DOCUMENTATION GUIDE #10:
LITERACY MODULE CONDUCTED AT WAVE 7

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Literacy is a key educational skill that individuals do not always attain in school—even after several years. Identifying variation in literacy skills in a population, independent from educational attainment, is important given that it is independently associated with individuals' health and wellbeing, and may correspond with broader patterns of social inequality. As such, TLT researchers designed and piloted a literacy module in Chichewa, which was fully implemented in wave 7 (June-August 2011). The module includes a direct assessment of literacy, self-reported literacy, and parents' literacy.

To capture adequate variation in literacy skills, the direct literacy assessment gauges respondents' elementary-level reading skills and comprehension through a card matching technique. Similar approaches have been used in other studies of direct literacy assessments[1]; however, such direct assessment in population surveys are quite rare. Instead, population surveys typically rely on educational attainment data to approximate whether individuals can read, or simply rely on respondents' self-report.

To directly assess respondents' literacy, TLT interviewers showed respondents a card with a picture and five sentences printed below it. One of the five sentences clearly matched the picture shown; the other four sentences included some relevant words but were incorrect. Appendix A includes the literacy cards used and Appendix B includes the English translation and correct answer.

When administering the literacy assessment, as outlined in the questionnaire, the interviewer asked the respondent to read aloud the sentence that best corresponds with the picture. The inclusion of four distinct picture and sentence combinations minimized the risk that respondents were guessing the correct sentence by chance. In addition to recording whether the respondent selected the correct answer that corresponded with the picture, interviewers recorded how much of the sentence the respondent was able to read aloud as a way to confirm their comprehension of the text. Note that the instrument was piloted among a sample of approximately 200 respondents in the neighboring Ntcheu district before incorporating it as a module within the wave 7 survey instrument.

Using the literacy assessment, respondents can be coded according to their ease of reading and/or comprehension of Chichewa. Specifically, respondents can be coded as having: (1) no reading skills (no ability to decode text), (2) some reading skills and some comprehension (some ability to decode and to

[1] LeVine, Robert A., et al. *Literacy and mothering: How women's schooling changes the lives of the world's children*. Oxford University Press, 2011.

LeVine, Robert A., et al. "Maternal literacy and health behavior: a Nepalese case study." *Social science & medicine*58.4 (2004): 863-877.

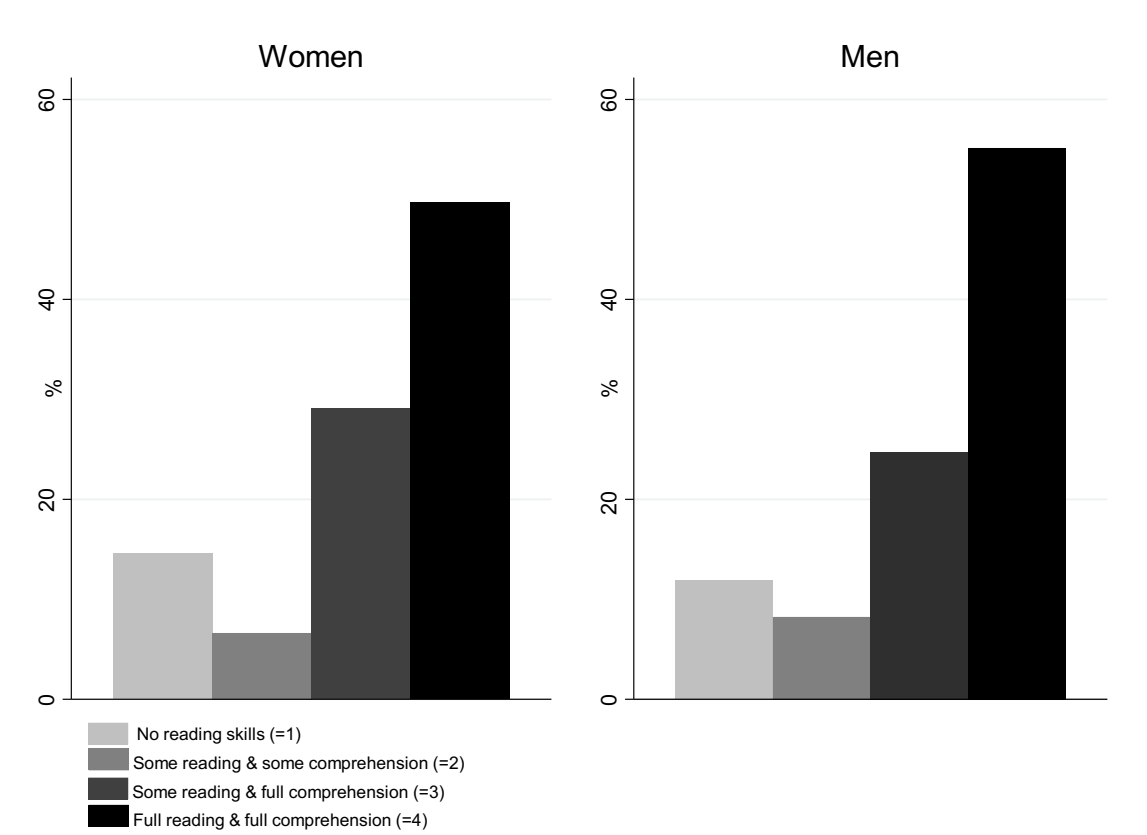
Tsogolo la Thanzi is a research project designed by Jenny Trinitapoli and Sara Yeatman and funded by grants R01-HD058366 and R01-HD077873 from the National Institute of Child Health and Human Development.
For data access see https://www.icpsr.umich.edu/icpsrweb/content/DSDR/index.html.

comprehend), (3) some reading skills and full comprehension (some ability to decode and full comprehension), and (4) full reading skills and full comprehension. The Stata code for creating this measure is included in Appendix D. This indicator of literacy has been shown to correspond with young adults' health outcomes in this sample.[2]

[2] Smith-Greenaway, Emily. "Are literacy skills associated with young adults' health in Africa? Evidence from Malawi." *Social Science & Medicine* 127 (2015): 124-133.

Figure 1 demonstrates the distribution of literacy skills among female and male respondents. Slightly more men are able to fully read and comprehend basic Chichewa relative to women (55% versus 50%). Overall, as many as 20 percent of women and men have, at most, some reading and comprehension.

FIGURE 1. Distribution of women's and men's literacy skills



Source: wave 7 of Tsogolo la Thanzi; N=1,221 women; N=437 men

Tabulations

WOMEN

```
. tab reading

    reading |      Freq.     Percent        Cum.
------------+-----------------------------------
          1 |        178       14.58       14.58
          2 |         81        6.63       21.21
          3 |        355       29.07       50.29
          4 |        607       49.71      100.00
------------+-----------------------------------
      Total |      1,221      100.00
```

```
. sum reading

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
     reading |      1,221     3.13923    1.062139          1          4
```

MEN

```
. tab reading

    reading |      Freq.     Percent        Cum.
------------+-----------------------------------
          1 |         52       11.90       11.90
          2 |         36        8.24       20.14
          3 |        108       24.71       44.85
          4 |        241       55.15      100.00
------------+-----------------------------------
      Total |        437      100.00

. sum reading

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
     reading |        437    3.231121    1.029002          1          4
```

Additional measures of literacy: self-reported literacy and parents' literacy

Prior to administering the direct literacy assessment, interviewers asked women and men to self-report their literacy. Specifically, interviewers asked respondents: "Would you say that you can read and understand a letter or newspaper easily, with difficulty, or not at all?" (Question L2). With this information, respondents can be classified as having self-reported: (1) no reading ability, (2) being able to read with difficulty, or (3) being able to read easily. As shown, the vast majority of female respondents report that they can read easily, just over one in ten report that they can read with difficulty, and just over one in ten report that they cannot read at all. Male respondents are generally more likely to report that they can read, either easily (80%) or with difficulty (13%), with only 6% reporting that they cannot read at all.

WOMEN

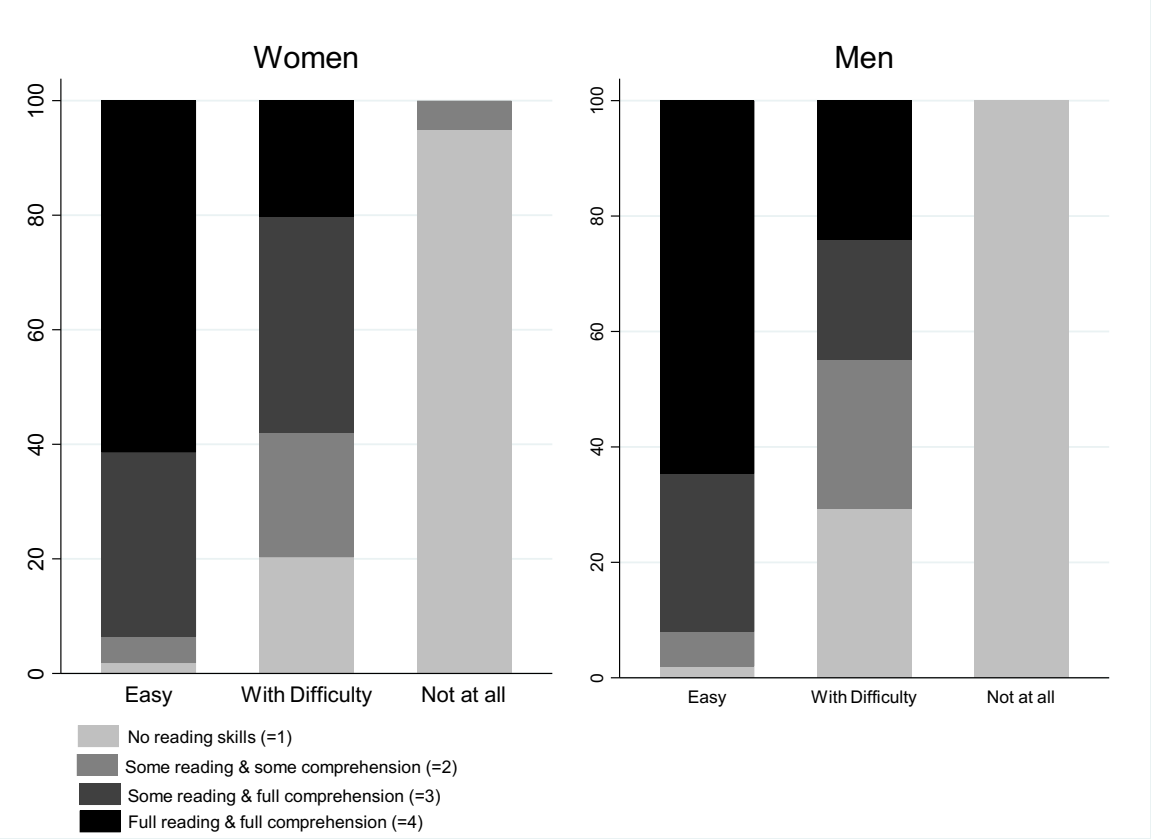
```
. tab selfreport, missing

     selfreport |      Freq.     Percent        Cum.
----------------+-----------------------------------
           Easy |        943       77.23       77.23
With Difficulty |        138       11.30       88.53
     Not at all |        139       11.38       99.92
              .m |          1        0.08      100.00
----------------+-----------------------------------
          Total |      1,221      100.00
```

MEN

```
. tab selfreport, missing

     selfreport |      Freq.     Percent        Cum.
----------------+-----------------------------------
           Easy |        351       80.32       80.32
With Difficulty |         58       13.27       93.59
     Not at all |         28        6.41      100.00
----------------+-----------------------------------
          Total |        437      100.00
```

Figure 2 depicts the association between the indirect measure of literacy (self-report) and the direct assessment to determine the accuracy with which TLT respondents self-report their literacy skills. As shown, measuring literacy using self-reported data misclassifies individuals according to their demonstrated skill level. Of female and male respondents who reported that they can "easily" read and understand a letter or newspaper, only roughly 60 percent displayed full reading and comprehension of basic Chichewa. Furthermore, among both female and male respondents who reported being able to read and understand a newspaper "with difficulty," the direct literacy assessment picks up on substantial variation in actual skill level.

FIGURE 2. Distribution of women's and men's direct literacy score by self-reported measure of literacy



Source: wave 7 of Tsogolo la Thanzi; N=1,221 women; N=437 men

Interviewers also asked respondents “does/did your mother or father know how to read?” (Question L1a & L1b). Among female respondents, well over one-half of respondents report that their mother and father can/could read, with approximately one in five reporting that only one parent could read, and just about ten percent reporting neither parent could do so. Distributions are highly comparable among men.

WOMEN

```
. tab momlit, missing
     momlit |      Freq.     Percent        Cum.
------------+-----------------------------------
         No |        392       32.10       32.10
        Yes |        825       67.57       99.67
         .d |          4        0.33      100.00
------------+-----------------------------------
      Total |      1,221      100.00

. tab dadlit, missing
     dadlit |      Freq.     Percent        Cum.
------------+-----------------------------------
         No |        167       13.68       13.68
        Yes |      1,040       85.18       98.85
         .d |         14        1.15      100.00
------------+-----------------------------------
      Total |      1,221      100.00

. tab parlit, missing

                  parlit |      Freq.     Percent        Cum.
-------------------------+-----------------------------------
        neither can read |        143       11.71       11.71
         only one parent |        264       21.62       33.33
mother & father can read |        799       65.44       98.77
                       . |         15        1.23      100.00
-------------------------+-----------------------------------
                   Total |      1,221      100.00
```

MEN

```
. tab momlit, missing
     momlit |      Freq.     Percent        Cum.
------------+-----------------------------------
         No |        115       26.32       26.32
        Yes |        319       73.00       99.31
         .d |          3        0.69      100.00
------------+-----------------------------------
      Total |        437      100.00
```

```
. tab dadlit, missing
     dadlit |      Freq.     Percent        Cum.
------------+-----------------------------------
         No |         50       11.44       11.44
        Yes |        382       87.41       98.86
         .d |          5        1.14      100.00
------------+-----------------------------------
      Total |        437      100.00

. tab parlit, missing
                  parlit |      Freq.     Percent        Cum.
-------------------------+-----------------------------------
        neither can read |         42        9.61        9.61
         only one parent |         78       17.85       27.46
mother & father can read |        309       70.71       98.17
                       . |          8        1.83      100.00
-------------------------+-----------------------------------
                   Total |        437      100.00
```

In addition to asking about parents' literacy, interviewers ask respondents—focusing only on those who are able to read—whether they have ever used their literacy skills to assist a friend or relative (Question L19). As shown, just over one half of female and male respondents report that they have used their skills to assist a family member. Note that respondents are coded as "s" if they have no reading skills at all.

WOMEN

```
. tab l19, missing
   Have you |
  ever used |
 ability to |
    read to |
help friend |
         or |
  relative? |      Freq.     Percent        Cum.
------------+-----------------------------------
         No |        390       31.94       31.94
        Yes |        667       54.63       86.57
         .m |         14        1.15       87.71
         .s |        150       12.29      100.00
------------+-----------------------------------
      Total |      1,221      100.00
```

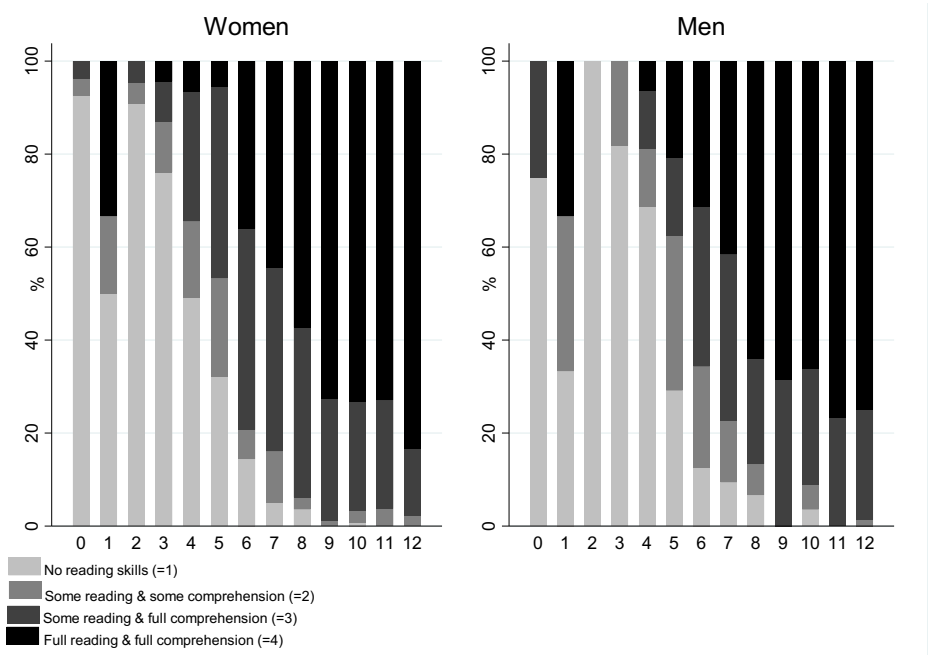
MEN

```
. tab l19, missing
   Have you |
  ever used |
 ability to |
    read to |
help friend |
         or |
  relative? |      Freq.     Percent        Cum.
------------+-----------------------------------
         No |        152       34.78       34.78
        Yes |        243       55.61       90.39
         .m |          3        0.69       91.08
         .s |         39        8.92      100.00
------------+-----------------------------------
      Total |        437      100.00
```

Correlates of literacy: Associations with years of education and socioeconomic status

Figure 3 demonstrates the association between respondents' literacy skills and their highest grade completed among those who attended school. This bivariate analysis confirms that the percentage of TLT respondents who can read and comprehend basic Chichewa increases linearly by their highest grade completed; however, literacy is generally low across each level of education. For instance, among respondents who attended some secondary school (grade 9 - grade 12), approximately 25 percent of female respondents and as many as 30 percent of male respondents could not fully read and comprehend basic Chichewa. Also of note is the considerable variation in literacy skills among both female and male respondents with lower levels of education, attesting to the importance of directly measuring literacy rather than attempting to infer it based on educational level.

FIGURE 3. Distribution of women's and men's literacy skills, by educational attainment

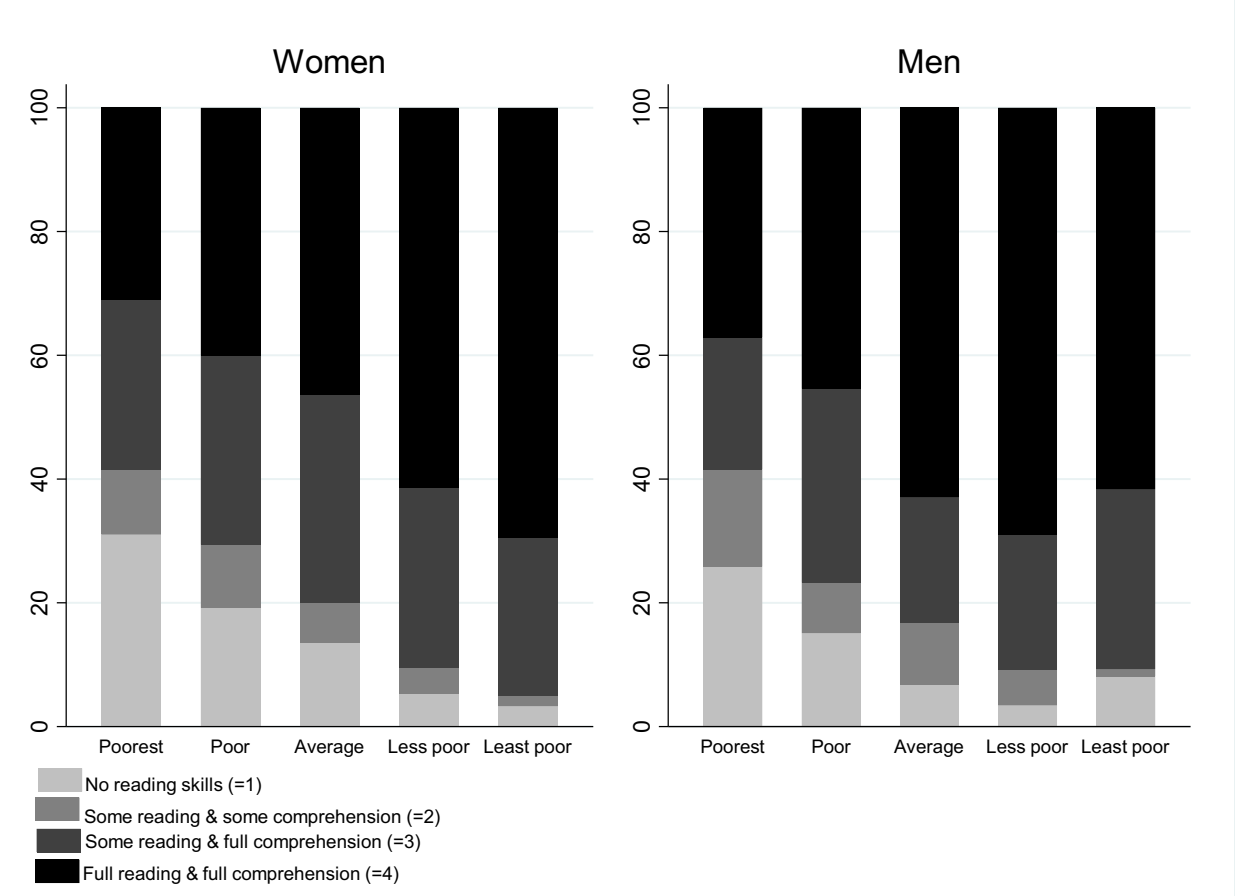


Source: wave 7 of Tsogolo la Thanzi; N=1,221 women; N=437 men

Figure 4 demonstrates the association between respondents' literacy skills and wealth quintile based on a household asset index derived from a principal components analysis.[3] Among both female and male respondents, those who are in the wealthiest quintile based on the household asset index are also most likely to be able to fully read.

[3] The linear asset index comprises nine durable goods (a bed with a mattress, a television, a radio, a landline or mobile phone, a refrigerator, a bicycle, a motorcycle, an animal-drawn cart, and an automobile) and one household asset (electricity). A principal components analysis calculates weights following the same procedure used to construct the Demographic Health Survey wealth index. The resulting index places households on a continuous scale relative to the sample, which for the purposes of these descriptive analysis, I use as the basis to create wealth quintiles.

FIGURE 4. Distribution of women's and men's literacy skills, by wealth quintile



Source: wave 7 of Tsogolo la Thanzi; N=1,221 women; N=437 men

Auditory health comprehension

Based on research demonstrating that literacy is tied to individuals' ability to process auditory health information[4], wave 7 of TLT included a simulated radio health message exercise. Interviews read aloud a passage, at a uniform pace, to respondents (see page 12 of wave 7 questionnaire). The English translation for the message is as follows:

Today you are going to learn more about HPV and cervical cancer. HPV is a sexually transmitted infection that puts women at risk of developing cervical cancer. The risk of HPV infection increases when a woman has unprotected intercourse with multiple partners. Women with HPV can develop cervical cancer. The signs and symptoms for cervical cancer are a woman releases a foul smelling discharge, sometimes a woman bleeds when having sex, a woman feels severe pains when having sex and a woman may release continuous menses. Women who have cancer should seek medical treatment. A woman can be cured if the cancer is discovered earlier however it can cause death if it remains untreated or discovered late.

After reading the message aloud, interviewers then asked respondents a series of questions in order to gauge their comprehension. Without prompting respondents, interviewers recorded how many key points respondents gathered and articulated (L8), the number of symptoms of cervical cancer they could recall (L9), and their overall assessment of whether the respondent understood the message (L10).
As shown, approximately one half of both female and male respondents recalled that HPV can be sexually transmitted, approximately one-third reported that it can lead to cancer, roughly half reported symptoms of cervical cancer and reported the importance of seeking help for symptoms. In general, female respondents recalled elements of the information more readily than male respondents, on average.

WOMEN

```
. tab l8a, missing
       Can you |
 describe what |
      you just |
        heard? |
      Sexually |
   transmitted |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        606       49.63       49.63
     Discussed |        610       49.96       99.59
             .m |          5        0.41      100.00
---------------+-----------------------------------
         Total |      1,221      100.00
```

[4] LeVine, Robert A., et al. *Literacy and mothering: How women's schooling changes the lives of the world's children*. Oxford University Press, 2011.

LeVine, Robert A., et al. "Maternal literacy and health behavior: a Nepalese case study." *Social science & medicine*58.4 (2004): 863-877.

```
. tab l8b, missing

       Can you |
 describe what |
      you just |
    heard? Can |
lead to cancer |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        790       64.70       64.70
     Discussed |        428       35.05       99.75
             .m |          3        0.25      100.00
---------------+-----------------------------------
         Total |      1,221      100.00

. tab l8c, missing

       Can you |
 describe what |
      you just |
        heard? |
   Symptoms of |
      cervical |
        cancer |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        423       34.64       34.64
     Discussed |        793       64.95       99.59
             .m |          5        0.41      100.00
---------------+-----------------------------------
         Total |      1,221      100.00

. tab l8e, missing

       Can you |
 describe what |
      you just |
heard? Need to |
     seek help |
    w/symptoms |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        623       51.02       51.02
     Discussed |        589       48.24       99.26
             .d |          1        0.08       99.34
             .m |          8        0.66      100.00
---------------+-----------------------------------
         Total |      1,221      100.00
```

```
. tab l9a, missing

  What are the |
   symptoms of |
      cervical |
       cancer? |
     Discharge |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        323       26.45       26.45
     Discussed |        898       73.55      100.00
---------------+-----------------------------------
         Total |      1,221      100.00

. tab l9b, missing

  What are the |
   symptoms of |
      cervical |
 cancer? Bleed |
    during sex |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        410       33.58       33.58
     Discussed |        811       66.42      100.00
---------------+-----------------------------------
         Total |      1,221      100.00

. tab l9c, missing

  What are the |
   symptoms of |
      cervical |
  cancer? Pain |
         w/sex |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        483       39.56       39.56
     Discussed |        738       60.44      100.00
---------------+-----------------------------------
         Total |      1,221      100.00

. tab l9d, missing

  What are the |
   symptoms of |
      cervical |
     cancer? R |
can't remember |
           any |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |      1,035       84.77       84.77
     Discussed |        186       15.23      100.00
---------------+-----------------------------------
         Total |      1,221      100.00
```

MEN

```
. tab l8a, missing

       Can you |
 describe what |
      you just |
        heard? |
      Sexually |
   transmitted |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        193       44.16       44.16
     Discussed |        244       55.84      100.00
---------------+-----------------------------------
         Total |        437      100.00

. tab l8b, missing

       Can you |
 describe what |
      you just |
    heard? Can |
lead to cancer |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        298       68.19       68.19
     Discussed |        139       31.81      100.00
---------------+-----------------------------------
         Total |        437      100.00

. tab l8c, missing

       Can you |
 describe what |
      you just |
        heard? |
   Symptoms of |
      cervical |
        cancer |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        206       47.14       47.14
     Discussed |        231       52.86      100.00
---------------+-----------------------------------
         Total |        437      100.00
```

```
. tab l8e, missing

       Can you |
 describe what |
      you just |
heard? Need to |
     seek help |
    w/symptoms |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        224       51.26       51.26
     Discussed |        213       48.74      100.00
---------------+-----------------------------------
         Total |        437      100.00

. tab l9a, missing

  What are the |
   symptoms of |
      cervical |
       cancer? |
     Discharge |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        148       33.87       33.87
     Discussed |        289       66.13      100.00
---------------+-----------------------------------
         Total |        437      100.00

. tab l9b, missing

  What are the |
   symptoms of |
      cervical |
 cancer? Bleed |
    during sex |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        203       46.45       46.45
     Discussed |        234       53.55      100.00
---------------+-----------------------------------
         Total |        437      100.00

. tab l9c, missing

  What are the |
   symptoms of |
      cervical |
  cancer? Pain |
        w/sex |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        234       53.55       53.55
     Discussed |        203       46.45      100.00
---------------+-----------------------------------
         Total |        437      100.00
. tab l9d, missing
```

What are the symptoms of cervical cancer? R can't remember any	Freq.	Percent	Cum.
Not discussed	356	81.46	81.46
Discussed	81	18.54	100.00
Total	437	100.00	

Written health message exercise

In a final literacy-related exercise, to assess respondents' ability to demonstrate more advanced, functional literacy skills, interviewers asked respondents to read a notecard with a health message about diabetes aloud. After they were finished reading, the interviewer removed the card from the respondents' view, and asked them a series of questions. The text in Chichewa, with the English translation, is as follows:

Shuga ndi nthenda yokhuzana ndi vuto limene thupi limakumana nalo potenga zakudya zomwe zagayidwa kale mmimba. Thupi limatenga zakudya zimene zagayidwa mmimba ndikudzilowetsa mmagazi kuti thupi lipeze mphamvu komanso lidzikula. Zinthu zambiri zimene timadya zimagayidwa ndikusungunulidwa kukhala shuga wa mmagazi. Koma shugayu sangalowe mmagazi popanda madzi ofunika anthupi otchedwa insulini. Madzi a insulini amene amapangidwa kuchokera muchiwalo chotchedwa pankiliyasi, amapangitsa kuti thupi lithe kutenga shuga uja komanso insulini ndi amene amachepetsa mlingo wakuchuluka kwa shuga mmagazi. Munthu amene wadwala nthenda ya shuga ali ndi vuto loti shuga wa mmagazi mwake wachulukitsa. Shuga ochulukitsayu amapezeka kuti akutuluka nthupi pokodza nkodzo. zizindikiro za nthenda ya shuga ndi monga kusinthasintha kwa kuona mmaso, mselu, kusanza, tizilonda ta pa khungu. Nthenda ya shuga imapita patsogolo ngati munthu akumwa zinthu zokhala ndi shuga wambiri. Matenda a shuga amatha kuchepetsedwa ndi mankhwala ngakhale kuti ndi nthenda yovuta kuyichiza.

Diabetes is a metabolism disorder. Metabolism refers to the way our bodies use digested food for energy and growth. Most of what we eat is broken down into glucose. Glucose is a form of sugar in the blood. When our food is digested the glucose makes its way into our bloodstream. Our cells use the glucose for energy and growth. However, glucose cannot enter our cells without insulin being present – insulin, produced by pancreas, makes it possible for our cells to take in the glucose and lowers the blood sugar level. A person with diabetes has a condition in which the quantity of glucose in the blood is too elevated. This excess blood glucose eventually passes out of the body in urine. Sign and symptoms include cases of rapid vision changes, nausea; vomiting and skin rashes. Diabetes can be aggravated by drinking extreme amounts of sugar-containing drinks. All forms of diabetes may be controlled with medications even though it is a chronic condition that usually cannot be cured.

In addition to recording the extent to which the respondent could read the card (L15), the interviewers also recorded whether the respondent could correctly answer a question about diabetes (L17) and the number of symptoms they could recall (L18) without prompting. As shown, approximately one-half of

both female and male respondents could read the text fully, whereas fewer than 20% a comprehension question correctly. Without prompting, between 20-50% of respondents noted each of the four key symptoms mentioned in the health passage.

WOMEN

```
. tab l15, missing

How much of the |
  passage can R |
          read? |      Freq.     Percent        Cum.
----------------+-----------------------------------
     Every word |        700       57.33       57.33
 More than half |        222       18.18       75.51
  Half of words |         80        6.55       82.06
Fewer than half |         37        3.03       85.09
  None of words |         22        1.80       86.90
              .m |         10        0.82       87.71
              .s |        150       12.29      100.00
----------------+-----------------------------------
          Total |      1,221      100.00

. tab l17, missing

  What organ |
helps bodies |
 lower blood |
       sugar? |      Freq.     Percent        Cum.
--------------+-----------------------------------
    Pancreas |        167       13.68       13.68
       Other |        521       42.67       56.35
           .d |        351       28.75       85.09
           .m |         10        0.82       85.91
           .s |        172       14.09      100.00
--------------+-----------------------------------
        Total |      1,221      100.00

. tab l18a, missing

      What are |
   symptoms of |
     diabetes? |
 Vision change |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        805       65.93       65.93
     Discussed |        244       19.98       85.91
             .s |        172       14.09      100.00
---------------+-----------------------------------
         Total |      1,221      100.00
```

```
. tab l18b, missing

      What are |
   symptoms of |
     diabetes? |
        Nausea |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        453       37.10       37.10
     Discussed |        596       48.81       85.91
             .s |        172       14.09      100.00
---------------+-----------------------------------
         Total |      1,221      100.00

. tab l18c, missing

      What are |
   symptoms of |
     diabetes? |
       Vomiting |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        503       41.20       41.20
     Discussed |        546       44.72       85.91
             .s |        172       14.09      100.00
---------------+-----------------------------------
         Total |      1,221      100.00

. tab l18d, missing

      What are |
   symptoms of |
diabetes? Skin |
         rashes |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        645       52.83       52.83
     Discussed |        404       33.09       85.91
             .s |        172       14.09      100.00
---------------+-----------------------------------
         Total |      1,221      100.00
```

MEN

```
. tab l15, missing

How much of the |
  passage can R |
          read? |      Freq.     Percent        Cum.
----------------+-----------------------------------
     Every word |        258       59.04       59.04
 More than half |         78       17.85       76.89
  Half of words |         23        5.26       82.15
Fewer than half |         21        4.81       86.96
  None of words |         16        3.66       90.62
             .m |          2        0.46       91.08
             .s |         39        8.92      100.00
----------------+-----------------------------------
          Total |        437      100.00


. tab l17, missing

  What organ |
helps bodies |
 lower blood |
      sugar? |      Freq.     Percent        Cum.
-------------+-----------------------------------
    Pancreas |         83       18.99       18.99
       Other |        219       50.11       69.11
           .d |         78       17.85       86.96
           .m |          2        0.46       87.41
           .s |         55       12.59      100.00
-------------+-----------------------------------
       Total |        437      100.00

. tab l18a, missing

      What are |
   symptoms of |
     diabetes? |
 Vision change |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        313       71.62       71.62
     Discussed |         69       15.79       87.41
             .s |         55       12.59      100.00
---------------+-----------------------------------
         Total |        437      100.00
```

```
. tab l18b, missing

      What are |
   symptoms of |
     diabetes? |
        Nausea |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        173       39.59       39.59
     Discussed |        209       47.83       87.41
            .s |         55       12.59      100.00
---------------+-----------------------------------
         Total |        437      100.00

. tab l18c, missing

      What are |
   symptoms of |
     diabetes? |
       Vomiting |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        218       49.89       49.89
     Discussed |        164       37.53       87.41
            .s |         55       12.59      100.00
---------------+-----------------------------------
         Total |        437      100.00
. tab l18d, missing

      What are |
   symptoms of |
diabetes? Skin |
        rashes |      Freq.     Percent        Cum.
---------------+-----------------------------------
 Not discussed |        245       56.06       56.06
     Discussed |        137       31.35       87.41
            .s |         55       12.59      100.00
---------------+-----------------------------------
         Total |        437      100.00
```

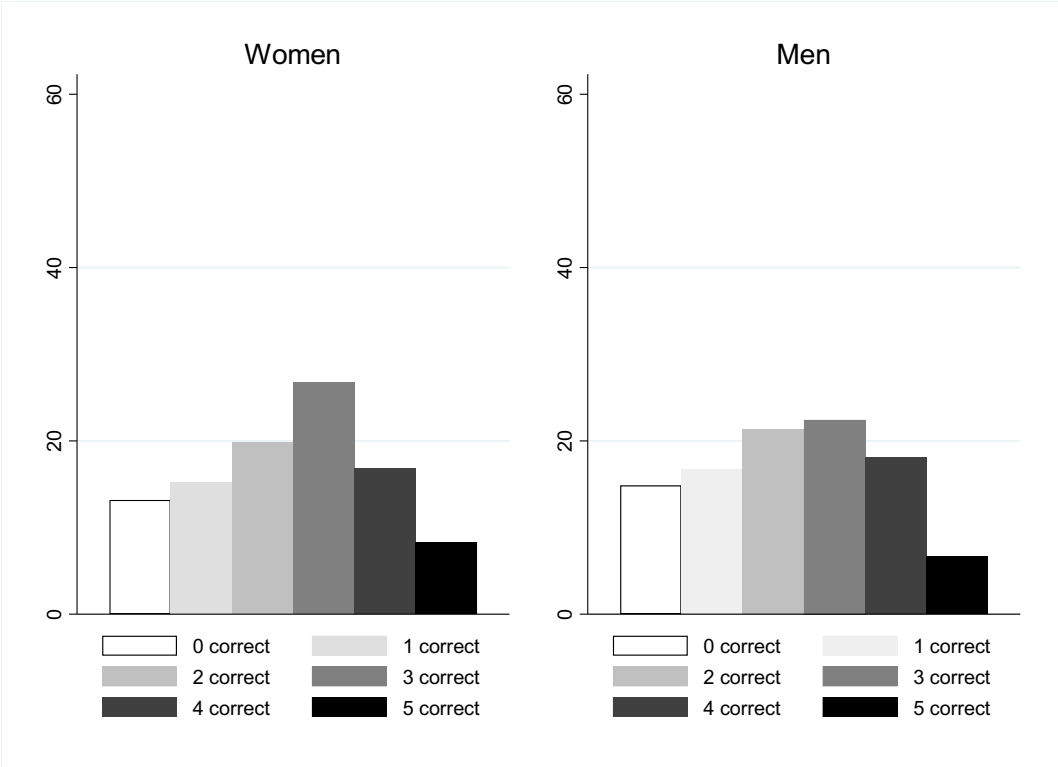
Numeracy

In addition to assessing respondents' basic literacy, functional literacy, and literacy-related skills, wave 7 of TLT included a set of questions to gauge respondents' numeracy skills through a series of practical, monetary-based word problems (Questions L21-L25). The numeracy questions, modeled after a section on the Woodcock-Johnson III Test of Achievement, specifically focused on respondents' ability to do mathematical calculations including addition, subtraction, division, and multiplication. The questions were designed as applied problems with no multiple-choice responses, just as the Woodcock Johnson-III applied problems subset. Moreover, in line with the Woodcock-Johnson III, the exercise was timed, and although the problems did not require paper and pencil to calculate, the respondents were allowed to use scratch paper.

The five numeracy questions, which are provided in Appendix C, were pilot tested in the neighboring Ntcheu district before incorporating it as a module within the wave 7 survey instrument. This helped ensure the questions were challenging enough that they would provide adequate differentiation between respondents. Respondents were given a total of five minutes to answer the questions (see page 15 of wave 7 questionnaire), enable researchers to create a summative score, ranging from 0 to 5, to differentiate respondents' numeracy skills (see Stata code for doing so in Appendix D).

As shown in Figure 5 and in the tabulations below, women and men have comparable numeracy scores, which are fairly normally distributed. On average, female respondents answered 2.4 questions correct, whereas male respondents answered an average of 2.3 questions correct.

FIGURE 5. Distribution of women's and men's numeracy skills



Source: wave 7 of Tsogolo la Thanzi; N=1,221 women; N=437 men

Tabulations:

WOMEN

```
. tab numeracy, missing

   numeracy |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        161       13.19       13.19
          1 |        186       15.23       28.42
          2 |        242       19.82       48.24
          3 |        326       26.70       74.94
          4 |        205       16.79       91.73
          5 |        101        8.27      100.00
------------+-----------------------------------
      Total |      1,221      100.00

. sum numeracy

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
    numeracy |      1,221    2.434889    1.474948          0          5

. tab num_1, missing

      num_1 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        312       25.55       25.55
          1 |        894       73.22       98.77
         .d |         15        1.23      100.00
------------+-----------------------------------
      Total |      1,221      100.00

. tab num_2, missing

      num_2 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        368       30.14       30.14
          1 |        837       68.55       98.69
         .d |         15        1.23       99.92
         .m |          1        0.08      100.00
------------+-----------------------------------
      Total |      1,221      100.00
```

```
. tab num_3, missing

      num_3 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        536       43.90       43.90
          1 |        658       53.89       97.79
         .d |         21        1.72       99.51
         .m |          6        0.49      100.00
------------+-----------------------------------
      Total |      1,221      100.00
. tab num_4, missing

      num_4 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        648       53.07       53.07
          1 |        423       34.64       87.71
         .d |        110        9.01       96.72
         .m |         40        3.28      100.00
------------+-----------------------------------
      Total |      1,221      100.00

. tab num_5, missing

      num_5 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        858       70.27       70.27
          1 |        161       13.19       83.46
         .d |         70        5.73       89.19
         .m |        132       10.81      100.00
------------+-----------------------------------
      Total |      1,221      100.00
```

Note that there are missing values for several of the individual numeracy items, because as many as 12 percent of female respondents ran out of time. Below, the tabulation of numeracy among those who ran out of time demonstrates that, on average, respondents who ran out of time reported fewer correct answers.

```
. tab l27, missing

  Did R run |
     out of |
      time? |      Freq.     Percent        Cum.
------------+-----------------------------------
         No |      1,079       88.37       88.37
        Yes |        142       11.63      100.00
------------+-----------------------------------
      Total |      1,221      100.00
```

```
. tab numeracy if l27==1

   numeracy |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         27       19.01       19.01
          1 |         39       27.46       46.48
          2 |         26       18.31       64.79
          3 |         36       25.35       90.14
          4 |         12        8.45       98.59
          5 |          2        1.41      100.00
------------+-----------------------------------
      Total |        142      100.00
MEN

. tab numeracy

   numeracy |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |         65       14.87       14.87
          1 |         73       16.70       31.58
          2 |         93       21.28       52.86
          3 |         98       22.43       75.29
          4 |         79       18.08       93.36
          5 |         29        6.64      100.00
------------+-----------------------------------
      Total |        437      100.00

. sum numeracy

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
    numeracy |        437    2.320366     1.48629          0          5

. tab num_1, missing

      num_1 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        126       28.83       28.83
          1 |        309       70.71       99.54
         .d |          2        0.46      100.00
------------+-----------------------------------
      Total |        437      100.00

. tab num_2, missing

      num_2 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        180       41.19       41.19
          1 |        255       58.35       99.54
         .d |          1        0.23       99.77
         .m |          1        0.23      100.00
------------+-----------------------------------
      Total |        437      100.00
```

```
. tab num_3, missing

      num_3 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        198       45.31       45.31
          1 |        230       52.63       97.94
         .d |          6        1.37       99.31
         .m |          3        0.69      100.00
------------+-----------------------------------
      Total |        437      100.00

. tab num_4, missing

      num_4 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        240       54.92       54.92
          1 |        154       35.24       90.16
         .d |         25        5.72       95.88
         .m |         18        4.12      100.00
------------+-----------------------------------
      Total |        437      100.00

. tab num_5, missing

      num_5 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        307       70.25       70.25
          1 |         66       15.10       85.35
         .d |         13        2.97       88.33
         .m |         51       11.67      100.00
------------+-----------------------------------
      Total |        437      100.00
```

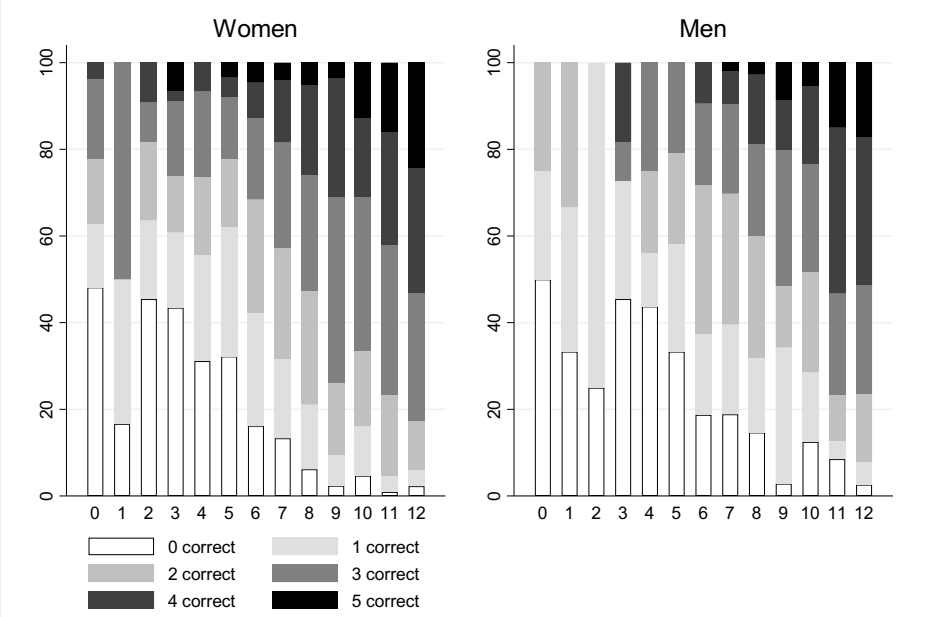
Again, it is important to note that there are higher levels of missing data on the numeracy items is because 12 percent of male respondents ran out of time. Similar to female respondents, the tabulation of numeracy among those who ran out of time demonstrates that, on average, respondents who ran out of time reported fewer correct answers.

```
. tab l27, missing

  Did R run |
     out of |
      time? |      Freq.     Percent        Cum.
------------+-----------------------------------
         No |        385       88.10       88.10
        Yes |         52       11.90      100.00
------------+-----------------------------------
      Total |        437      100.00
```

```
. tab numeracy if l27==1

   numeracy |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |          9       17.31       17.31
          1 |         12       23.08       40.38
          2 |          9       17.31       57.69
          3 |         16       30.77       88.46
          4 |          6       11.54      100.00
------------+-----------------------------------
      Total |         52      100.00
```

As shown in Figure 6, TLT respondents who completed higher levels of education generally answered more questions correctly. Even so, among both female and male respondents, Figure 6 demonstrates the considerable variation in numeracy skills at each level of education—attesting to the importance of directly assessing respondents' numeracy.

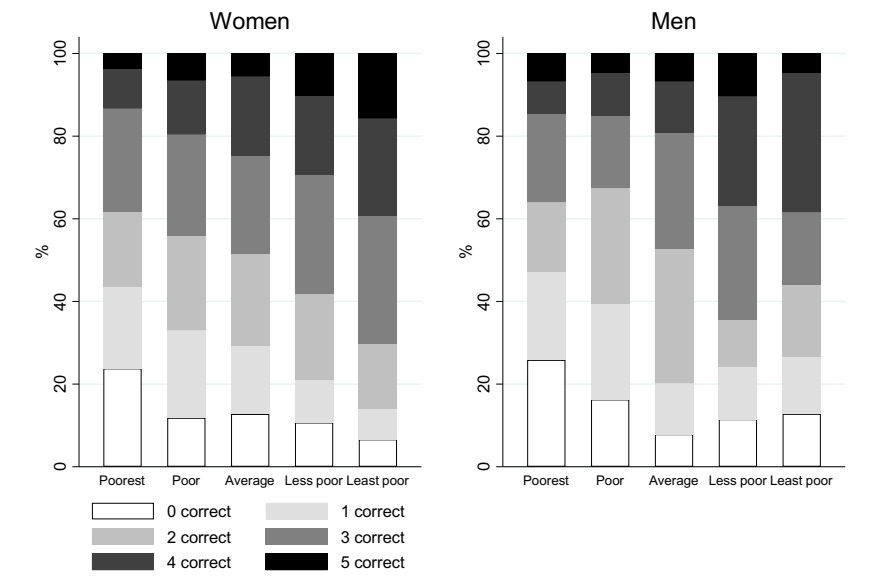
FIGURE 6. Distribution of women's and men's numeracy skills, by educational attainment



Source: wave 7 of Tsogolo la Thanzi; N=1,221 women; N=437 me

Figure 7 further shows that, similar to literacy skills, numeracy skills correspond with TLT respondents' household asset index score: respondents in the highest wealth quintile tending to score higher on the numeracy assessment than those in the lower wealth quintile. However, the correspondence between numeracy and wealth quintile is quite weak for both female and male respondents (Pearson's r correlation of 0.26 and 0.21, respectively).

FIGURE 7. Distribution of women's and men's numeracy skills, by wealth quintile



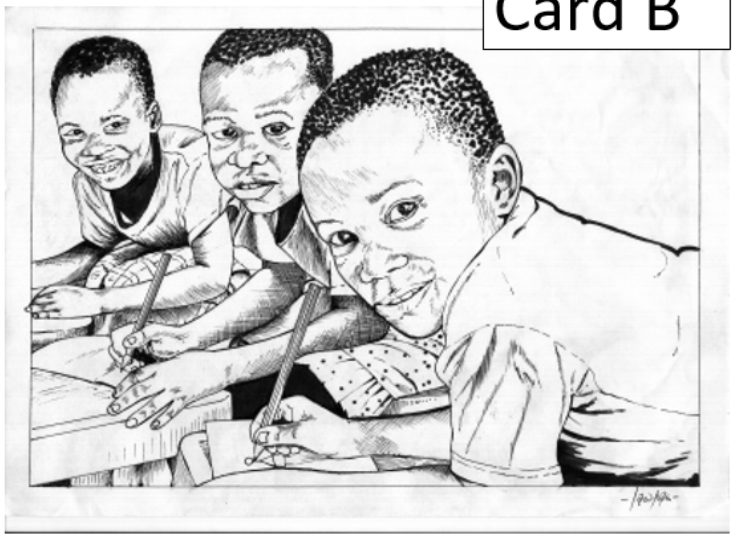
Source: wave 7 of Tsogolo la Thanzi; N=1,221 women; N=437 men

Appendix A. Cards used to assess literacy in Wave 7 of Tsogolo la Thanzi

Card A

1. Mnyamata akusewera mpila mu galawundi.
2. Anyamata akusewera mpila limodzi mu galawundi.
3. Ana akuthandizana kuwerenga.
4. Anyamata akuyenda limodzi.
5. Ana akuvina limodzi pabwalo la masewelo.

Card B



1. Mwana akuwerenga yekha.
2. Mwana akulemba yekha.
3. Ana a sukulu akucheza limodzi.
4. Ana akusewera limodzi.
5. Ana akuphunzira kulemba limodzi.

Card C

1. Mnyamata akuvina limodzi.
2. Mtsikana akuyimba ng’oma.
3. Ana akuyimba.
4. Atsikana ndi anyamata akuvina limodzi.
5. Mtsikana akuvina ndipo anyamata akuyimba ng’oma.

Card D

1. Amayi akugwira ntchito mmunda.
2. Abambo akulima.
3. Azimayi akupita kumsika.
4. Amayi akuchapa zovala zawo.
5. Amayi akugulitsa mteza mumsika.

Appendix B. English translations of literacy cards A-D

English translation
Correct answer

Card A

1. The boy is playing football on the field.
2. **The boys are playing football together on the field.**
3. The children are helping each other study.
4. The boys are walking together.
5. The children are dancing on the field together.

Card B

1. The child is reading alone.
2. The child is writing alone.
3. The students are chatting together.
4. The children are reading together.
5. **The students are learning how to write.**

Card C

1. The boys are dancing together.
2. The girl is playing the drum.
3. The children are singing.
4. The girls and boys are dancing together.
5. **The girl is dancing and the boys beat the drums.**

Card D

1. **The woman is working in the field.**
2. The men are farming.
3. The women are walking to the market.
4. The woman is washing their clothes.
5. The woman is selling groundnuts in the market.

Appendix C. Numeracy Questions (in English)

We will do one more exercise. This section will have to do with numbers. I'm going to ask you some questions about money. During all of these questions, I want you to imagine that you have 2800 kwacha. I have plenty of questions, so if you want to move on, just tell me to skip the question and I will move on to the next one. We only have five minutes for this section and I can only tell you each question twice. Here is a pen and a piece of paper. Feel free to use the pen and paper whenever you would like, but don't feel like you have to if you do not want to do so.

L21. Again, imagine that you have 2800 kwacha. If you do some work for your neighbor and he pays you 500 kwacha, how much money will you have after he pays you?

1 3300 kwacha
2 Other
88 I don't know
L21a = 1 if repeated

L22. Again, imagining you have 2800 kwacha, something comes up and you have to send half of the money to your relatives, but you keep the other half of the money. How much money will you have left?

1 1400 kwacha
2 Other
88 I don't know
L22a = 1 if repeated

L23. If you have 2800 kwacha and make 1000 kwacha working, but then you buy a bus ticket to Blantyre for 300 kwacha, how much kwacha will you have left?

1 3500 kwacha
2 Other
88 I don't know
L23a = 1 if repeated

L24. If you earned the 2800 kwacha because you worked for 7 days, how much would you hve made for each day that you worked?

1 400 kwacha
2 Other
88 I don't know
L24a = 1 if repeated

L25. If you were to put this money in the bank and add 200 kwacha to it each month, how many months would it take for you to have 4,800 kwacha saved?

1 10 months
2 Other
88 I don't know
L25a = 1 if repeated

L26. INTERVIEWER: Did the respondent use the pencil and paper?

1 Yes
0 No

L27. INTERVIEWER: Did the respondent run out of time?

1 Yes
0 No

Appendix D. Stata code to create composite literacy and numeracy measures

```
*LITERACY
*1 - no phonetic awareness
*2 - some phonetic awarness & some comprehension
*3 - complete phonetic awarness & some comprehension
*4 - complete phonetic awareness & complete comprehension
*PHONETIC
gen nophonetic= 0
replace nophonetic = 1 if l11b==5 & l12b==5 & l13b==5 & l14b==5

gen allphonetic = 0
replace allphonetic = 1 if l11b==1 & l12b==1 & l13b==1 &  l14b==1

gen somephonetic = 0
foreach var of varlist l11b l12b l13b l14b {
replace somephonetic=1 if `var'==5
replace somephonetic=1 if `var'==4
replace somephonetic=1 if `var'==3
replace somephonetic=1 if `var'==2
replace somephonetic=1 if `var'==1
}
replace somephonetic=0 if nophonetic==1
replace somephonetic=0 if allphonetic==1

gen phonetic = .
replace phonetic = 0 if nophonetic==1
replace phonetic = 1 if somephonetic==1
replace phonetic = 2 if allphonetic==1

*COMPREHENSION
gen correct_1 = 1 if l11a==2
gen correct_2 = 1 if l12a==5
gen correct_3 = 1 if l13a==5
gen correct_4 = 1 if l14a==1
gen wrong_1 = 1 if l11a!=2
gen wrong_2 = 1 if l12a!=5
gen wrong_3 = 1 if l13a!=5
gen wrong_4 = 1 if l14a!=1

gen nocomp = 0
replace nocomp= 1 if wrong_1==1 & wrong_2==1 & wrong_3==1 & wrong_4==1

gen allcomp = 0
replace allcomp = 1 if correct_1==1 & correct_2==1 & correct_3==1 &
correct_4==1

gen somecomp = 0
replace somecomp= 1 if nocomp!=1 & allcomp!=1

gen comp = .
replace comp = 0 if nocomp==1
replace comp = 1 if somecomp==1
replace comp = 2 if allcomp==1
```

```
3*READING SCALE
*1 - no phonetic awareness
*2 - some phonetic awarness & some comprehension
*3 - complete phonetic awarness & some comprehension
*4 - complete phonetic awareness & complete comprehension

generate reading = .
replace reading = 4 if comp==2
replace reading = 3 if phonetic==2 & comp==1
replace reading = 2 if phonetic==1 & comp==1
replace reading = 1 if phonetic==0
replace reading = 1 if comp==0
replace reading = . if l11a==.

*Numeracy

gen num_1 = l21
gen num_2 = l22
gen num_3 = l23
gen num_4 = l24
gen num_5 = l25
forv i=1/5 {
recode num_`i' 2=0
}
egen numeracy = rsum(num_1 num_2 num_3 num_4 num_5)
```