**Table 1. Summary statistics of 2010 and 2013 Malawi food security measures and predictors for both household and cluster levels.** Ranges of possible values are in parentheses in column 1. Higher rCSI values indicates lower food security; lower HDDS and FCS values indicate lower food security. The 2010-11 LSMS sample is representative for each month and each district. The 2013 food security measures are used for the out-of-sample predictions. We present the cluster average of the household-level variables, which includes food security measures and asset measures.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | Year 2010 (12270 households) | | | | | Year 2013 (3999 households) | | | |
| Variable | Mean | Median | Std. Dev. | | Min | Max | Mean | Median | | Std. Dev. | Min | Max |
| Household logFCS (0-4.72) | 3.82 | 3.83 | 0.37 | | 1.1 | 4.72 | 3.91 | 3.91 | | 0.36 | 2.2 | 4.72 |
| Household rCSI (0-42) | 3.68 | 0 | 6.51 | | 0 | 42 | 4.23 | 0 | | 6.95 | 0 | 42 |
| Household HDDS (0-12) | 5.18 | 5 | 1.27 | | 1 | 7 | 5.56 | 6 | | 1.15 | 1 | 7 |
|  | | | | Year 2010 (768 clusters) | | | | | Year 2013 (204 clusters) | | | |
| Cluster mean logFCS | 3.87 | 3.86 | 0.21 | | 3.23 | 4.53 | 3.96 | 3.95 | | 0.18 | 3.45 | 4.49 |
| Cluster mean rCSI | 3.68 | 2.88 | 3.05 | | 0.00 | 17.25 | 4.26 | 3.70 | | 2.66 | 0.00 | 16.28 |
| Cluster mean HDDS | 5.18 | 5.19 | 0.70 | | 3.00 | 6.75 | 5.55 | 5.55 | | 0.57 | 4.10 | 6.86 |
| Total rainfall (meters) | 1.00 | 0.99 | 0.18 | | 0.57 | 1.58 | 0.93 | 0.90 | | 0.17 | 0.59 | 1.58 |
| First day of rain | 45.02 | 41.00 | 10.25 | | 3.00 | 72.00 | 53.36 | 51.00 | | 13.26 | 30.00 | 72.00 |
| Max days without rain | 23.76 | 21.00 | 8.14 | | 10.00 | 52.00 | 24.30 | 24.00 | | 6.75 | 12.00 | 43.00 |
| Rainfall in flood prone regions (meters) | 2.04 | 0.00 | 9.66 | | 0.00 | 75.97 | 1.11 | 0.00 | | 7.34 | 0.00 | 69.15 |
| Number of cellphones owned | 0.60 | 0.44 | 0.60 | | 0.00 | 4.13 | 0.94 | 0.70 | | 0.71 | 0.05 | 4.40 |
| Maize price (log form) | 3.34 | 3.41 | 0.39 | | 2.40 | 5.19 | 4.46 | 4.50 | | 0.26 | 2.77 | 5.05 |
| Market thinness | 0.46 | 0.49 | 0.29 | | 0.00 | 1.00 | 0.27 | 0.25 | | 0.16 | 0.00 | 1.00 |
| Percent of non-natural roof | 0.36 | 0.49 | 0.25 | | 0.00 | 1.00 | 0.46 | 0.40 | | 0.27 | 0.00 | 1.00 |
| Household size | 4.56 | 4.56 | 0.68 | | 2.31 | 7.06 | 5.00 | 4.89 | | 0.72 | 3.58 | 7.53 |
| Household age | 42.15 | 42.06 | 4.65 | | 30.81 | 56.38 | 42.56 | 42.37 | | 4.06 | 33.63 | 56.19 |
| Household gender (1 for male, 2 for female) | 1.24 | 1.25 | 0.12 | | 1.00 | 1.69 | 1.23 | 1.22 | | 0.10 | 1.00 | 1.50 |
| Asset Index | 0.00 | -0.02 | 0.35 | | -0.83 | 1.05 | -0.02 | -0.30 | | 0.54 | -0.30 | 2.94 |
| Distance to road (km) | 8.37 | 4.36 | 10.15 | | 0.07 | 56.19 | 7.68 | 4.18 | | 8.40 | 0.06 | 44.68 |
| Distance to admarc market (km) | 8.06 | 6.56 | 5.77 | | 0.38 | 37.32 | 7.81 | 6.24 | | 5.04 | 1.20 | 32.89 |
| Percentage of agricultural land | 0.36 | 0.49 | 0.25 | | 0.00 | 1.00 | 0.34 | 0.41 | | 0.22 | 0.00 | 0.75 |
| Nutrition retention constrained | 0.28 | 0.00 | 0.44 | | 0.00 | 1.00 | 0.26 | 0.05 | | 0.38 | 0.00 | 1.00 |
| Elevation (km) | 0.87 | 0.90 | 0.35 | | 0.04 | 1.73 | 0.94 | 1.02 | | 0.29 | 0.12 | 1.55 |
| IPC Value (1 month lag) | 1.17 | 1.00 | 0.40 | | 1.00 | 3.00 | 1.08 | 1.00 | | 0.22 | 1.00 | 3.00 |
| IPC Value (12 month lag) | 1.07 | 1.00 | 0.25 | | 1.00 | 2.00 | 1.09 | 1.00 | | 0.27 | 1.00 | 2.00 |

**Table 2: Regression results for each food security measure using 2010 LSMS data for Malawi confirms that food security measures are associated with common drivers.** The results are estimated at the cluster-level and include predictors from all Class 1 + Class 2 + Class 3. Standard errors are presented in parentheses and asterisks indicate level of statistical significance of coefficients where three asterisks indicate 1%; two indicate 5% and one indicates 10%.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | (1) | (2) | (3) | | logFCS | HDDS | rCSI | |

|  |  |  |  |
| --- | --- | --- | --- |
| IPC Value (Previous month) | -0.022 | -0.080 | 2.121\*\*\* |
|  | (0.017) | (0.055) | (0.267) |
| IPC Value (Previous year) | -0.030 | -0.025 | 1.212\*\* |
|  | (0.031) | (0.101) | (0.494) |
| Total rainfall during rainy season | 0.104\*\*\* | 0.003 | -0.923\* |
|  | (0.034) | (0.113) | (0.549) |
| First day of rain | 0.0001 | -0.001 | 0.001 |
|  | (0.001) | (0.002) | (0.009) |
| Maximum days without rain | -0.001\* | -0.004\* | -0.013 |
|  | (0.001) | (0.002) | (0.012) |
| Maize price | -0.001\* | -0.003\*\* | 0.010\* |
|  | (0.0004) | (0.001) | (0.006) |
| Maize Market Thinness | -0.002 | -0.072 | 0.105 |
|  | (0.018) | (0.060) | (0.293) |
| Percent of agricultural land | 0.013 | 0.046 | -0.037 |
|  | (0.022) | (0.072) | (0.351) |
| Elevation | -0.090\*\*\* | -0.144\*\* | -0.873\*\* |
|  | (0.021) | (0.069) | (0.339) |
| Soil nutrient retention constrained | -0.016 | -0.100\*\* | 0.577\*\*\* |
|  | (0.013) | (0.043) | (0.212) |
| Distance to nearest road | -0.002\*\*\* | -0.008\*\*\* | -0.002 |
|  | (0.001) | (0.002) | (0.009) |
| Distance to nearest admarc market | 0.003\*\*\* | 0.007\*\* | 0.007 |
|  | (0.001) | (0.003) | (0.015) |
| Roof type | 0.133\*\*\* | 0.693\*\*\* | -0.859\* |
|  | (0.031) | (0.103) | (0.501) |
| Number of cells owned | 0.140\*\*\* | 0.312\*\*\* | -0.662\*\*\* |
|  | (0.015) | (0.050) | (0.243) |
| Household size | -0.013 | -0.051\* | 0.255\* |
|  | (0.009) | (0.029) | (0.144) |
| Household age | -0.002 | -0.013\*\*\* | -0.013 |
|  | (0.001) | (0.004) | (0.020) |
| Household gender | -0.038 | 0.071 | 1.122 |
|  | (0.047) | (0.154) | (0.751) |
| Asset index | 0.103\*\*\* | 0.413\*\*\* | -0.036 |
|  | (0.019) | (0.061) | (0.298) |
| Quarter 1 | -0.060\*\*\* | -0.223\*\*\* | -0.877\*\*\* |
|  | (0.017) | (0.055) | (0.266) |
| Quarter 2 | 0.131 | 0.480 | 1.238 |
|  | (0.091) | (0.299) | (1.455) |
| Quarter 3 | -0.013 | -0.068 | -0.799\*\*\* |
|  | (0.014) | (0.045) | (0.217) |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  | | --- | --- | --- | --- | | Observations | 581 | 581 | 581 | | R2 | 0.634 | 0.643 | 0.426 | |

**Table 3: IPC value regression results indicate that the IPC is significantly associated with food insecurity but the explanatory power (R-squared) is quite low.** Standard errors are presented in parentheses and asterisks indicate level of statistical significance of coefficients where three asterisks indicate 1%; two indicate 5% and one indicates 10%.

|  |  |  |  |
| --- | --- | --- | --- |
|  | (1) | (2) | (3) |
|  | IPC Value | IPC Value | IPC Value |
| rCSI | 0.055\*\*\* |  |  |
|  | (0.004) |  |  |
|  |  |  |  |
| logFCS |  | -0.282\*\*\* |  |
|  |  | (0.069) |  |
|  |  |  |  |
| HDDS |  |  | -0.087\*\*\* |
|  |  |  | (0.021) |
|  |  |  |  |
| Constant | 0.963\*\*\* | 2.255\*\*\* | 1.616\*\*\* |
|  | (0.021) | (0.267) | (0.109) |
| Observations | 760 | 760 | 760 |
| R2 | 0.175 | 0.022 | 0.023 |

**Table 4: The percentage of food insecure clusters correctly predicted to be food insecure.** The results are out of sample predictions at the food insecure category in 2013. They are estimated at the cluster-level, using only the IPC value and include predictors from all Class 1 + Class 2 + Class 3, respectively. The percentage of food insecure clusters that are predicted to be in the insecure category is also known as the true positive rate or “sensitivity” of prediction.

|  |  |  |  |
| --- | --- | --- | --- |
| Model | HDDS | logFCS | rCSI |
| IPC only | 1.000 | 0.000 | 0.097 |
| Full model | 0.994 | 0.833 | 0.860 |

**Table S1: The cluster average tail food security measures are based on the cluster average of the remaining households at the tail.** The results are estimated at the cluster-level and include predictors from all Class 1 + Class 2 + Class 3. Standard errors are presented in parentheses and asterisks indicate level of statistical significance of coefficients where three asterisks indicate 1%; two indicate 5% and one indicates 10%.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | (1) | (2) | (3) | | logFCS tail | HDDS tail | rCSI tail | |

|  |  |  |  |
| --- | --- | --- | --- |
| IPC Value (Previous month) | -0.012 | -0.075 | 0.875\*\* |
|  | (0.023) | (0.061) | (0.384) |
| IPC Value (Previous year) | 0.012 | -0.019 | 0.328 |
|  | (0.040) | (0.108) | (0.706) |
| Total rainfall during rainy season | 0.034 | -0.018 | -1.891 |
|  | (0.056) | (0.123) | (1.146) |
| First day of rain | -0.0002 | -0.001 | 0.008 |
|  | (0.001) | (0.002) | (0.018) |
| Maximum days without rain | -0.0003 | -0.005\* | -0.040 |
|  | (0.001) | (0.003) | (0.024) |
| Maize price | -0.001 | -0.003\*\* | 0.005 |
|  | (0.0005) | (0.001) | (0.008) |
| Maize Market Thinness | 0.032 | -0.070 | -0.901\* |
|  | (0.025) | (0.065) | (0.524) |
| Percent of agricultural land | 0.013 | 0.033 | -0.336 |
|  | (0.034) | (0.081) | (0.680) |
| Elevation | -0.021 | -0.134\* | -1.474\*\* |
|  | (0.031) | (0.075) | (0.701) |
| Soil nutrient retention constrained | -0.037\* | -0.107\*\* | 0.891\*\* |
|  | (0.020) | (0.048) | (0.399) |
| Distance to nearest road | -0.00004 | -0.007\*\*\* | -0.001 |
|  | (0.001) | (0.002) | (0.016) |
| Distance to nearest admarc market | 0.002 | 0.009\*\* | 0.043 |
|  | (0.001) | (0.004) | (0.032) |
| Roof type | 0.065 | 0.586\*\*\* | 1.085 |
|  | (0.066) | (0.124) | (1.017) |
| Number of cells owned | 0.027 | 0.289\*\*\* | -1.952\*\*\* |
|  | (0.054) | (0.082) | (0.694) |
| Household size | -0.002 | -0.036 | 0.301 |
|  | (0.014) | (0.033) | (0.265) |
| Household age | 0.0002 | -0.011\*\* | -0.038 |
|  | (0.002) | (0.005) | (0.037) |
| Household gender | -0.070 | 0.100 | 0.378 |
|  | (0.075) | (0.171) | (1.477) |
| Asset index | 0.050\* | 0.411\*\*\* | 0.161 |
|  | (0.028) | (0.069) | (0.532) |
| Quarter 1 | -0.037 | -0.257\*\*\* | 0.099 |
|  | (0.026) | (0.060) | (0.478) |
| Quarter 2 |  | 0.451 | -2.397 |
|  |  | (0.306) | (2.017) |
| Quarter 3 | -0.011 | -0.078 | 0.536 |
|  | (0.024) | (0.050) | (0.409) |
| Observations | 146 | 492 | 173 |
| R2 | 0.162 | 0.457 | 0.392 |