

Mapping the Distribution of Poverty and Happiness Areas in East Nusa Tenggara Using the Small Area Estimation Method

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Abstract

Poverty and subjective well-being are related but distinct dimensions of human development. This article outlines a small area estimation (SAE) framework for mapping poverty and happiness profiles across regencies and municipalities in East Nusa Tenggara (NTT), Indonesia. The framework adapts the spatial-analysis approach used in earlier poverty-and-happiness research and identifies the data integration required to produce reliable subprovincial estimates. Publicly available Statistics Indonesia (BPS) data show that the poverty rate in NTT was 19.48% in March 2024 and 19.02% in September 2024; it declined further to 18.60% in March 2025 and 17.50% in September 2025. The provincial Happiness Index was 70.31 in 2021. These published indicators provide context but do not, by themselves, support district-level happiness estimates. The source thesis available for this assignment analyses the Special Region of Yogyakarta, not NTT, and the NTT household microdata and fitted SAE outputs needed to map happiness at small-area level were not supplied. Accordingly, this manuscript distinguishes verified contextual statistics from the proposed estimation workflow and does not invent district-level happiness estimates, model coefficients, standard errors, or map classifications. The framework specifies data harmonisation, model fitting, uncertainty assessment, spatial classification, and validation steps required for a complete empirical article.

Keywords

East Nusa Tenggara; Happiness; Poverty Mapping; Small Area Estimation; Spatial Analysis



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INTRODUCTION

Poverty is commonly measured through monetary deprivation, whereas happiness captures people's subjective evaluations of their lives. The two concepts can intersect, but they are not interchangeable: households with similar expenditure may report different levels of life satisfaction, and average well-being can conceal substantial inequalities within a province. Spatially disaggregated evidence is therefore useful for targeting policies that combine poverty reduction with improvements in quality of life. (Diener et al., 1985; Stiglitz et al., 2009).

East Nusa Tenggara (Nusa Tenggara Timur, NTT) is an important setting for this analysis because official statistics continue to record a high poverty rate. Statistics Indonesia

reported that 19.48% of the province's population was poor in March 2024 and 19.02% in September 2024. The rate subsequently stood at 18.60% in March 2025 and 17.50% in September 2025 (BPS-Statistics Indonesia, 2025; BPS-Statistics Indonesia, NTT Province, 2026). These province-wide figures describe the overall trend, but they cannot identify which smaller areas combine high poverty with low subjective well-being.

Small area estimation (SAE) can support more detailed estimates when direct survey estimates for small domains are unstable because sample sizes are limited. The approach combines survey outcomes with auxiliary information available for a larger population or a more detailed geographic frame. Elbers, Lanjouw, and Lanjouw (2003) developed a widely used poverty-mapping approach that links household survey data to census or census-like covariates and then predicts welfare measures for small areas. The approach requires compatible variables, appropriate model diagnostics, and careful reporting of uncertainty. (Fay & Herriot, 1979; Rao & Molina, 2015; Corral Rodas et al., 2023).

The present article aims to set out an SAE-based framework for mapping poverty and happiness profiles in NTT and to document the official statistics that can be verified from public sources. An important source limitation must be made explicit: the thesis provided as the methodological reference analyses the Special Region of Yogyakarta using Podes 2018, Susenas 2017, and SPTK 2017, rather than NTT. NTT-specific household microdata, harmonised auxiliary data, and fitted SAE outputs were not included in the materials available for this article. Consequently, the article does not present unverified district-level happiness estimates or claim that a completed NTT SAE model has been fitted.

METHODS

This study is framed as a quantitative spatial-estimation design. Its intended analytical unit is the regency/municipality (kabupaten/kota) in NTT, with a finer unit considered only if the sample design, auxiliary data, and model diagnostics support reliable estimates. The workflow is adapted from the source thesis by El-Yasha (2020), which combines household survey data with village-level auxiliary characteristics to estimate poverty and happiness indicators. The adaptation is methodological; the numerical findings from Yogyakarta are not transferred to NTT.

The required data architecture consists of: (1) household microdata from the National Socio-Economic Survey (Susenas) to construct expenditure or welfare measures and household covariates; (2) microdata from the Happiness Measurement Survey (SPTK) to model life satisfaction, affect, and eudaimonic well-being; (3) village-level auxiliary data from Village Potential Statistics (Podes), or another compatible census frame, to predict outcomes across small areas; and (4) official administrative boundaries and geographic identifiers to connect estimates to maps. These datasets must refer to compatible periods and geographic codes. Access to microdata may require formal authorisation from BPS.

For poverty mapping, household welfare should be defined consistently with the official

poverty methodology. A model may estimate the probability that household welfare falls below a selected poverty line, then aggregate predicted indicators to the target area. The headcount ratio is $H = q/n$, where q is the estimated number of people below the poverty line and n is the relevant population. Inequality can be summarised using the Gini coefficient when the underlying welfare distribution can be estimated with sufficient reliability. For happiness, the outcome definition must follow the available SPTK instrument and its survey weights; a happiness index should not be treated as interchangeable with a binary happy/unhappy classification unless the model and threshold are explicitly justified. (Foster et al., 1984; Alkire & Foster, 2011).

The model-fitting stage should follow the Elbers, Lanjouw, and Lanjouw (2003) poverty-mapping logic: harmonise common covariates, estimate the survey-based model, simulate or predict welfare outcomes for the auxiliary population, and aggregate estimates to each target area. Separate models are required for distinct outcomes unless a defensible joint model is specified. Standard errors or confidence intervals must be produced for all small-area estimates. Model checks should assess covariate compatibility, residual behaviour, prediction error, and sensitivity to alternative specifications. Direct survey estimates, where reliable, should be compared with model-based estimates as a validation step. (Elbers et al., 2003; Corral Rodas et al., 2023).

Spatial analysis would classify each area using pre-defined thresholds based on estimated poverty and happiness distributions. A two-dimensional classification can distinguish areas with relatively high poverty/low happiness, high poverty/high happiness, low poverty/low happiness, and low poverty/high happiness. Thresholds should be stated before interpretation and sensitivity-tested. Choropleth maps should display estimates together with uncertainty or reliability categories so that areas with unstable estimates are not misinterpreted as definitively different. (Anselin, 1995).

The present draft uses only publicly reported contextual statistics that could be verified. Because the necessary NTT microdata and fitted model outputs were not supplied, no coefficients, standard errors, district-level happiness estimates, poverty–happiness cross-tabulations, or thematic maps are fabricated. This restriction limits the findings to a documented baseline and a reproducible analytical protocol.

FINDINGS AND DISCUSSION

Official statistics provide the baseline for poverty in East Nusa Tenggara (NTT). The poverty rate was 19.48% in March 2024, 19.02% in September 2024, 18.60% in March 2025, and 17.50% in September 2025 (Table 1). This is a decline of 1.98 percentage points across the four reporting periods. The sequence shows a consistent downward trend, but it does not explain the causes or establish whether gains were evenly distributed among regencies and municipalities. The figures are useful as a benchmark for future small-area estimates, not as a substitute for local-level analysis. (BPS-Statistics Indonesia, 2025; BPS-Statistics Indonesia, NTT Province, 2026).

Table 1. Official poverty statistics for East Nusa Tenggara

Reference period	Poor population (million)	Poverty rate (%)
March 2024	Not reproduced in this draft	19.48
September 2024	1.108 (approx.)	19.02
March 2025	1.089	18.60
September 2025	1.032	17.50

Source: BPS-Statistics Indonesia (2025) and BPS-Statistics Indonesia, NTT Province (2026). Values are published official statistics; counts are rounded.

The available provincial indicator for subjective well-being is the Happiness Index published for 2021. NTT scored 70.31, compared with Indonesia's 71.49 (Table 2) (BPS-Statistics Indonesia, 2022), a difference of 1.18 points. This indicates that average reported happiness in NTT was below the national score in that year. However, the provincial index cannot identify districts with relatively high or low happiness or reveal differences among population groups. It also refers to 2021, whereas the poverty observations refer to 2024 and 2025. Because the periods differ, the figures cannot establish a contemporaneous relationship between poverty and happiness. They should be treated as separate contextual indicators motivating a harmonised small-area analysis. (BPS-Statistics Indonesia, 2022; Diener et al., 1985).

Table 2. Published happiness indicator available for NTT

Area	Year	Happiness Index
East Nusa Tenggara	2021	70.31
Indonesia	2021	71.49

Source: BPS-Statistics Indonesia, Happiness Index by Province (2021 release).

These indicators justify further small area estimation (SAE), but they do not establish a spatial association between poverty and happiness within NTT. It would be invalid to infer that districts with higher poverty necessarily have lower happiness from provincial figures alone. Poverty measures the share of people below the official poverty line, whereas the Happiness Index reflects subjective life evaluations. The measures represent different concepts, use different instruments, and refer to different years. Their local relationship must be tested with compatible microdata and an explicit analytical design rather than assumed from aggregate values. (Kahneman & Krueger, 2006; Stiglitz et al., 2009).

A defensible SAE workflow would harmonise geographic identifiers and construct common auxiliary variables from the National Socio-Economic Survey (Susenas), the Happiness Measurement Survey (SPTK), and Village Potential (Podes). Candidate variables should be selected based on substantive relevance, availability, and comparability across sources. Household characteristics, access to services, housing conditions, livelihoods, and community characteristics may be used only where definitions can be aligned. The poverty model should follow a recognised poverty-mapping approach, such as Elbers, Lanjouw, and Lanjouw (2003), and use the official poverty-line definition. Happiness requires a separate operational definition based on the SPTK questionnaire and its scoring procedure. The two concepts should not be conflated in a single outcome measure. (Elbers et al., 2003; Corral Rodas et al., 2023).

Model estimation must be followed by diagnostics and uncertainty assessment before

district rankings or maps are published. A complete report should state sample sizes, target domains, variable definitions, model specification, coefficients, standard errors, and diagnostic results. It should explain how uncertainty was propagated to small-area predictions and flag estimates with wide uncertainty intervals. Where possible, model-based estimates should be compared with reliable direct estimates at higher administrative levels, and sensitivity to alternative specifications should be reported. The smallest defensible geographic unit must be determined by the survey design, auxiliary-data quality, and model performance—not by the visual appeal of a finer map. (Rao & Molina, 2015; Fay & Herriot, 1979).

The findings therefore have two layers. First, public statistics show that NTT's poverty rate declined from 19.48% in March 2024 to 17.50% in September 2025, while its 2021 Happiness Index was 70.31, below the national score of 71.49. Second, the figures reveal an information gap: province-level values do not show variation among districts or whether local poverty and happiness patterns overlap. The central empirical output of a completed SAE study should be validated small-area estimates, uncertainty measures, and maps. These outputs are not reported here because NTT household microdata and fitted model results were not provided. No district-level values, coefficients, or spatial classes have been invented.

Poverty and happiness maps should be treated as complementary planning tools, not combined into a simplistic ranking of local welfare. If validated estimates become available, areas with relatively high poverty and low happiness could be examined for needs involving income support, livelihoods, health, education, and basic services. Areas with high poverty but relatively high happiness would require a different interpretation: social cohesion or other non-monetary sources of well-being may coexist with material deprivation, although this explanation would need local evidence. Likewise, lower poverty does not automatically imply higher happiness, which may also reflect health, safety, relationships, and expectations. These are possible interpretations for future analysis, not claims about specific NTT districts.

Spatial scale is critical. Provincial aggregates can conceal local disparities, while very small-area estimates may be unstable when samples are sparse or auxiliary data are poorly matched. SAE borrows strength from relationships between survey outcomes and auxiliary information, but it does not remove uncertainty or correct incompatible data automatically. El-Yasha's (2020) study of the Special Region of Yogyakarta offers a methodological precedent, but its estimates cannot be transferred to NTT. NTT needs its own harmonised inputs, fitted models, and validation. The contribution of this draft is to establish a verified statistical baseline and specify requirements for responsible mapping. A completed analysis should report local estimates and uncertainty transparently, compare urban and rural patterns where supported, and avoid interpreting associations as causal effects. (Anselin, 1995; Corral Rodas et al., 2023).

CONCLUSION

This article sets out a small area estimation framework for mapping poverty and happiness in East Nusa Tenggara and establishes a verified provincial baseline. Official statistics report a poverty rate of 17.50% in September 2025, down from 19.48% in March 2024, while the 2021 Happiness Index for NTT was 70.31. These indicators demonstrate the relevance of analysing material deprivation alongside subjective well-being, but they do not support district-level happiness classifications on their own.

The main conclusion is methodological: a valid NTT poverty-and-happiness map requires harmonised Susenas, SPTK, and auxiliary area data, fitted SAE models, uncertainty assessment, and spatial validation. The Yogyakarta thesis used as a reference supports the general workflow but does not supply NTT-specific estimates. Future work should obtain authorised NTT microdata, estimate the poverty and happiness models separately or through a justified joint framework, validate results, and publish district-level tables and maps with uncertainty measures. Until then, district-level estimates and classifications should not be invented or inferred from province-wide indicators.

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