene_charcoal	Household mainly using charcoal for cooking	0.3232	0.3673	13.6580
nat_water	Household with access to natural water: well, spring, rainwater	0.2628	0.2512	4.4112
tv	Household with TV	0.6904	0.7905	14.4960
cellphone	Household with cellphone	0.7802	0.7663	1.7742
ac	Household with air conditioning (AC)	0.0183	0.0201	9.7559
agri_land	Household with agricultural land	0.8766	0.7799	11.0265
hhsiz_4	Household with four members	0.1640	0.1636	0.2645
hhsiz_5	Household with five members	0.1729	0.1902	9.9966
hhsiz_6	Household with six members	0.4873	0.5423	11.2755
child_1	Household with one member aged 1 to 14	0.2204	0.2425	10.0221
child_2	Household with two members aged 1 to 14	0.2468	0.2647	7.2397
child_3	Household with three members aged 1 to 14	0.3572	0.3392	5.0337
ln_hdage	Log of household head age	3.7904	3.8582	1.7875
urb_loghhsiz	Urban x Log of household size	0.1920	0.2040	6.2770

TABLE A13 Sekong

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.9764	0.9745	0.1883
linschool_share	Share of enrollment among children aged 6-18	0.5840	0.6026	3.1798
usecedu_share	Share of lower secondary and above among adults aged 15-64	0.1357	0.1517	11.7718
literacy_share	Share of literacy among adults aged 15-64	0.7720	0.8176	5.9085
male_head	Household head is male	0.8961	0.9056	1.0606
age_head	Age of household head	43.7902	47.0215	7.3790
age25t64_head	Household head aged 25-64	0.8672	0.8746	0.8624
married_head	Household head is married	0.8941	0.9094	1.7196
usec_abv_head	Household head with completed upper secondary education and above	0.1810	0.1610	11.0623
male_mn	Share of male household members	0.4918	0.5143	4.5587
ethnicity2_mn	Share of Hmong-lumien household members	0.8042	0.7827	2.6751
age1t14_mn	Share of household members aged 1-14	0.3801	0.3980	4.6989
age15t24_mn	Share of household members aged 15-24	0.1793	0.1756	2.0556
age25t64_mn	Share of household members aged 25-64	0.3981	0.3931	1.2604
single_mn	Share of household members who are single	0.5298	0.5646	6.5651
literacy_mn	Share of literate household members	0.6574	0.7320	11.3453
pri_com_mn	Share of household members with completed primary education	0.2272	0.2063	9.1988
usec_com_mn	Share of household members with completed upper secondary education	0.0758	0.0772	1.9651
age15t24_sm	Number of household members aged 15-24	1.0991	1.1950	8.7267
age65pl_sm	Number of household members aged 65 and older	0.2222	0.2403	8.1465
married_sm	Number of household members who are married	2.3139	2.6110	12.8398
widowed_sm	Number of household members who are widowers	0.1688	0.1468	13.0199
pri_com_sm	Number of household members with completed primary education	1.3393	1.4276	6.5911
male_yn	Household with at least one male member	0.9749	0.9916	1.7074
female_yn	Household with at least one female member	0.9819	0.9939	1.2200
ethnicity1_yn	Household with at least one Lao-Tai member	0.2286	0.2524	10.3707

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
ethnicity2_yn	Household with at least one Mon-Khmher member	0.8478	0.8339	1.6443
age1t14_yn	Household with at least one child aged 0–14	0.8446	0.8838	4.6434
age15t24_yn	Household with at least one individual aged 15–24	0.5875	0.5747	2.1817
age25t64_yn	Household with at least one individual aged 25–64	0.9618	0.9827	2.1805
married_yn	Household with at least one married member	0.9255	0.9483	2.4610
widowed_yn	Household with at least one widowed member	0.1568	0.1370	12.6303
single_yn	Household with at least one single member	0.9342	0.9811	5.0155
literacy_yn	Household with at least one literate member	0.9647	0.9896	2.5818
pri_com_yn	Household with at least one member with completed primary education	0.6740	0.6493	3.6639
village_type	Village type	1.8651	1.9229	3.1024
floor_area	Household living areas	50.0841	56.1169	12.0452
nrooms	Number of rooms	2.3057	2.5219	9.3759
roof_mat2	Roof made of zinc	0.7305	0.6418	12.1353
wall_mat3	Wall made of bamboo	0.2336	0.2085	10.7511
floor_mat3	Floor made of wood	0.7394	0.7175	2.9595
floor_mat4	Floor made of other materials	0.0842	0.0955	13.4074
grid_elec	Household with access to grid electricity	0.7137	0.6950	2.6223
ene_wood	Household mainly using wood for cooking	0.7666	0.7011	8.5386
toilet_flush	Household with flush toilet	0.5611	0.6081	8.3929
tractor	Household with tractor	0.2525	0.2278	9.8105
tv	Household with TV	0.6257	0.5784	7.5589
cellphone	Household with cellphone	0.7716	0.6654	13.7712
agri_land	Household with agricultural land	0.8090	0.8458	4.5389
hhsiz_4	Household with four members	0.1448	0.1237	14.5884
hhsiz_5	Household with five members	0.1640	0.1658	1.1088
child_2	Household with two members aged 1 to 14	0.2085	0.1786	14.3498
ln_hdage	Log of household head age	3.7290	3.8113	2.2089
urb_loghhsiz	Urban x Log of household size	0.6134	0.5681	7.3966

TABLE A14 Attapeu

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.7091	0.7040	0.7204
linschool_share	Share of enrollment among children aged 6-18	0.4995	0.5525	10.6038
literacy_share	Share of literacy among adults aged 15-64	0.9047	0.9100	0.5863
evereduc_share	Share of ever educated among adults aged 15-64	0.9056	0.8864	2.1206
male_head	Household head is male	0.8523	0.8484	0.4663
age_head	Age of household head	47.9361	50.7817	5.9362
age25t64_head	Household head aged 25-64	0.8539	0.8468	0.8246
married_head	Household head is married	0.8478	0.8459	0.2193
pri_com_head	Household head with completed primary education	0.5089	0.4372	14.0836
lsec_com_head	Household head with completed lower secondary education	0.0864	0.0945	9.3620
lsec_abv_head	Household head with completed lower secondary education and above	0.1788	0.1897	6.0851
usec_abv_head	Household head with completed upper secondary education and above	0.0924	0.0952	3.0223
everattd_head	Household head used to attend school	0.9068	0.8712	3.9299
male_mn	Share of male household members	0.4834	0.4813	0.4291
age1t14_mn	Share of household members aged 1-14	0.2980	0.2871	3.6527
age15t24_mn	Share of household members aged 15-24	0.1931	0.1716	11.1247
age25t64_mn	Share of household members aged 25-64	0.4520	0.4870	7.7344
widowed_mn	Share of household members who are widowers	0.0367	0.0370	0.8629
single_mn	Share of household members who are single	0.4925	0.4619	6.2144
literacy_mn	Share of literate household members	0.7920	0.8143	2.8162
pri_com_mn	Share of household members with completed primary education	0.3854	0.3322	13.7938
age1t14_sm	Number of household members aged 1-14	1.7560	1.5378	12.4259
age25t64_sm	Number of household members aged 25-64	2.3593	2.3355	1.0075
age65pl_sm	Number of household members aged 65 and older	0.2601	0.2560	1.5634
married_sm	Number of household members who are married	2.3498	2.3326	0.7338
widowed_sm	Number of household members who are widowers	0.1565	0.1641	4.8379

Variable	Variable description	Mean		Percentage point
		Census	Survey	
male_yn	Household with at least one male member	0.9700	0.9767	0.6838
female_yn	Household with at least one female member	0.9887	0.9931	0.4451
ethnicity1_yn	Household with at least one Lao-Tai member	0.8817	0.9203	4.3840
age1t14_yn	Household with at least one child aged 0–14	0.7893	0.7651	3.0670
age15t24_yn	Household with at least one individual aged 15–24	0.5947	0.5612	5.6331
age25t64_yn	Household with at least one individual aged 25–64	0.9699	0.9840	1.4494
married_yn	Household with at least one married member	0.9129	0.9265	1.4960
widowed_yn	Household with at least one widowed member	0.1477	0.1563	5.8137
single_yn	Household with at least one single member	0.9411	0.9496	0.9132
literacy_yn	Household with at least one literate member	0.9815	0.9869	0.5485
pri_com_yn	Household with at least one member with completed primary education	0.8218	0.7918	3.6416
ປະເພດບ້ານ	Village type	1.8701	1.8341	1.9263
urban	Urban	0.2512	0.2464	1.9395
rur_road	Rural with road access	0.6274	0.6732	7.2954
floor_area	Household living areas	78.0252	80.7863	3.5388
nrooms	Number of rooms	3.2182	3.0884	4.0333
roof_mat2	Roof made of zinc	0.7224	0.6611	8.4781
grid_elec	Household with access to grid electricity	0.9234	0.9949	7.7376
ene_charcoal	Household mainly using charcoal for cooking	0.6240	0.7158	14.7077
motorbike	Household with motorbike	0.8279	0.8761	5.8114
bicycle	Household with bicycle	0.3271	0.2815	13.9483
tv	Household with TV	0.8604	0.9401	9.2595
cellphone	Household with cellphone	0.8870	0.8879	0.0938
child_1	Household with one member aged 1 to 14	0.2522	0.2889	14.5449
child_2	Household with two members aged 1 to 14	0.2702	0.2664	1.3919
ln_hdage	Log of household head age	3.8279	3.8951	1.7552
urb_loghhsiz	Urban x Log of household size	0.4002	0.3882	3.0069

TABLE A15 Champassak

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.7978	0.7507	5.9069
linschool_share	Share of enrollment among children aged 6-18	0.5009	0.5671	13.2137
literacy_share	Share of literacy among adults aged 15-64	0.7793	0.7886	1.1890
evereduc_share	Share of ever educated among adults aged 15-64	0.7772	0.7596	2.2721
male_head	Household head is male	0.8802	0.8784	0.2111
age_head	Age of household head	43.5516	47.6719	9.4605
age25t64_head	Household head aged 25-64	0.8791	0.8758	0.3694
married_head	Household head is married	0.8801	0.9078	3.1450
lsec_abv_head	Household head with completed lower secondary education and above	0.1959	0.1907	2.6363
usec_abv_head	Household head with completed upper secondary education and above	0.1304	0.1396	7.0896
everattd_head	Household head used to attend school	0.8096	0.7366	9.0197
male_mn	Share of male household members	0.4856	0.4944	1.8040
age1t14_mn	Share of household members aged 1-14	0.3308	0.3289	0.5784
age15t24_mn	Share of household members aged 15-24	0.1825	0.2094	14.7488
age25t64_mn	Share of household members aged 25-64	0.4380	0.4181	4.5486
single_mn	Share of household members who are single	0.4747	0.5252	10.6489
literacy_mn	Share of literate household members	0.6791	0.6883	1.3628
pri_com_mn	Share of household members with completed primary education	0.2459	0.2348	4.5257
usec_com_mn	Share of household members with completed upper secondary education	0.0596	0.0660	10.6344
age1t14_sm	Number of household members aged 1-14	1.8468	2.1226	14.9332
widowed_sm	Number of household members who are widowers	0.1384	0.1532	10.7089
male_yn	Household with at least one male member	0.9673	0.9887	2.2218
female_yn	Household with at least one female member	0.9853	0.9961	1.0943
age1t14_yn	Household with at least one child aged 0-14	0.7970	0.8554	7.3240
age25t64_yn	Household with at least one individual aged 25-64	0.9541	0.9865	3.4012

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
married_yn	Household with at least one married member	0.9162	0.9588	4.6458
single_yn	Household with at least one single member	0.9115	0.9714	6.5751
literacy_yn	Household with at least one literate member	0.9450	0.9611	1.7077
pri_com_yn	Household with at least one member with completed primary education	0.6490	0.7231	11.4233
village_type	Village type	1.6782	1.6165	3.6767
urban	Urban	0.3619	0.3835	5.9757
rur_road	Rural with road access	0.5980	0.6165	3.0853
nrooms	Number of rooms	2.5456	2.4318	4.4696
roof_mat2	Roof made of zinc	0.7738	0.7770	0.4139
ene_wood	Household mainly using wood for cooking	0.7825	0.7725	1.2764
tractor	Household with tractor	0.3457	0.3896	12.7128
motorbike	Household with motorbike	0.7606	0.8165	7.3574
tv	Household with TV	0.6774	0.6499	4.0609
cellphone	Household with cellphone	0.7946	0.8246	3.7724
washmach	Household with washing machine	0.1208	0.1270	5.1290
ac	Household with air conditioning (AC)	0.0445	0.0470	5.7982
hhsige_5	Household with five members	0.1824	0.1980	8.5581
ln_hdage	Log of household head age	3.7258	3.8285	2.7569

TABLE A16 Xaysomboun

Variable	Variable description	Mean		Percentage point difference
		Census	Survey	
depratio	Dependency ratio	0.9709	0.9471	2.4471
literacy_share	Share of literacy among adults aged 15-64	0.8043	0.7476	7.0485
evereduc_share	Share of ever educated among adults aged 15-64	0.8112	0.7254	10.5710
ethnicity3_head	Household head from Hmong-lumien ethno-linguistic group	0.5197	0.5808	11.7480
male_head	Household head is male	0.9107	0.9476	4.0518
age_head	Age of household head	42.3005	42.0681	0.5496
age25t64_head	Household head aged 25-64	0.8862	0.9409	6.1727
married_head	Household head is married	0.9363	0.9839	5.0800
pri_com_head	Household head with completed primary education	0.3953	0.3606	8.7827
lsec_abv_head	Household head with completed lower secondary education and above	0.2679	0.2842	6.0858
usec_abv_head	Household head with completed upper secondary education and above	0.1626	0.1533	5.7323
male_mn	Share of male household members	0.4967	0.5145	3.5874
age1t14_mn	Share of household members aged 1-14	0.3855	0.3981	3.2517
age15t24_mn	Share of household members aged 15-24	0.1870	0.1688	9.6870
age25t64_mn	Share of household members aged 25-64	0.3909	0.4063	3.9333
single_mn	Share of household members who are single	0.5177	0.5414	4.5951
literacy_mn	Share of literate household members	0.6669	0.6565	1.5606
pri_com_mn	Share of household members with completed primary education	0.2998	0.2566	14.3905
usec_com_mn	Share of household members with completed upper secondary education	0.0632	0.0637	0.9015
age1t14_sm	Number of household members aged 1-14	2.3658	2.4042	1.6202
age15t24_sm	Number of household members aged 15-24	1.1119	1.1555	3.9133
age25t64_sm	Number of household members aged 25-64	2.0172	2.2739	12.7288
married_sm	Number of household members who are married	2.3911	2.5016	4.6214
pri_com_sm	Number of household members with completed primary education	1.6938	1.5306	9.6352

Variable	Variable description	Mean		Percentage point
		Census	Survey	
male_yn	Household with at least one male member	0.9785	0.9938	1.5615
female_yn	Household with at least one female member	0.9873	1.0000	1.2891
age1t14_yn	Household with at least one child aged 0–14	0.8646	0.8941	3.4117
age15t24_yn	Household with at least one individual aged 15–24	0.5953	0.5738	3.6003
age25t64_yn	Household with at least one individual aged 25–64	0.9543	0.9872	3.4477
married_yn	Household with at least one married member	0.9546	0.9839	3.0618
single_yn	Household with at least one single member	0.9433	0.9743	3.2800
literacy_yn	Household with at least one literate member	0.9730	0.9686	0.4512
pri_com_yn	Household with at least one member with completed primary education	0.7875	0.8022	1.8764
village_type	Village type	1.6704	1.6916	1.2714
urban	Urban	0.3372	0.3084	8.5581
rur_road	Rural with road access	0.6552	0.6916	5.5682
floor_area	Household living areas	61.0372	69.0358	13.1043
nrooms	Number of rooms	2.8917	2.7111	6.2471
ene_wood	Household mainly using wood for cooking	0.9502	0.9382	1.2644
toilet_flush	Household with flush toilet	0.8113	0.7546	6.9977
tv	Household with TV	0.6335	0.6713	5.9687
cellphone	Household with cellphone	0.8733	0.9081	3.9891
agri_land	Household with agricultural land	0.7600	0.8298	9.1792
hhsize_4	Household with four members	0.1766	0.1806	2.2808
hhsize_6	Household with six members	0.4668	0.5090	9.0550
child_2	Household with two members aged 1 to 14	0.2459	0.2711	10.2354
child_3p	Household with three members aged 1 to 14	0.4206	0.4787	13.8181
ln_hdage	Log of household head age	3.6969	3.7025	0.1500
urb_loghhsize	Urban x Log of household size	0.5416	0.5153	4.8537

Appendix 2: Small Area Estimation Model

TABLE A17 Model Estimates based on LECS 6 — Vientiane Capital (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age15t24_sm	-0.001***	0.000	-0.001***	0.000
age15t24_yn	0.002**	0.001	0.002***	0.001
age1t14_sm	-0.001***	0.000	-0.001***	0.000
age25t64_head	0.002***	0.001	0.002**	0.001
depratio	0.001**	0.001	0.002**	0.001
ene_charcoal	-0.002***	0.000	-0.001***	0.000
female_yn	-0.006***	0.001	-0.005***	0.001
literacy_mn	0.005***	0.002	0.004***	0.001
male_mn	-0.003***	0.001	-0.003***	0.001
nrooms	0.000***	0.000	0.000***	0.000
roof_mat2	-0.001***	0.000	-0.001**	0.000
single_yn	-0.003***	0.001	-0.003***	0.001
tv	0.004***	0.001	0.005***	0.001
usecedu_share	0.005***	0.001	0.005***	0.001
village_type	-0.002***	0.001	-0.001***	0.000
constant	1.219***	0.002	1.218***	0.002
Number of observations	574			
Adjusted R-squared	0.325			
Sigma eta sq.	0.000			
Ratio of Sigma eta sq. over MSE	0.002			
Variance of epsilon	0.000			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	Box-Cox			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A18 Model Estimates based on LECS 6 — Phongsaly (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
cellphone	-0.151*	0.080	-0.161**	0.075
ene_wood	-0.446***	0.149	-0.529***	0.118
ethnicity4_head	0.223***	0.059	0.242***	0.065
fan_m_d_s	-2.058***	0.419	-2.254***	0.587
hhsige_4	0.327***	0.069	0.345***	0.067
literacy_mn	0.709***	0.135	0.778***	0.130
married_yn	-0.583***	0.170	-0.539***	0.159
nrooms	0.056**	0.027	0.057**	0.025
pri_com_yn	0.444***	0.144	0.449***	0.143
single_mn	-1.209***	0.149	-1.144***	0.156
usededu_share	0.819***	0.141	0.820***	0.149
widowed_head	-0.423*	0.221	-0.387**	0.171
constant	17.457***	0.356	17.548***	0.439
Number of observations	397			
Adjusted R-squared	0.449			
Sigma eta sq.	0.006			
Ratio of Sigma eta sq. over MSE	0.018			
Variance of epsilon	0.331			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	lnskew			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A19 Model estimates based on LECS 6 — Bokeo, Huaphan, Luang Namtha (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age1t14_mn	-0.180**	0.073	-0.186***	0.070
age25t64_mn	0.542***	0.079	0.585***	0.074
age25t64_yn	-0.319***	0.077	-0.299***	0.075
age_head	-0.006***	0.001	-0.006***	0.001
child_1	0.093***	0.025	0.080***	0.024
ene_wood	-0.257***	0.043	-0.292***	0.041
ethnicity2_yn	-0.135***	0.026	-0.171***	0.028
ethnicity4_m_p_s	0.808***	0.059	0.822***	0.134
evereduc_share	0.170***	0.049	0.130***	0.048
female_yn	-0.175*	0.098	-0.286**	0.122
hhsiz_4	0.146***	0.024	0.157***	0.023
hhsiz_m_d_s	-0.242***	0.052	-0.240**	0.102
literacy_mn	0.598***	0.066	0.543***	0.065
literacy_yn	-0.292***	0.090	-0.220***	0.076
male_yn	-0.306***	0.098	-0.391***	0.094
married_yn	-0.321***	0.060	-0.328***	0.063
nrooms	0.117***	0.012	0.125***	0.010
nrooms_m_p_s	-0.633***	0.052	-0.536***	0.102
pri_com_mn	-0.207***	0.047	-0.136***	0.047
radio	0.054*	0.031	0.065**	0.032
single_mn	-0.554***	0.087	-0.516***	0.079
tractor_m_d_s	-0.788***	0.140	-0.628**	0.317
tv	0.188***	0.032	0.178***	0.028
urb_loghhsiz	-0.085***	0.031	-0.101***	0.030
village_type	-0.268***	0.038	-0.244***	0.036
widowed_mn	-0.354***	0.112	-0.402***	0.119
constant	20.820***	0.447	20.578***	0.860
Number of observations	3212			
Adjusted R-squared	0.434			
Sigma eta sq.	0.026			
Ratio of Sigma eta sq. over MSE	0.073			
Variance of epsilon	0.336			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	Inskew			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A20 Model estimates based on LECS 6 — Oudomxay (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age1t14_yn	-0.399***	0.103	-0.349***	0.102
ene_wood	-0.473***	0.145	-0.624***	0.165
ethnicity2_mn	-0.180*	0.093	-0.137	0.083
floor_mat3	-0.164	0.103	-0.260***	0.096
floor_mat4	-0.480***	0.124	-0.569***	0.113
ln_hdage	-0.367**	0.155	-0.377***	0.133
nrooms	0.118***	0.033	0.116***	0.029
single_mn	-0.704***	0.214	-0.767***	0.219
usec_abv_head	0.610***	0.118	0.494***	0.108
village_type	-0.383***	0.076	-0.267***	0.075
widowed_sm	-0.195*	0.104	-0.218**	0.099
_cons	18.352***	0.647	18.332***	0.587
Number of observations	476			
Adjusted R-squared	0.414			
Sigma eta sq.	0.054			
Ratio of Sigma eta sq. over MSE	0.080			
Variance of epsilon	0.635			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	lnskew			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A21 Model estimates based on LECS 6 — Luang Prabang (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age15t24_mn	-1.314***	0.179	-1.358***	0.146
age25t64_sm	-0.249***	0.031	-0.251***	0.027
age65pl_sm	-0.222***	0.055	-0.213***	0.039
cellphone	0.187***	0.064	0.198***	0.052
computer	0.213**	0.087	0.257***	0.076
depratio	-0.320***	0.061	-0.328***	0.046
ene_wood	-0.332***	0.097	-0.329***	0.080
ethnicity1_yn	0.183***	0.049	0.102*	0.057
literacy_mn	0.767***	0.104	0.597***	0.090
nrooms	0.111***	0.023	0.097***	0.019
pri_com_sm	-0.092***	0.022	-0.076***	0.017
single_yn	-0.157	0.099	-0.101	0.083
toilet_oth_m_d_s	-2.322***	0.367	-2.192**	1.068
urb_loghhsiz	-0.165***	0.064	-0.271***	0.056
village_type	-0.438***	0.072	-0.475***	0.073
widowed_mn	0.348**	0.154	0.245*	0.147
_cons	17.037***	0.221	17.213***	0.356
Number of observations	527			
Adjusted R-squared	0.644			
Sigma eta sq.	0.062			
Ratio of Sigma eta sq. over MSE	0.235			
Variance of epsilon	0.225			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	lnskew			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A22 Model estimates based on LECS 6 — Xayaboury (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age25t64_mn	0.004***	0.001	0.003***	0.001
age25t64_yn	-0.003***	0.001	-0.003**	0.001
age_head	-0.000***	0.000	-0.000***	0.000
child_1	0.001**	0.000	0.001**	0.000
ethnicity2_yn	-0.001***	0.000	-0.001***	0.000
evereduc_share	0.000	0.001	0.001	0.001
female_yn	-0.002**	0.001	-0.002*	0.001
hhsiz_4	0.001***	0.000	0.001***	0.000
hhsiz_m_d_s	-0.001***	0.000	-0.002	0.001
literacy_mn	0.003***	0.001	0.003***	0.001
male_yn	-0.003***	0.001	-0.004***	0.001
married_yn	-0.002**	0.001	-0.002***	0.001
nrooms	0.001***	0.000	0.001***	0.000
pri_com_mn	-0.001**	0.001	-0.001	0.000
single_mn	-0.003***	0.001	-0.002***	0.001
tractor_m_d_s	-0.007***	0.002	-0.009***	0.003
tv	0.001	0.000	0.001***	0.000
urb_loghhsiz	-0.002***	0.001	-0.002***	0.001
village_type	-0.003***	0.001	-0.003***	0.001
widowed_mn	-0.002**	0.001	-0.002**	0.001
constant	1.124***	0.004	1.128***	0.009
Number of observations	525			
Adjusted R-squared	0.434			
Sigma eta sq.	0.000			
Ratio of Sigma eta sq. over MSE	0.094			
Variance of epsilon	0.000			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	Box-Cox			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A23 Model Estimates based on LECS 6 — Xieng Khuang (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age25t64_mn	2.02E-06***	6.78E-07	1.85E-06***	6.21E-07
agri_land	-1.30E-06***	2.99E-07	-1.37E-06***	2.71E-07
cellphone	1.32E-06***	4.00E-07	1.25E-06***	3.90E-07
child_1	-8.87E-07**	4.04E-07	-8.52E-07**	3.85E-07
child_2	-1.62E-06***	4.29E-07	-1.79E-06***	4.16E-07
child_3p	-1.94E-06***	4.98E-07	-1.89E-06***	4.71E-07
everattd_head	7.74E-07***	3.57E-07	8.19E-07**	3.33E-07
floor_area	8.07E-09***	2.49E-09	7.77E-09***	2.24E-09
hhszge_6	-1.29E-06***	2.72E-07	-1.30E-06***	2.83E-07
linschool_share	8.93E-07***	3.24E-07	9.83E-07***	2.84E-07
lsec_abv_head	8.78E-07**	3.47E-07	8.73E-07***	3.38E-07
lsec_com_head	-9.94E-07**	4.59E-07	-1.10E-06***	4.14E-07
married_head	-3.25E-07	4.29E-07	-3.48E-07	3.26E-07
motorbike	-3.10E-07	5.17E-07	-4.70E-07	3.56E-07
single_yn	-7.35E-07**	5.22E-07	-1.02E-06*	5.01E-07
toilet_flush	7.31E-07***	3.58E-07	6.99E-07*	3.80E-07
tv	1.15E-06***	3.05E-07	1.17E-06***	3.09E-07
constant	0.28619***	8.65E-07	0.28619***	7.72E-07
Number of observations	438			
Adjusted R-squared	0.467			
Sigma eta sq.	0.000			
Ratio of Sigma eta sq. over MSE	0.005			
Variance of epsilon	0.000			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	Box-Cox			
Alpha model	Yes			
Source: LECS 6				
Transformation (lhs)	Box-Cox			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A24 Model estimates based on LECS 6 — Vientiane Province (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age1t14_yn	-0.015**	0.006	-0.013**	0.005
ethnicity3_head	-0.031***	0.009	-0.019**	0.008
evereduc_share	0.031***	0.009	0.034***	0.008
female_yn	-0.065***	0.018	-0.053***	0.017
hhsiz3_3	0.017**	0.007	0.017***	0.006
hhsiz3_6	-0.033***	0.006	-0.036***	0.005
lsec_abv_head	0.020***	0.005	0.017***	0.005
male_yn	-0.041***	0.014	-0.038***	0.013
motorbike	0.028***	0.009	0.020***	0.007
nrooms	0.008***	0.002	0.006***	0.002
radio	-0.016***	0.005	-0.016***	0.004
single_yn	-0.036***	0.009	-0.043***	0.008
cellphone	0.029***	0.009	0.033***	0.007
constant	3.983***	0.023	3.980***	0.022
Number of observations	528			
Adjusted R-squared	0.398			
Sigma eta sq.	0.0003			
Ratio of Sigma eta sq. over MSE	0.101			
Variance of epsilon	0.002			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	Box-Cox			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A25 Model estimates based on LECS 6 — Borikhamxay (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age15t24_yn	-0.233***	0.062	-0.196***	0.059
age25t64_sm	-0.146***	0.042	-0.100***	0.033
cellphone	0.219***	0.069	0.242***	0.067
depratio	-0.248***	0.056	-0.188***	0.046
ethnicity1_m_d_s	-1.970***	0.509	-1.844**	0.803
floor_area	0.001***	0.000	0.001***	0.000
floor_area_m_d_s	0.017***	0.005	0.020**	0.009
male_yn	-0.415**	0.165	-0.506***	0.127
married_head	-0.243**	0.103	-0.226**	0.112
nrooms	0.055***	0.015	0.056***	0.016
single_mn	-0.261	0.162	-0.262*	0.158
usec_com_mn	0.670***	0.224	0.656***	0.139
widowed_mn	-0.683**	0.286	-0.723***	0.237
_cons	16.230***	0.354	15.840***	0.524
Number of observations	461			
Adjusted R-squared	0.265			
Sigma eta sq.	0.009			
Ratio of Sigma eta sq. over MSE	0.032			
Variance of epsilon	0.263			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Boot-			
	strapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	No			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A26 Model estimates based on LECS 6 — Khammuan (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age25t64_mn	0.236**	0.108	0.210**	0.088
agri_land	-0.245***	0.050	-0.260***	0.044
cellphone	0.107***	0.037	0.082**	0.037
child_2	-0.088*	0.049	-0.070	0.043
child_3	-0.109**	0.051	-0.140***	0.048
everattd_head	0.117***	0.039	0.089***	0.033
floor_area	0.002***	0.001	0.002***	0.001
floor_mat4	0.334***	0.067	0.282**	0.143
hhsize_3	0.152***	0.054	0.158***	0.041
hhsize_6	-0.273***	0.043	-0.235***	0.039
linschool_share	0.061	0.046	0.060	0.037
lsec_abv_head	0.120	0.073	0.192***	0.057
lsec_com_head	-0.100	0.077	-0.192***	0.070
married_head	-0.172***	0.066	-0.196***	0.055
nrooms	0.071***	0.021	0.085***	0.019
single_yn	-0.340***	0.078	-0.333***	0.073
toilet_flush	0.194***	0.037	0.137***	0.035
constant	15.392***	0.118	15.501***	0.103
Number of observations	541			
Adjusted R-squared	0.552			
Sigma eta sq.	0.006			
Ratio of Sigma eta sq. over MSE	0.050			
Variance of epsilon	0.119			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	No			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A27 Model estimates based on LECS 6 — Savannakhet (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
agri_land	-0.229***	0.059	-0.228***	0.055
child_2	-0.120**	0.054	-0.127**	0.055
child_3	-0.270***	0.063	-0.296***	0.066
everattd_head	0.139***	0.049	0.155***	0.047
floor_area	0.002***	0.000	0.002***	0.000
floor_mat4	-0.160**	0.071	-0.082	0.078
hhsiz_3	0.197***	0.060	0.183***	0.066
hhsiz_6	-0.248***	0.055	-0.255***	0.053
linschool_share	0.098**	0.047	0.148***	0.050
lsec_abv_head	0.293***	0.082	0.272***	0.077
lsec_com_head	-0.156	0.110	-0.199**	0.101
motorbike	0.220***	0.056	0.225***	0.053
nrooms	0.028*	0.016	0.040**	0.018
single_yn	-0.615***	0.127	-0.637***	0.104
toilet_flush	0.139**	0.056	0.145***	0.054
tv	0.199***	0.055	0.156***	0.058
constant	15.463***	0.126	15.461***	0.118
Number of observations	623			
Adjusted R-squared	0.451			
Sigma eta sq.	0.026			
Ratio of Sigma eta sq. over MSE	0.091			
Variance of epsilon	0.257			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	lnskew			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A28 Model estimates based on LECS 6 — Saravan (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age15t24_yn	-0.000007***	0.000002	-0.00001***	0.00000
cellphone	0.000015***	0.000003	0.00002***	0.00000
depratio	-0.000010***	0.000002	-0.00001***	0.00000
ethnicity1_yn	0.000010***	0.000003	0.00001***	0.00000
hhsiz_6	-0.000019***	0.000002	-0.00002***	0.00000
literacy_share	0.000008**	0.000003	0.00001**	0.00000
lsec_abv_head	0.000015***	0.000004	0.00002***	0.00000
female_yn	-0.000029***	0.000007	-0.00003***	0.00001
single_yn	-0.000011**	0.000005	-0.00001*	0.00000
constant	0.391320***	0.000008	0.39132***	0.00001
Number of observations	510			
Adjusted R-squared	0.389			
Sigma eta sq.	0.000			
Ratio of Sigma eta sq. over MSE	0.068			
Variance of epsilon	0.000			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	Box-Cox			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A29 Model estimates based on LECS 6 — Sekong (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
ac	0.367***	0.105	0.442***	0.076
age15t24_yn	-0.389***	0.080	-0.357***	0.069
age25t64_mn	-0.123***	0.046	-0.103***	0.036
bicycle	-0.241***	0.064	-0.226***	0.058
car	0.187*	0.107	0.184**	0.088
child_1	0.210**	0.084	0.204***	0.074
depratio	-0.414***	0.071	-0.406***	0.055
ene_wood	-0.406***	0.084	-0.459***	0.065
evereduc_share	0.335**	0.137	0.306***	0.109
gen_elec	-0.793**	0.337	-1.228***	0.192
grid_elec	-0.410***	0.090	-0.337***	0.078
hhsiz_1	0.657***	0.238	0.607***	0.174
hhsiz_2	0.636***	0.166	0.659***	0.163
hhsiz_3	0.182	0.136	0.198	0.123
hhsiz_4	0.263**	0.116	0.319***	0.085
hhsiz_5	0.234**	0.098	0.184**	0.076
linschool_share	0.184**	0.079	0.204***	0.062
literacy_share	-0.264**	0.126	-0.548***	0.109
ln_hdage	-0.271**	0.113	-0.309***	0.086
married_sm	-0.051	0.043	-0.066**	0.028
nat_water	0.218*	0.129	0.426***	0.074
nrooms	0.085**	0.037	0.063***	0.023
pri_com_head	-0.125*	0.072	-0.124**	0.060
pri_com_yn	0.120	0.096	0.128**	0.063
roof_mat2	-0.220***	0.076	-0.203***	0.050
rur_road	-0.153**	0.066	-0.189***	0.045
toilet_flush	0.297***	0.098	0.336***	0.080
tractor	0.172**	0.086	0.176***	0.059
wall_mat3	-0.202**	0.097	-0.231***	0.075
washmach	0.152	0.106	0.133**	0.067
widowed_sm	-0.084	0.097	-0.104	0.067
constant	17.166***	0.461	17.532***	0.398
Number of observations	327			
Adjusted R-squared	0.718			
Sigma eta sq.	0.002			
Ratio of Sigma eta sq. over MSE	0.010			
Variance of epsilon	0.220			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	lnskew			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A30 Model Estimates based on LECS 6 — Champassak (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age15t24_yn	-2.42E-06**	1.05E-06	-1.97E-06**	1.08E-06
cellphone	2.47E-06*	1.41E-06	2.86E-06**	1.40E-06
computer	6.17E-06***	1.63E-06	6.21E-06***	1.72E-06
depratio	-3.59E-06***	7.04E-07	-2.70E-06***	7.26E-07
hhsiz_3	3.90E-06***	1.25E-06	3.91E-06***	1.26E-06
hhsiz_6	-5.44E-06***	1.22E-06	-5.01E-06***	1.06E-06
literacy_share	4.71E-06**	1.87E-06	4.81E-06**	2.10E-06
lsec_abv_head	3.89E-06***	1.27E-06	4.78E-06***	1.20E-06
roof_mat2	-3.29E-06***	1.02E-06	-2.67E-06***	9.87E-07
single_yn	-5.81E-06***	1.91E-06	-6.28E-06***	1.98E-06
urban	5.62E-06***	1.12E-06	2.40E-06**	1.21E-06
constant	0.34749***	2.69E-06	0.347489***	3.03E-06
Number of observations	567			
Adjusted R-squared	0.307			
Sigma eta sq.	0.000			
Ratio of Sigma eta sq. over MSE	0.115			
Variance of epsilon	0.000			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	Box-Cox			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A31 Model estimates based on LECS 6 — Attapeu (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age15t24_yn	-0.253***	0.074	-0.263***	0.079
age65pl_sm	0.258***	0.098	0.214***	0.073
depratio	-0.349***	0.070	-0.311***	0.068
hhsiz3_3	0.260***	0.091	0.230**	0.099
hhsiz3_6	-0.392***	0.078	-0.369***	0.079
literacy_share	0.541***	0.125	0.439***	0.118
lsec_abv_head	0.557***	0.089	0.416***	0.085
male_yn	-0.435**	0.197	-0.443**	0.214
roof_mat2	-0.159**	0.078	-0.148*	0.077
urban	0.191**	0.078	0.294***	0.070
widowed_yn	-0.257*	0.133	-0.231**	0.109
constant	15.727***	0.215	15.772***	0.244
Number of observations	336			
Adjusted R-squared	0.443			
Sigma eta sq.	0.040			
Ratio of Sigma eta sq. over MSE	0.108			
Variance of epsilon	0.342			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	lnskew			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

TABLE A32 Model estimates based on LECS 6 — Xaysomboun (Beta Model)

	OLS		GLS	
	Coef	Std	Coef	Std
age15t24_yn	-0.205***	0.078	-0.175***	0.059
age_head	-0.006**	0.003	-0.007***	0.002
cellphone	0.212*	0.120	0.260***	0.094
ene_wood	-0.518***	0.114	-0.365***	0.096
hhsiz_4	0.211***	0.070	0.165***	0.059
male_head	-0.554**	0.240	-0.498***	0.129
married_yn	0.516	0.323	0.509***	0.180
single_yn	-0.554***	0.156	-0.522***	0.158
urb_loghsize	0.084**	0.041	0.134***	0.033
usec_com_mn	0.793***	0.238	0.780***	0.216
constant	16.413***	0.304	16.138***	0.299
Number of observations	336			
Adjusted R-squared	0.214			
Sigma eta sq.	0.080			
Ratio of Sigma eta sq. over MSE	0.230			
Variance of epsilon	0.289			
Error decomposition	H3			
Empirical best methods	Yes			
Beta drawing	Bootstrapped			
Eta drawing method	Normal			
Epsilon drawing method	Normal			
Transformation (lhs)	lnskew			
Alpha model	Yes			

Source: LECS 6

Note: Model settings: alpha model; error decomposition: H3; 100 simulations and 200 bootstraps with normal distribution; empirical best methods. * $p < .1$ ** $p < .05$ *** $p < .01$

Appendix 3: Poverty Rate and Poor Population by District

District code	District name	Poverty rate (%)	Standard error	Population in 2018	Number of poor
101	Chanthabuly District	3.19	1.00	74,722	2,385
102	Sikhottabong District	4.45	1.23	132,912	5,910
103	Xaysetha District	3.68	1.11	129,118	4,748
104	Sisattanak District	3.51	1.18	71,068	2,495
105	Naxaithong District	5.67	1.64	84,096	4,768
106	Xaythany District	6.28	1.40	221,781	13,928
107	Hadxayfong District	4.91	1.37	106,843	5,248
108	Sangthong district	6.30	2.26	32,673	2,059
109	Mayparkngum district	8.14	2.30	53,646	4,368
201	Phongsaly District	9.01	2.39	23,998	2,162
202	May District	13.59	2.41	28,397	3,858
203	Khoua District	4.57	1.72	27,272	1,246
204	Samphanh District	4.75	1.62	25,898	1,231
205	Boun Neua District	5.28	1.42	24,207	1,277
206	Yot Ou District	10.47	2.27	32,891	3,444
207	Boun Tay District	5.86	1.91	27,109	1,589
301	Namtha District	4.91	1.69	58,911	2,895
302	Sing District	10.79	2.20	43,195	4,660
303	Long District	26.15	3.28	38,507	10,069
304	Viengphoukha District	14.16	3.21	26,346	3,731
305	Na Le District	5.15	2.95	25,430	1,311
401	Xay District	23.83	2.68	85,558	20,388
402	La District	27.25	4.94	18,367	5,005
403	Na Mo District	28.86	4.05	42,638	12,305
404	Nga District	57.96	5.51	34,582	20,045
405	Beng District	18.57	4.67	40,455	7,514
406	Houne District	25.87	3.36	81,044	20,969
407	Pak Beng District	30.35	5.76	32,057	9,728
501	Houayxay District	10.27	2.36	75,920	7,794
502	Ton Pheung District	11.67	2.14	38,113	4,449
503	Meung District	36.03	4.70	16,280	5,866
504	Pha Oudom District	34.51	2.95	45,217	15,605
505	Pak Tha District	40.51	5.47	21,112	8,551
601	Luang Prabang District	3.43	1.39	95,660	3,277
602	Xiengngeun District	12.32	2.41	35,089	4,323
603	Nane District	13.25	2.84	29,345	3,889
604	Pak Ou District	35.79	3.78	27,649	9,896
605	Nam Bak District	9.19	2.10	73,969	6,800

District code	District name	Poverty rate (%)	Standard error	Population in 2018	Number of poor
606	Ngoy District	57.21	4.10	30,944	17,702
607	Pak Seng District	23.73	5.37	23,109	5,484
608	Phonxay District	28.09	3.60	35,135	9,870
609	Chomphet District	21.34	4.03	31,848	6,798
610	Viengkham District	36.91	4.58	29,896	11,035
611	Phoukhoun District	21.28	5.15	25,554	5,437
612	Phonthong District	41.76	5.96	20,994	8,768
701	Xam Neua District	21.61	3.06	60,570	13,090
702	Xiengkho District	27.78	4.26	26,927	7,479
703	Hiam District	13.78	4.45	12,929	1,782
704	Viengxay District	22.55	3.25	33,060	7,455
705	Houameuang District	38.77	5.54	34,664	13,438
706	Samtay District	27.72	3.55	39,015	10,815
707	Sop Bao District	13.87	4.02	26,816	3,719
708	Et District	36.69	3.97	28,212	10,352
709	Kone District	49.13	4.99	26,717	13,126
710	Xon District	46.45	5.97	17,337	8,053
801	Sainyabuli District	25.10	2.68	82,636	20,743
802	Khop District	8.96	2.98	22,813	2,044
803	Hongsa District	31.21	3.71	30,064	9,384
804	Ngeun District	16.11	3.59	19,536	3,147
805	Xienghone District	17.92	2.86	35,519	6,366
806	Phiang District	20.08	3.35	62,707	12,594
807	Parklai District	12.80	1.67	73,087	9,358
808	Kenethao District	21.82	3.57	42,219	9,211
809	Botene District	16.21	4.06	17,789	2,884
810	Thongmyxay District	13.18	3.09	9,080	1,196
811	Xaisathan District	63.79	6.92	16,440	10,488
901	Pek District	14.93	1.85	80,953	12,090
902	Kham District	27.98	2.67	50,241	14,058
903	Nong Het District	36.70	3.24	40,287	14,787
904	Khoune District	28.05	2.76	35,774	10,033
905	Mok May District	40.99	4.05	15,810	6,481
906	Phou Kout District	25.10	2.76	26,154	6,564
907	Phaxay District	23.55	2.93	12,470	2,937
1001	Phonhong District	5.87	1.65	69,199	4,065
1002	Thoulakhom District	6.80	1.23	56,612	3,852
1003	Keo Oudom District	1.57	1.17	18,647	293
1004	Kasy District	6.11	2.01	40,270	2,459
1005	Vangvieng District	5.85	1.53	59,812	3,502
1006	Feuang District	13.18	2.26	44,810	5,905

District code	District name	Poverty rate (%)	Standard error	Population in 2018	Number of poor
1007	Xanakharm District	4.75	1.37	42,600	2,022
1008	Mad District	7.48	3.66	22,506	1,684
1009	Viengkham District	0.95	0.96	19,533	186
1010	Hinhurp District	3.21	1.80	31,415	1,008
1013	Meun District	27.40	3.38	45,073	12,352
1101	Pakxan District	12.17	2.59	49,288	5,997
1102	Thaphabat District	21.59	3.54	27,893	6,021
1103	Pakkading District	15.54	2.85	55,655	8,649
1104	Borikhane District	25.87	4.44	55,629	14,392
1105	Khamkeut District	22.69	2.91	69,037	15,664
1106	Viengthong District	38.11	5.21	33,663	12,828
1107	Xaichamphon District	48.29	6.51	12,631	6,100
1201	Thakhek District	14.48	2.63	95,081	13,767
1202	Mahaxay District	24.08	4.75	39,677	9,554
1203	Nong Bok District	14.99	3.79	49,823	7,470
1204	Hineboune District	15.55	3.38	53,689	8,346
1205	Yommalath District	34.36	3.42	35,901	12,337
1206	Boualapha District	51.34	4.60	35,660	18,307
1207	Nakai District	34.46	4.39	27,875	9,605
1208	Sebangphay District	27.28	4.23	30,637	8,357
1209	Xaibouathong District	28.69	5.02	28,613	8,210
1210	Kounkham District	25.43	4.61	23,995	6,102
1301	Kaysone Phomvihane District	7.16	3.38	132,252	9,465
1302	Outhoumphone District	32.56	3.68	96,961	31,571
1303	Atsaphangthong District	18.72	5.03	48,772	9,132
1304	Phine District	35.22	5.44	72,011	25,364
1305	Seponh District	44.00	5.37	62,779	27,625
1306	Nong District	61.83	7.17	33,168	20,507
1307	Thapangthong District	40.98	5.03	44,952	18,419
1308	Songkhone District	24.61	4.68	105,453	25,954
1309	Champhone District	23.09	3.46	113,986	26,319
1310	Xonaboury District	38.28	5.30	64,102	24,536
1311	Xayboury District	16.51	4.55	63,772	10,530
1312	Viraboury District	40.88	4.43	43,084	17,611
1313	Assaphone District	52.76	4.47	63,046	33,263
1314	Xonboury District	13.62	4.14	49,493	6,738
1315	Thaphalanxay District	42.74	5.04	43,720	18,684
1401	Saravane District	33.78	3.16	107,741	36,399
1402	Ta Oy District	51.44	4.51	35,679	18,352
1403	Toumlane District	61.76	5.28	31,580	19,504
1404	Lakhonepheng District	14.60	3.24	51,118	7,464

District code	District name	Poverty rate (%)	Standard error	Population in 2018	Number of poor
1405	Vapy District	28.94	3.44	39,745	11,503
1406	Khongsedone District	15.98	3.06	65,928	10,538
1407	Lao Ngam District	26.51	3.30	77,062	20,426
1408	Sa Mouay District	53.80	9.14	18,135	9,756
1501	La Mam District	28.29	2.50	37,971	10,741
1502	Kaleum District	30.99	3.86	19,247	5,964
1503	Dak Cheung District	34.83	3.93	25,533	8,894
1504	Tha Teng District	27.77	2.54	41,818	11,613
1601	Pakse District	1.92	1.65	79,593	1,529
1602	Sanasomboun District	7.32	3.03	70,694	5,172
1603	Batiengchaleunsouk District	13.01	2.95	61,544	8,006
1604	Paksong District	18.83	2.61	89,390	16,835
1605	Pathouphone District	6.93	3.20	66,173	4,583
1606	Phonthong District	12.17	2.12	98,486	11,982
1607	Champassack District	11.97	3.07	65,524	7,841
1608	Soukhoumma District	7.34	3.46	61,753	4,534
1609	Mounlapamok District	22.65	4.90	42,083	9,533
1610	Khong District	20.81	2.51	98,342	20,462
1701	Saysetha District	24.59	2.74	36,137	8,886
1702	Samakkeuxay District	10.79	3.26	39,539	4,267
1703	Sanamxay District	28.37	3.82	37,510	10,640
1704	Sanxay District	46.36	3.99	24,671	11,438
1705	Phouvong District	37.60	4.00	15,799	5,941
1801	Anouvong District	7.83	2.02	28,178	2,208
1802	Thathom District	3.12	2.78	23,113	721
1803	Longchaeng District	12.70	3.93	10,854	1,379
1804	Hom District	13.86	3.02	12,878	1,785
1805	Longxan District	15.15	2.16	27,017	4,094
Total					1,386,296



LAO STATISTICS BUREAU

Ministry of Planning and Investment
Nong Beuak Road, Dongnasok Neu Village
Sikhottabong District, Vientiane Capital

Tel: + 856-21 214740
Fax: + 856-21 242022
Email: lstats@lsb.gov.la
Website: www.lsb.gov.la