An Assessment of Sierra Leone's SSNP Cash Transfer Program

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Paul von Chamier

Executive Summary

The study of Sierra Leone's 2011 SSNP cash transfer program finds that it is successful in reaching poor households in most of the regions. Applying data-driven sensitivity analysis of disbursement criteria it identifies areas for improvement moving forward to reduce exclusion of the poorest households in the underserved regions, thus closing the persisting gaps.

Current community-based and proxy-means (PMT) targeting systems capture most poor households but in doing so create financial inefficiency and political backlash. While together the targeting systems reach 91% of poor and extremely poor households (the coverage rate), 35% of recipient households are non-poor (the leakage rate). As a result, approximately $1.5 million (USD) are directed to non-poor households. Literature on cash-transfer programs demonstrates that this unintended use of resources can be linked to dissatisfaction among program supporters and poor households. Additionally, the data suggests that the program's community-based testing selects unrepresentative populations of poor households within the community, thus creating an exclusionary bias.

Building on the existing three-level targeting framework, I recommend the following changes to the program to reduce leakage and to ensure objectivity of the community-based targeting:

- To reduce the leakage rate, the program should lower the PMT threshold and modify the PMT calculation formula based on the updated data.
- To ensure objectivity at the community-based level, the program should implement a third-party monitoring mechanism conducted by third parties, e.g. a group of NGOs.
- Considering the high coverage rate and substantial leakage rate in the nine regions subject to the current targeting study, the World Bank's next round grant should be used towards the expansion into additional districts to increase the coverage of poor households in underserved regions.

Together, these changes will create a more effective program, build greater political support and reduce negative social response.

Targeting assessment in Sierra Leone

I. Background: Sierra Leone's Socio-Economic challenges and the introduction of the Social Safety Net Program

Since a decade-long civil war, Sierra Leone has experienced steady GDP growth over the last decade, averaging 5.8% annual per capita growth between 2003 and 2011. However, nearly half of the population remains poor. In 2011, 53% of the country's 6 million population were below the poverty line, and almost 1 million (14%) were extremely poor. Poor households are disproportionately concentrated in rural areas where 78% of all the poor people live.[i]

A recent outbreak of the Ebola Virus Disease (EDV) was a hard blow to the fragile economy. Despite gradual recovery, the average number of hours worked per day by people in the affected areas is still below baseline levels and many households lack capital to reopen their business or non-farm household enterprises. Nearly 1/3 of the country's workforce report lower revenues than before the Ebola crisis.[ii]

In this backdrop, the Government of Sierra Leone in collaboration with the World Bank and UNICEF had established a Social Protection Policy in 2011 which has culminated into the Social Safety Net Program (SSN Program) to support extremely poor households and vulnerable communities throughout the country. The SSN Program is financed by a US$10 million grant from the World Bank's International Development Association (IDA), a US$300,000 grant from UNICEF, and US$1 million from the Government of Sierra Leone.[iii] Overall, the program seeks to identify and assist poor and vulnerable households across the country, including those affected by the Ebola outbreak. In this paper, I will evaluate evidence on the targeting of this program by analyzing the benefit incidents and discuss a number of policy proposals to improve targeting in the future expansion of the program.

II. Analysis of the current targeting

Assessment of the current targeting design

There is a three-stage targeting system combining geographical, community identification of potentially eligible beneficiaries, and verification by proxy means testing (PMT). The resulting targeting efficiency is the following:

Figure 1. Targeting Performance under the current program design

	Undercoverage	Leakage
Poverty	9.5%	35.2% (poverty is the current disbursement threshold)
Extreme Poverty	4.9%	82.2% (if extreme poverty was the disbursement threshold)
Food Poverty	64.6%	99.3% (if food poverty was the disbursement threshold)

Source: own elaboration based on SSNP data

The current design is effective at identifying the extreme poverty and poverty. It is not able to identify well households experiencing specifically the food poverty. Unfortunately, the design is allowing many non-poor households to enjoy the cash transfers. Those ineligible recipients get access to the funds because they pass the Community-based and Proxy-means verification. Currently living below the poverty line is set as a threshold for program eligibility. This measure is the equivalent to earning $1.00 a day in 1996 US prices per person in the household.[iv] 35.2% of cash transfer recipients are households which enjoy a higher income per person.
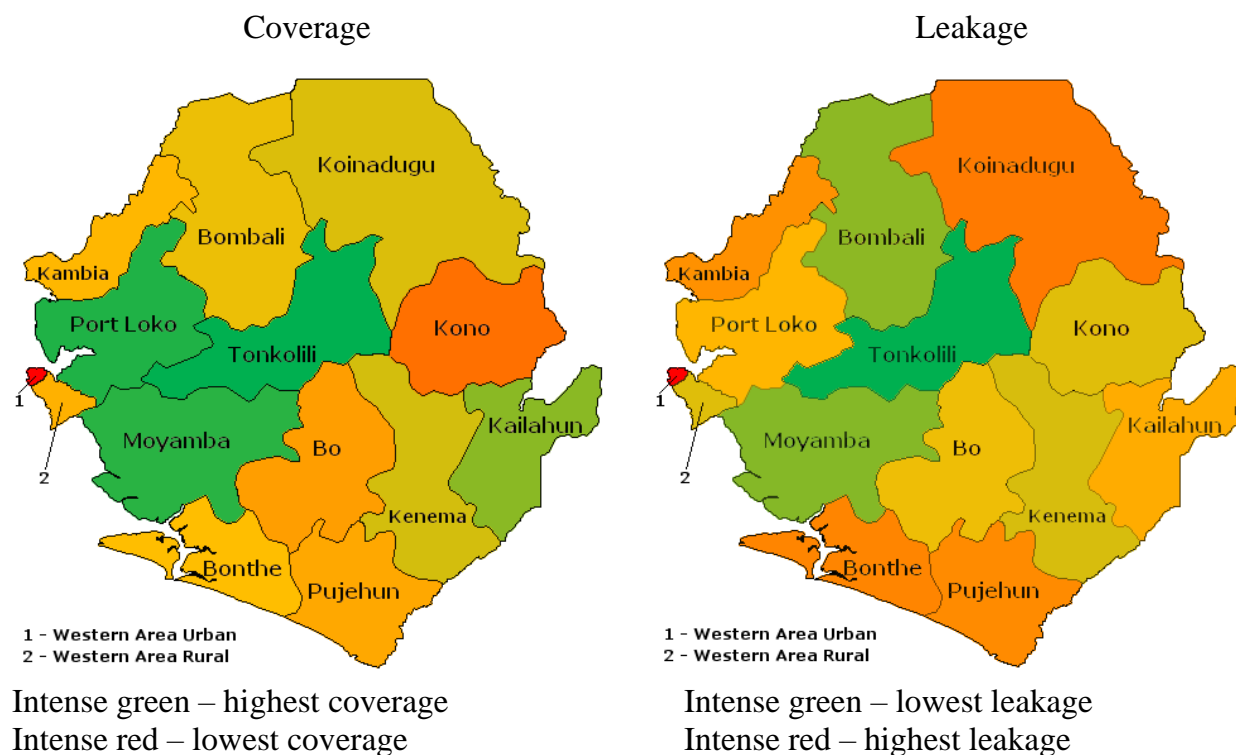
1.   Targeting of geographical areas

The first stage of selecting recipients is based on their residence. The program has been only implemented in 9 out of 14 districts in Sierra Leone so far. These are: Kono, Bo, Western, Bombali, Kanema, Kailahun, Moyamba, Port Lok, and Tonkilil. The geographic targeting design of the program only reaches 44.4% of the population nationwide. There is still a large room of improvement for the coverage rate if the program were to expand to other districts, even while taking into account the current budget limitations.

If the program were to expand to other districts, the following districts should be considered first according to the highest potential coverage rate of each district:
* Koinadug (coverage rate 91.96%)
* Bonthe (coverage rate 90.41%)
* Kambia (coverage rate 88.74%)
* Pujehun (coverage rate 84.37%)
* Western Urban (coverage rate 38.24%)

The coverage rates were simulated using the current targeting criteria as well as data on income and living conditions. Most of those regions (except for the last two) would achieve similar coverage rates to the ones in the currently active regions. The geographic distribution of coverage and leakage reveal patterns in program implementation effectiveness:

Figure 2. Geographic distribution of targeting performance:

Coverage   Leakage

Intense green – highest coverage   Intense green – lowest leakage
Intense red – lowest coverage   Intense red – highest leakage

Source: own elaboration based on SSNP data

Two conclusions from the geographic distribution of targeting effectiveness are the following:
- The program targets rural poor better than the urban poor
- The rural regions in direct proximity to the capital city region have better coverage than more remote ones.

2.   Community Based Targeting

The second stage, Community Based Targeting (CBT), helps identify extremely poor and poor people who are potentially eligible. I found that 92% of people who are chosen in the CBT will then pass the final PMT stage. It means that CBT allows for better targeting of the extremely poor and poor people. I assessed whether the CBT introduces bias into the program by comparing the group of people which actually passed CBT and then PMT using the program's administrative data and the group of people which would have passed PMT, had there been no CBT using the national census household data. Based on the PMT criteria those two groups are statistically different. It means that the current CBT stage excludes people who would be qualified for the program.

See Figure 14 in the Appendix: Tests of Exclusion of PMT-Qualifying Households by CBT

3.   Proxy Means Testing Score (PMT Score)

The final selection stage is Proxy Means Testing. Since there is no reliable data for most of households' income, proximate measures are applied to filter out the poorest households. The process includes program representatives traveling to villages and verifying the condition of the house a family lives in, their material possessions and the size of their livestock.

The accuracy of the current PMT method can be assessed by comparing the distribution of extremely poor, poor, and non-poor household (marked with colors) based on their PMT score using the representative samples for which both the PMT and the income data are available. A successful PMT instrument would produce distributions with substantially different modes, corresponding to limited overlap. This would allow for a clean cut-off in terms of a PMT score.

**Figure 3**. Distribution of PMT scores by income-based household poverty status
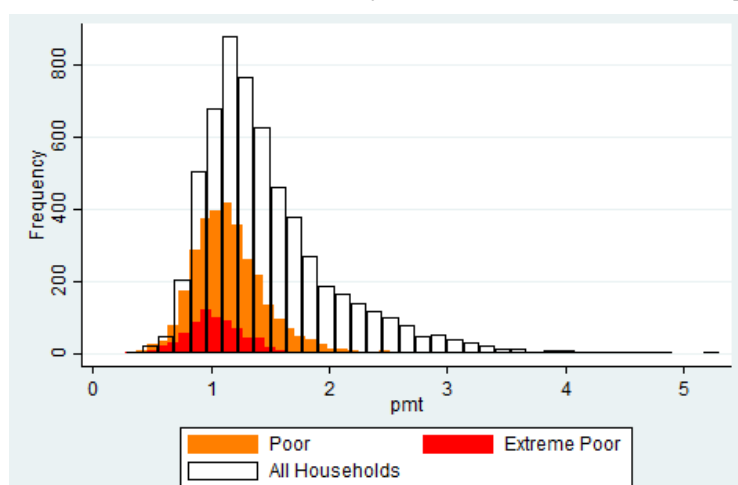
Source: own elaboration based on SSNP data

From the graph, it can be seen that the PMT does not accurately represent the actual poverty level of the population measured by the national household income data. If PMT accurately represented the poverty level, there should be little overlap between the non-poor, the poor, and the extreme poor. In particular, we should see few non-poor population scoring very low on the PMT scale. The overlap between those three groups doesn't allow for a clear cut-off using just the PMT score as a tool. This indicates that the current PMT criteria are not optimal in distinguishing the poor from the non-poor population.

Furthermore, if only PMT was used in the targeting design (removing the geographic and community-based stages), 85% of Sierra Leone population would be considered qualified for the program. It means that the PMT design is not distinguishing the group of interest from the rest of the society well since the current poverty ratio is 52%.

The sensitivity analysis of the PMT threshold allows for a simulation of coverage and leakage rate depending on the chosen PMT cut-off score. The figure below reveals the trade-off imposed by the current design.

Figure 4. Trade-off between coverage and leakage under the current design
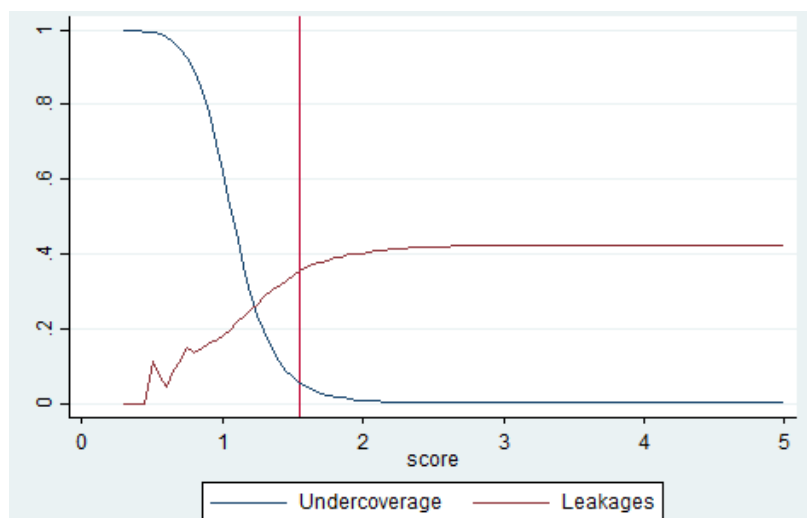
Source: own elaboration based on SSNP data

If the PMT score chosen as the cut-off was very low, the leakage (marked red) would be very low too. However, this would also mean that many eligible families would not be covered by the program (undercoverage marked blue). Adjusting the threshold solves one problem at the expense of exacerbating the other. The current threshold is marked by the vertical red line. As mentioned earlier it stops the leakage at 35.2% of all the program recipients while keeping the undercoverage at 9.5% of all the poor and extremely poor households.

4.   Summary of the analysis of the targeting design

The current overall targeting design of the program can be evaluated by the two types of targeting errors; leakage rate and under-coverage rate. With imperfect targeting, only those who are evaluated as poor through the targeting mechanism can benefit from transfers, and there are possibilities of leaving out some poor people or non-poor people predicted as poor receiving transfers.

The former is called the Type 1 Error, or the under-coverage rate, and the current program's under-coverage rate in the 9 districts is estimated as 9.52% for Poor and 4.88% for Extremely Poor. The Type II error refers to the leakage rate, and this arises when benefits are awarded to ineligible people under perfect targeting. This is 35.22% for Poor and 82.18% for Extremely Poor in the 9 districts. These negative occurrences might be underestimated. Data suggests that the community targeting misses some people who are poor or extremely poor and their household never make it into the PMT stage.

At the same time, it can be observed that the program is generous in its design. The threshold was chosen in away that high overage is achieved (over 90%) at the expense of a very high leakage rate (over 35%).

See Figure 6 in the Appendix. Targeting Performance Under Current PMT design within
SSNP Districts

Policy Recommendation

Based on the diagnostic above, I recommend the following policy options to improve the targeting performance of the SSN Program:

1.   Improve the proxy means-testing (PMT) by modifying its formula (adding missing district dummies and interaction terms for urban and the district dummies) as well as lowering the current cut-off threshold.

The current PMT design and the threshold do not accurately capture the poor population. Without the geographical and community-based targeting stages, the PMT alone would classify 85% of the entire population of Sierra Leone as eligible for the benefits (based on the analysis of the national census household survey data). Since the PMT ensures the objectivity of the program by deterring possible political capture at the community based targeting level, it is essential to maintain the PMT but modify its calculation formula and lower the threshold.

As shown in Figure 9, (1) adding 'missing district dummies' and (2) 'interaction terms for urban and the district dummies' to the PMT formula can marginally reduce the leakage rate.

See Figure 9 in the Appendix: Performance of Alternative PMT formulas (calibrated to 91% coverage)

The high leakage rate tends to be more politically, economically, and socially costly. Poor people who are accidentally missed out will have strong distrusts toward the government if their better-off neighbors get the benefits. Therefore, before scaling up the program to all the regions the high leakage rate can be lowered at an expense of a slightly higher under-coverage rate. This will also make the program more financially sustainable.

2.   Conduct a third-party monitoring mechanism to ensure the objectivity of the community-based targeting

Community-based targeting is the most subjective targeting criterion. It is vulnerable to political capture, rent-seeking, tribal discrimination, and personal biases. Despite such risks, it should be maintained for the following reasons: (i) without community-based targeting, any targeting errors will be blamed directly on the federal government, creating political tensions, (ii) it is more efficient administratively since the program officials only have to visit households selected by the community, (3) The community can potentially select people who are at a great immediate risk of poverty which cannot be measured by objective test such as PMT (e.g. very recently widowed single mothers).

To improve CBT's objectivity, a third-party, such as NGOs should be involved to monitor the village meetings convened to conduct the targeting. Consulting with local NGOs which are aware of the local context could additionally improve the targeting.

3.   Expand the Program to the other regions to increase the national coverage rate

With the additional resources from the World Bank available, it can be decided to either make the program more generous in the currently covered 9 districts or by expand the program to other districts. Considering the high coverage rate and the substantial leakage rate in the 9 regions subject to the current targeting study, scaling up the program to other regions will provide more added value. The mismatch between high coverage saturation in the studied 9 regions and lack of any cash transfers in the other 5 would be addressed, averting potential political tensions.

Technical Appendix

Interpretation of Estimates

The 2011 Sierra Leone Integrated Household Survey (SLIHS) uses Enumeration Areas as its primary sampling unit. Unless otherwise reported, statistics herein are calculated by using the "household" weighting scheme, which corrects for the oversampling of households in less populous Enumeration Areas. It does not give greater weight to larger households.

General Assessment

The principal metrics of interest for a targeting approach are the coverage and leakage rates, defined as:

Leakage: Number non-poor recipient households / Number recipient households
Coverage: Number poor recipient households / Number poor households

Ideally the targeting performance would be assessed by collecting information on program beneficiary households' expenditures, or linking administrative data to household surveys. In this case, because the household survey does not cover all program locations and because it preceded the launch of the SSNP, these strategies are not viable. From the SLIHS data, I therefore estimated the rates of coverage and leakage that would be attained if all households in SSNP districts that qualify under the PMT threshold received the transfer. These rates make the (inaccurate) assumption that no qualifying households are excluded from the program by the "shortlisting" process or by the per-location quotas. Thus, these estimates reflect only a portion of the design of the targeting:

- The proxy-means test design
- Selection of program districts.

Figure 5. Partial SSNP targeting performance under the current design

	Undercoverage	Leakage
Poor	31.2%	35.2%
Extreme Poor	21.3%	82.2%
Food Poor	75.3%	99.3%
All Households	55.6%	0.0%

Source: own elaboration based on SSNP data

Proxy Means Testing

The PMT design would be "good" if it made it possible to distinguish poor from non-poor households with a low rate of errors either of inclusion or exclusion. To isolate the PMT design, I treat as the target population only poor households resident in the 9 program districts.

Figure 6. Targeting performance under the current PMT design *within* SSNP districts

	Undercoverage	Leakage
Poverty	9.5%	35.2%
Extreme Poverty	4.9%	82.2%
Food Poverty	64.6%	99.3%
All Households	16.2%	0.0%

Source: own elaboration based on SSNP data

The usefulness of the PMT instrument can also be assessed by comparing the distribution of poor and non-poor households by PMT score. A successful PMT instrument would produce distributions with substantially different modes, corresponding to limited overlap.

Figure 7. Distribution of PMT scores by household poverty status
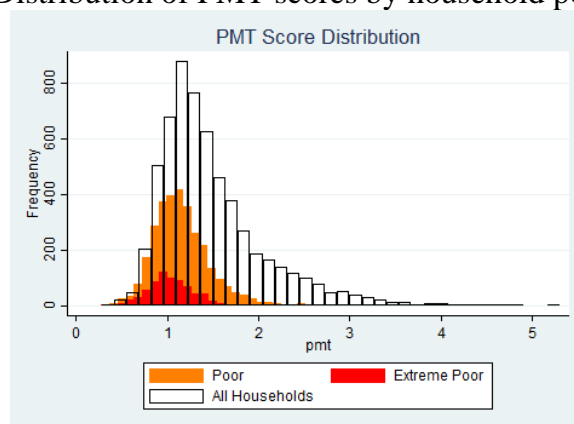
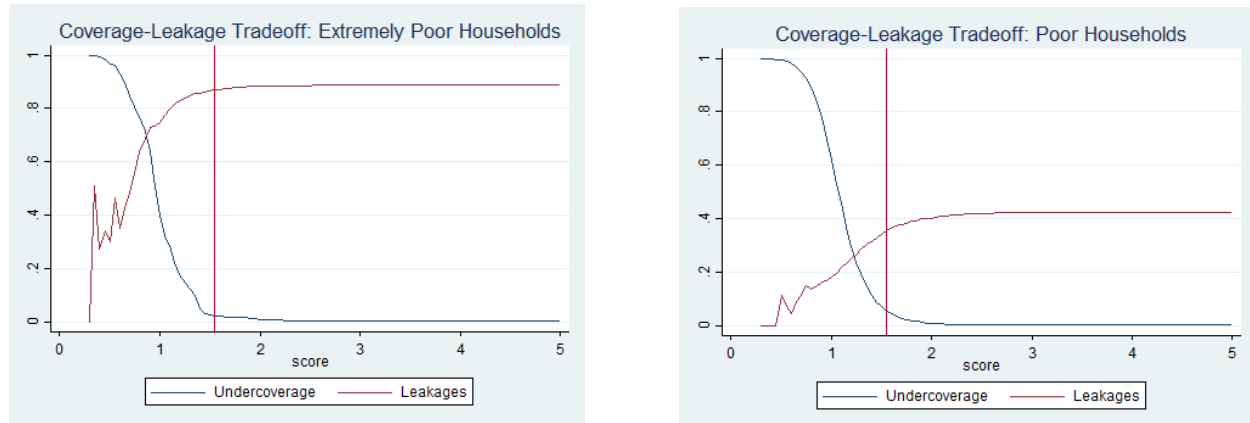Source: own elaboration based on SSNP data

Note: this figure does not employ household sampling weights

In the process of the calibration exercise described below, I noticed that the implied threshold PMT score by the OLS-estimation of the PMT formula was lower than 1.55. The lower PMT threshold have been due to minor differences in the coefficients in our estimate. Therefore I compared the mean predicted PMT score according to our new coefficients and the PMT score calculated according to the official formula. A t-test rejects the null hypothesis that the means (predicted PMT = 1.78 and official PMT = 1.48) are equal at the 1% level. This may be due to data errors but it appears to indicate that the PMT formula is more generous than setting the threshold exactly at the point corresponding to a poverty line level of household expenditure.

Design: Qualification Threshold

The simplest change to the design of the PMT is to alter the threshold. I calculated the "overall" coverage and leakage rates (analogous to Figure 5) at all potential PMT thresholds.

Figure 8. Targeting responsiveness to changes in qualification threshold

Source: own elaboration based on SSNP data

These figures do not reveal any threshold with the current instrument that obviously reflects a better leakage-coverage tradeoff. They highlight as in the previous section that the PMT formula reflects a decision to use generous inclusion criteria.

Unfortunately the administrative data did not distinguish which households which failed the light PMT and households that failed the full PMT. If this is available, it would provide crucial insight if the PMT could easily be replaced with the light PMT at lower cost.

Design: Alternative Formulas

To compare alternate specifications of the PMT formula, I estimated the corresponding regression and calibrate the threshold value to obtain the same rate of coverage as the current formula. I identified a set of regressions *ex ante* and limited the number of specifications in order to avoid overfitting the model. A new formula will be "better" if it can obtain the same coverage rate with lower leakage. Figure 9 reports the leakage rates for each of the specifications. It also includes the new threshold value (expressed either in terms of predicted expenditure or predicted log expenditure).

Figure 9. Performance of alternative PMT formulas (calibrated to ~91% coverage)

Description	Threshold*	Coverage**	Leakage	R-Squared
Re-estimate original formula	14.486	91.1%	35.2%	0.359
Linear expenditure as dependent variable	2347961	90.8%	36.1%	0.296
Logit model with poverty status as dummy variable	.873	91.5%	46.4%	0.218
Quadratic hhsize term	14.486	91.1%	35.2%	0.359
Quadratic hhsize term and linear dependent variable	2363417	90.9%	35.3%	0.313
Adding missing district dummies	14.444	91.1%	34.6%	0.368
Add "dependency ratio"	14.493	91.0%	35.4%	0.359
Interaction terms for urban and the district dummies	14.454	91.1%	34.6%	0.377
Add sweet consumption	14.487	91.1%	35.3%	0.361
Add food consumption	14.478	91.3%	34.4%	0.391
Both sweets and food consumption	14.475	91.2%	34.5%	0.392
Add formal savings dummy	14.484	91.0%	35.1%	0.361

* In terms of the dependent variable in the description
** Note: due to some subtle issues with the sampling weights and missing observations, it's difficult to calculate exactly where the threshold value is that produces a given coverage rate. This approach always gets it within 0.3%.
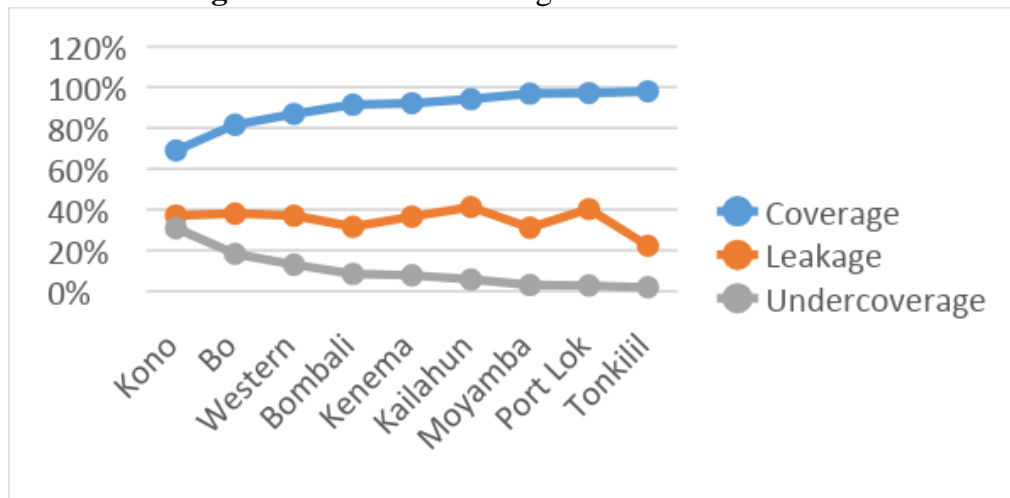
Geographic targeting

Current SSNP districts are poorer on average:

Figure 10. Differences in poverty status in SSNP program area and outside

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Absolute  |    ssnp_district
poor      |   No   Yes  Total
----------+--------------------
Non-poor | .2515 .2835  .535

 Poor     | .1114 .3536  .465
          |
 Total    | .3629 .6371    1
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Source: own elaboration based on SSNP data

Figure 11: Current coverage in the SSNP districts

Source: own elaboration based on SSNP data

Design: Expansion or Reduction

I sorted the districts by the within-district coverage rate to illustrate the extensive margin. Koinadug and Bonthe are the next two districts, respectively. Expanding into the next marginal district expands the cumulative coverage rate from 56% to 61%.

Figure 12. Cumulative coverage and leakage with geographic expansion

District	Coverage	**Leakage**	**Cumulative coverage**
Tonkilil	98.04%	22.30%	6%
Port Lok	97.20%	40.27%	14%
Moyamba	96.92%	31.13%	19%
Kailahun	94.22%	41.28%	27%
Kenema	92.19%	36.57%	37%
Bombali	91.50%	31.67%	44%
Bo	81.66%	38.09%	51%
Kono	69.03%	37.13%	56%
Koinadug	91.96%	46.48%	61%
Bonthe	90.41%	45.30%	64%
Kambia	88.74%	44.09%	68%
Western other	86.98%	37.09%	71%
Pujehun	84.37%	44.67%	75%
Western urban	38.24%	59.01%	81%

Source: own elaboration based on SSNP data

Design: Urban and Rural Areas

The current targeting design performs better in rural areas. The program benefits almost entirely rural households, through the lower-level geographic targeting which hasn't been covered here.

Figure 13. Coverage coming from rural households

	Coverage	Leakage
Urban+Rural	90.48%	35.2%
Rural Only	94.80%	33.5%

Source: own elaboration based on SSNP data

Community-based Targeting

The estimated coverage rate in "General Assessment" does not reflect the possibility (fact) that some poor households will be wrongfully excluded by the community-based shortlisting. To test the importance of these exclusion effects, I would like to compare shortlisted households (all households in the SSNP administrative data) with households from the SLIHS. If the shortlist includes all poor households, then the households which make it through the LPMT and PMT phases would be expected to resemble households from the SLIHS that would hypothetically pass the PMT. If the shortlist systematically excluded certain types of households from consideration, then there might be detectable differences between the PMT-passing households in the SLIHS and the administrative data. I ran differences-in-means t-tests on the characteristics included in the PMT questionnaire, and the results are statistically significant at arbitrary levels of confidence.

To some extent these effects must be driven by compositional effects resulting from the allocation of quotas for the SSNP to locations with different characteristics. For instance, note that urban households are strongly overrepresented in the SLIHS data compared to SSNP receipients. I attempt to control for this by constructing weights for each district and applying these to the administrative data, but they do not substantially affect the result of the tests; in fact they amplify the differences. Furthermore I restrict the tests to rural households, once again with no substantive change in results.

Although this analysis is undermined by the compositional effects, I interpret it as indicating a high level of exclusion of households that would have passed the PMT. Given the poor performance of the PMT, this does not necessarily mean that the CBT is doing a bad job of identifying the poor. 92% of shortlisted candidates receive the transfer, which could be explained by the shortlisting identifying the true poor at a higher rate than the PMT.

Figure 14. Tests of Exclusion of PMT-Qualifying Households by CBT Shortlisting

	SLIHS Mean	Admin Mean	t	p-value
PMTscore	1.08	1.08	173.39	~0
edu_head	4.63	1.29	2134.03	~0
hhsize	7.27	4.98	4534.94	~0
impr_toilet	0.36	0.50	-1519.82	~0
marrpoly	0.25	0.12	1803.86	~0
num_rooms	3.42	0.00	13701.21	~0
numkid0004	0.82	0.80	106.50	~0
numkid0509	1.32	0.88	2333.14	~0
owns_generator	0.01	0.00	768.68	~0
owns_iron	0.12	0.01	2252.47	~0
owns_radiorec	0.53	0.06	6666.43	~0
owns_refrifreezer	0.01	0.00	505.11	~0
owns_sofa	0.02	0.00	757.18	~0
ownsani_sheep	0.16	0.01	2921.39	~0
roof_iron	0.72	0.65	959.75	~0
urban	0.21	0.01	3367.92	~0
wall_cement	0.17	0.04	2311.38	~0
water_borehole	0.18	0.23	-667.60	~0
water_tap	0.10	0.06	875.35	~0

N (SLIHS): 4508; N (Admin): 20879

References:

[i] The World Bank. 2013. A Poverty Profile for Sierra Leone. Africa Region.

[ii] The World Bank. 2014. International Development Association Project Appraisal Document on Proposed Grant in The Amount of SDR 4.6 Million to The Republic of Sierra Leone for A Social Safety Net Project. Africa Region.

[iii] The World Bank. 2015. International Development Association Project Appraisal Document on A Proposed Additional Grant from IDA in The Amount of SDR 7.2 Million (US$ 10 Million Equivalent) and An Additional Grant from The Ebola Recovery and Reconstruction Trust Fund in The Amount of US$ 4.3 Million to The Republic of Sierra Leone for The Social Safety Nets Project. Africa Region.

[iv] The World Bank. 2016. Poverty research overview. http://www.worldbank.org/en/topic/poverty/overview