A comparison of the associations between adiposity and lipids in Malawi and the United Kingdom

Additional file 1: supplementary methods, tables and figures

Supplementary methods
Details of assessment of covariates included in the analyses

In Malawi, ethnicity was assessed in seven groups: Chewa, Tumbuka, Ngoni, Yao, Lomwe, Nkhonde and Other. Household assets score was based on the score of cumulative value, using local costs, of 15 items. The items and respective values are: paraffin lamp 2,000, radio 8,000, mobile phone 10,000, land phone 15,000, table & chair(s) 31,500, bed & mattress 31,000, bicycle 35,000, TV 85,000, electric/gas cooker 30,000, sofa set 125,000, oxcart 200,000, fridge 200,000, motorbike 350,000, car 2,000,000, and cow 150,000. The sum of the score was divided by 1,000 and categorised into quintiles. Educational level was assessed in 7 categories (illiterate, no formal education; literate, no formal education; primary 1-5 years, illiterate; primary 1-5 years, literate; primary 6-8 years, secondary (9-12 years); and tertiary (12 or more years)), and then it was recategorised into: no formal education; primary 1-5 years, primary 6-8 years, secondary, and tertiary. Marital status was assessed as never married, married, widowed or divorced/separated. Parity was considered the number of pregnancies the women ever had, regardless of its outcome. Smoking status comprised regular cigarette smoking (at least weekly), and it was categorised into never smoker, former smoker (stopped more than 6 months ago), and current smoker (smoked in the last 6 months). Alcohol intake in the previous 12 months and its frequency were categorised into: never, less than once a month, 1-3 days per month, 1-4 days per week, and 5 or more days per week. The number of days and frequency of walking, moderate and vigorous physical activity in leisure-time, work and commuting was assessed, and Metabolic Equivalent of Task (MET) was calculated. Physical activity was categorised into low, moderate or high based on the International Physical Activity Questionnaire (IPAQ) scoring protocol (Fogelholm et al., 2006). Low physical activity corresponds to neither moderate nor high criteria; moderate physical activity corresponds to any of the three criteria: (a) 3 days of vigorous activity of at least 20 minutes/day; (b) 5 days of moderate-intensity activity or walking of >30 minutes/day for >10 minutes at a time; or (c) 5 days of any combination of walking, moderate- or vigorous-intensity activities achieving at least 600 MET-minutes/week; high physical activity corresponds to either of two criteria: (a) vigorous-intensity activity on >3 days/week and accumulating at least 1500 MET-minutes/week; or (b) >5 days of any combination of walking, moderate- or vigorous-intensity
activities achieving at least 3000 MET-minutes/week. Use of regular lipid-lowering medication was investigated among those who reported medical diagnosis of raised cholesterol, and it was then recategorised into no raised cholesterol, raised cholesterol not taking medication, and raised cholesterol taking medication. HIV status was also investigated (positive/negative).

In UK adolescents, family socioeconomic data was assessed from questionnaires completed by the mothers during pregnancy and in the first months after delivery. Family income was measured at 33 and 47 months after delivery; a mean family income was calculated, and quintiles were generated. Maternal education was assessed at 32 weeks of gestation in 5 categories (CSE – Certificate of secondary education; Vocational degree; O level – ordinary level; A level – advanced level; and University degree). To note, O level typically represents 11 years of study and marks the end of secondary education; A level is a pre-university qualification requiring an additional 2 years of study and leading to a total of 13 years. Ethnicity was assessed at age 12 years in 5 categories (White, Mixed colour, Asian, Black and Other), and it was recategorised into White and Other because the vast majority (95%) were White. Smoking status and alcohol intake were assessed at the same time as adiposity and lipid measurements. Smoking status was classified into non-smoker, former smoker, and smoker (smoked in the last 30 days). Frequency of alcohol intake was assessed into never, monthly or less, 2-4 times a month, 2-3 times a week, and 4 or more times a week. Use of lipid-lowering medication (yes/no) was investigated among those who reported using any regular medication.

In UK adults, family socioeconomic information was the same as that used for the offspring (see above). Ethnicity was self-reported by the woman and her partner during pregnancy in 7 categories (White, Black Caribbean, Black African, Black Other, Indian, Chinese and other ethnicity); it was recategorised into White/British and Others as 98% were White. All the other covariates were assessed at the same time as assessment of anthropometric and lipids. Marital status was assessed in 9 categories (never married, widowed, divorced, separated, married only once, married for second time, married for third time or more, living as married, and civil partnership), and recategorised into never married, widowed, divorced/separated and married. Parity (number of pregnancies the woman had) was categorised as 1, 2, 3 and 4 or more. Smoking status including cigarette or other smoked tobacco use was categorised into never, former or current smoker. The frequency of alcohol intake was categorised as never, monthly or less, 2-4 times a month, 2-3 times a week, and 4 or more times a week.
Statistical Analysis for dyslipidaemia analysis

Age-standardised prevalence of each dyslipidaemia was described in adolescents and adults in Malawi and the UK, stratified by sex.

Multiple logistic regression analyses were used to examine the association of both BMI and WHR (in standard deviations) with each dyslipidaemia, adjusted initially for age and then for other potential confounders. The same confounders used in the linear regression analyses were used for the logistic regressions. However, for Malawian adolescents, HIV status was removed from the model due to high collinearity, and for ALSPAC adolescents, ethnicity was removed for the same reason.

Differences between the age-standardised prevalence of each dyslipidaemia and the adjusted associations of anthropometric measurements with dyslipidaemias between Malawi and the UK were compared by examining the point estimates and their 95% confidence intervals.

References:
Fogelholm M, Malmberg J, Suni J, Santtila M, Kyrolainen H, Mantysaari M and Oja P. International Physical Activity Questionnaire: Validity against fitness. Med Sci Sports Exerc. 2006;38:753-60.
Table S1. Number of individuals living in the same household in Malawi, by sex and age group

|        | Females N (%) | Males N (%) |
|--------|---------------|-------------|
| **Adolescents** |               |             |
| 1      | 696 (89.9)    | 432 (91.1)  |
| 2      | 70 (9.0)      | 39 (8.2)    |
| 3+     | 8 (1.0)       | 3 (0.6)     |
| **Adults**   |               |             |
| 1      | 1,280 (86.1)  | 598 (75.7)  |
| 2      | 202 (13.6)    | 185 (23.4)  |
| 3+     | 5 (0.3)       | 7 (0.9)     |
Table S2. Distribution of covariates in original and imputed data in adolescents in Malawi and the UK, by sex.

|                  | % missing | Category          | Male          | Female         |
|------------------|-----------|-------------------|---------------|----------------|
|                  |           |                   | Original      | Imputed        |
|                  |           |                   | % (95% CI)    | % (95% CI)     |
|                  |           |                   | Original      | Imputed        |
|                  |           |                   | % (95% CI)    | % (95% CI)     |
| Malawi HIV status| 11.2      | Positive          | 2.7 (1.7; 4.1)| 2.8 (1.6; 4.0)| 1.3 (0.5; 3.0)| 1.8 (0.4; 3.3) |
| ALSPAC Average income | 16.1 | Median (IQR) | 334.7 (250.9)| 322.9 (200.6)| 335.2 (255.1) | 332.8 (204.6) |
| Ethnicity        | 4.1       | White             | 95.3 (94.1; 96.2)| 95.2 (94.2; 96.3) | 95.4 (94.2; 96.4) | 95.4 (94.3; 96.5) |
|                  |           | Other             | 4.7 (3.8; 5.9)| 4.8 (3.7; 5.8)| 4.6 (3.6; 5.8)| 4.6 (3.5; 5.7) |
| Education        | 9.0       | CSE               | 11.9 (10.3; 13.6)| 12 (10.3; 13.7)| 9.5 (8.1; 11.2)| 9.9 (8.3; 11.5) |
|                  |           | Vocational degree | 6.4 (5.3; 7.8)| 6.6 (5.3; 7.8)| 7.6 (6.3; 9.1)| 7.5 (6.2; 8.9) |
|                  |           | O-level           | 33.9 (31.6; 36.4)| 33.9 (31.5; 36.3)| 30.8 (28.4; 33.2)| 31 (28.5; 33.4) |
|                  |           | A-level           | 28.2 (26.0; 30.6)| 28.2 (26.0; 30.5)| 31.1 (28.8; 33.6)| 30.8 (28.5; 33.2) |
|                  |           | Degree            | 19.6 (17.6; 21.6)| 19.3 (17.3; 21.3)| 21 (18.9; 23.2)| 20.7 (18.6; 22.8) |
| Smoking status   | 15.6      | Never             | 46.0 (43.4; 48.6)| 45.8 (43.2; 48.4)| 52.5 (49.8; 55.2)| 52 (49.3; 54.6) |
|                  |           | Former            | 25.6 (23.3; 27.9)| 25.3 (23.0; 27.6)| 21.5 (19.4; 23.9)| 21.9 (19.7; 24.2) |
|                  |           | Current           | 28.4 (26.1; 30.9)| 28.9 (26.5; 31.2)| 26 (23.7; 28.4)| 26.1 (23.7; 28.5) |
| Alcohol intake   | 19.5      | Never             | 1.8 (1.2; 2.7)| 2.0 (1.2; 2.8)| 2.5 (1.8; 3.6)| 2.4 (1.6; 3.2) |
|                  |           | Monthly or less   | 29.6 (27.2; 32.2)| 29.9 (27.3; 32.4)| 22.4 (20.2; 24.8)| 22.5 (20.1; 24.8) |
|                  |           | 2-4 times/month   | 48.7 (46.0; 51.4)| 48.1 (45.4; 50.9)| 45.7 (43; 48.5)| 46.1 (43.3; 48.9) |
|                  |           | 2-3 times/week    | 17.7 (15.7; 19.8)| 17.7 (15.3; 19.7)| 25.1 (22.8; 27.6)| 24.9 (22.5; 27.2) |
|                  |           | 4+ times/week     | 2.2 (1.5; 3.1)| 2.2 (1.4; 3.0)| 4.2 (3.2; 5.5)| 4.2 (3.1; 5.2) |

A level – advanced level; CI: confidence interval; CSE – Certificate of secondary education; HIV: human immunodeficiency virus; IQR: interquartile range; O level – ordinary level
## Table S3. Distribution of covariates in original and imputed data in adults in Malawi and the UK, by sex.

|                  | % missing | Category                  | Original % (95% CI) | Imputed % (95% CI) | Original % (95% CI) | Imputed % (95% CI) |
|------------------|-----------|---------------------------|---------------------|-------------------|---------------------|-------------------|
| **Malawi**       |           |                           |                     |                   |                     |                   |
| HIV status       | 9.2%      | Positive                  | 21.9 (19.8; 24.1)   | 21.8 (19.6; 24.0) | 15.9 (13.4; 18.8)   | 16.1 (13.4; 18.9) |
| ALSPAC           |           |                           |                     |                   |                     |                   |
| Average income   | 14.4%     | Median (IQR)              | 334.7 (250.9)       | 322.3 (200.6)     | 335.3 (255.1)       | 333.2 (209.6)     |
| Ethnicity        | 9.0%      | White                     | 97.8 (97.3; 98.2)   | 97.7 (97.2; 98.1) | 98.3 (97.6; 98.8)   | 98.1 (97.5; 98.8) |
|                  |           | Other                     | 2.2 (1.8; 2.7)      | 2.3 (1.9; 2.8)    | 1.7 (1.2; 2.4)      | 1.9 (1.2; 2.5)    |
| Education        | 10.9%     | CSE                       | 10.0 (9.1; 11)      | 10.2 (9.2; 11.1)  | 6.6 (5.5; 7.9)      | 6.8 (5.6; 8.1)    |
|                  |           | Vocational degree         | 7.5 (6.7; 8.3)      | 7.5 (6.7; 8.3)    | 5.3 (4.3; 6.5)      | 5.5 (4.3; 6.6)    |
|                  |           | O-level                   | 34.3 (32.8; 35.8)   | 34.3 (32.8; 35.8) | 21.1 (19.2; 23.2)   | 21.2 (19.2; 23.2) |
|                  |           | A-level                   | 29.2 (27.8; 30.6)   | 29.1 (27.7; 30.5) | 30.4 (28.2; 32.7)   | 30.4 (28.1; 32.6) |
|                  |           | Degree                    | 19.0 (17.8; 20.3)   | 18.9 (17.7; 20.1) | 36.6 (34.2; 39.0)   | 36.2 (33.9; 38.5) |
| Marital status   | 26.5%     | Never married             | 3.4 (2.8; 4.1)      | 3.6 (2.9; 4.3)    | 0.7 (0.4; 1.2)      | 0.7 (0.3; 1.1)    |
|                  |           | Married                   | 82.2 (80.7; 83.5)   | 81.4 (79.9; 82.9) | 90.9 (89.5; 92.1)   | 90.8 (89.5; 92.2) |
|                  |           | Widowed                   | 1.4 (1.0; 1.9)      | 1.5 (1.1; 2.0)    | 0.9 (0.6; 1.5)      | 0.9 (0.5; 1.4)    |
|                  |           | Divorced/ Separated       | 13.0 (11.8; 14.3)   | 13.5 (12.1; 14.8) | 7.5 (6.4; 8.8)      | 7.5 (6.3; 8.7)    |
| Smoking status   | 28.6%     | Never                     | 55.7 (53.8; 57.5)   | 54.9 (53; 56.8)   | 50.8 (48.5; 53.1)   | 50.8 (48.5; 53.1) |
|                  |           | Former                    | 35.2 (33.4; 37.0)   | 35.5 (33.8; 37.3) | 40.3 (38.1; 42.6)   | 40.3 (38.0; 42.5) |
|                  |           | Current                   | 9.2 (8.1; 10.3)     | 9.6 (8.4; 10.7)   | 8.9 (7.7; 10.3)     | 8.9 (7.6; 10.2)   |
| Alcohol intake   | 27.0%     | Never                     | 9.4 (8.4; 10.6)     | 9.9 (8.9; 11.0)   | 4.0 (3.2; 5.0)      | 4.1 (3.2; 5.0)    |
|                  |           | Monthly or less           | 15.4 (14.1; 16.7)   | 15.8 (14.4; 17.1) | 7.4 (6.3; 8.7)      | 7.5 (6.2; 8.7)    |
|                  |           | 2<sup>-4</sup> times/month| 18.5 (17.1; 19.9)   | 18.7 (17.2; 20.1) | 18.3 (16.6; 20.1)   | 18.3 (16.5; 20.1) |
|                  |           | 2<sup>-3</sup> times/week | 34.0 (32.2; 35.7)   | 33.5 (31.8; 35.1) | 39.3 (37.1; 41.6)   | 39.2 (37.0; 41.5) |
|                  |           | 4+ times/week             | 22.8 (21.3; 24.4)   | 22.2 (20.6; 23.7) | 30.9 (28.9; 33.1)   | 30.9 (28.8; 33.0) |
| Lipid lowering   | 0.8%      | No medication             | 98.2 (97.7; 98.5)   | 98.2 (97.8; 98.6) | 95.7 (94.7; 96.5)   | 95.7 (94.8; 96.6) |
|                  |           | Taking medication         | 1.8 (1.5; 2.3)      | 1.8 (1.4; 2.2)    | 4.3 (3.5; 5.3)      | 4.3 (3.4; 5.2)    |

A level – advanced level; CI: confidence interval; CSE – Certificate of secondary education; HIV: human immunodeficiency virus; IQR: interquartile range; O level – ordinary level
Table S4. Age-standardised means lipids, body mass index (BMI) and waist-hip ratio (WHR) in Malawian and UK adolescents and adults, by sex.

|                      | Females Mean (95% CI) | Males Mean (95% CI) | p-values |
|----------------------|-----------------------|---------------------|----------|
| **BMI (kg/m²)**      |                       |                     |          |
| Malawi adolescents (N=774) / (N=474) | 22.6 (22.4; 22.9) | 21.0 (20.8; 21.2) |          |
| UK adolescents (N=1,657) / (N=1,544) | 22.9 (22.7; 23.1) | 22.5 (22.3; 22.7) | <0.001   |
| P-values for difference between sex in Malawi |                     |                     |          |
| P-values for difference between sex in the UK |                     |                     | <0.001   |
| Malawi adults (N=1,487) / (N=790) | 28.1 (27.8; 28.4) | 24.2 (23.9; 24.5) |          |
| UK adults (N=4,423) / (N=1,900) | 26.5 (26.4; 26.7) | 27.5 (27.3; 27.7) | <0.001   |
| P-values for difference between sex in Malawi |                     |                     |          |
| P-values for difference between sex in the UK |                     |                     | <0.001   |
| **WHR**              |                       |                     |          |
| Malawi adolescents (N=774) / (N=474) | 0.78 (0.77; 0.78) | 0.81 (0.81; 0.82) | <0.001   |
| UK adolescents       | NA                    | NA                  |          |
| P-values for difference between sex in Malawi |                     |                     |          |
| P-values for difference between sex in the UK |                     |                     | NA       |
| Malawi adults (N=1,487) / (N=790) | 0.84 (0.84; 0.84) | 0.89 (0.89; 0.90) |          |
| UK adults (N=4,423) / (N=1,900) | 0.81 (0.81; 0.81) | 0.95 (0.94; 0.95) | <0.001   |
| P-values for difference between sex in Malawi |                     |                     |          |
| P-values for difference between sex in the UK |                     |                     | <0.001   |
| **TC (mmol/L)**      |                       |                     |          |
| Malawi adolescents (N=774) / (N=474) | 3.62 (3.57; 3.68) | 3.32 (3.25; 3.38) |          |
| UK adolescents (N=1,657) / (N=1,544) | 3.94 (3.90; 3.97) | 3.56 (3.53; 3.59) | <0.001   |
| P-values for difference between sex in Malawi |                     |                     |          |
| P-values for difference between sex in the UK |                     |                     | <0.001   |
| Malawi adults (N=1,487) / (N=790) | 4.64 (4.59; 4.69) | 4.47 (4.40; 4.54) |          |
| UK adults (N=4,423) / (N=1,900) | 4.93 (4.90; 4.95) | 5.12 (5.08; 5.16) | <0.001   |
| P-values for difference between sex in Malawi |                     |                     |          |
| P-values for difference between sex in the UK |                     |                     | <0.001   |
| **LDL-C (mmol/L)**   |                       |                     |          |
| Malawi adolescents (N=774) / (N=474) | 2.34 (2.29; 2.38) | 2.13 (2.08; 2.18) |          |
| UK adolescents (N=1,657) / (N=1,544) | 2.21 (2.18; 2.24) | 2.00 (1.97; 2.03) | <0.001   |
| P-values for difference between sex in Malawi |                     |                     |          |
| P-values for difference between sex in the UK |                     |                     | <0.001   |
| Malawi adults (N=1,487) / (N=790) | 3.18 (3.13; 3.22) | 3.03 (2.97; 3.10) |          |
| UK adults (N=4,423) / (N=1,900) | 2.98 (2.96; 3.00) | 3.18 (3.15; 3.22) | <0.001   |
| P-values for difference between sex in Malawi |                     |                     | <0.001   |
| P-values for difference between sex in the UK |                     |                     | 0.019    |
| **HDL-C (mmol/L)**   |                       |                     |          |
| Malawi adolescents (N=774) / (N=474) | 1.18 (1.16; 1.20) | 1.07 (1.04; 1.09) |          |
| UK adolescents (N=1,657) / (N=1,544) | 1.35 (1.33; 1.36) | 1.18 (1.17; 1.19) | <0.001   |
| P-values for difference between sex in Malawi |                     |                     |          |
| P-values for difference between sex in the UK |                     |                     | <0.001   |
| Malawi adults (N=1,487) / (N=790) | 1.21 (1.20; 1.23) | 1.16 (1.13; 1.18) |          |
| UK adults (N=4,423) / (N=1,900) | 1.48 (1.47; 1.49) | 1.29 (1.27; 1.30) | <0.001   |
| P-values for difference between sex in Malawi |                     |                     | <0.001   |
| P-values for difference between sex in the UK |                     |                     | <0.001   |
| **TG (mmol/L)**      |                       |                     |          |
| Malawi adolescents (N=774) / (N=474) | 0.70 (0.68; 0.72) | 0.77 (0.74; 0.80) |          |
| UK adolescents (N=1,657) / (N=1,544) | 0.84 (0.82; 0.86) | 0.84 (0.82; 0.86) | <0.001   |
| P-values for difference between sex in Malawi |                     |                     |          |
| P-values for difference between sex in the UK |                     |                     | 0.842    |
| Malawi adults (N=1,487) / (N=790) | 1.23 (1.19; 1.26) | 1.44 (1.37; 1.52) |          |
| UK adults (N=4,423) / (N=1,900) | 1.04 (1.02; 1.06) | 1.43 (1.40; 1.46) | <0.001   |
| P-values for difference between sex in Malawi |                     |                     | <0.001   |
| P-values for difference between sex in the UK |                     |                     | <0.001   |

BMI: body mass index; HDL-C: high density lipoprotein-cholesterol; LDL-C: low density lipoprotein-cholesterol; NA: not assessed; TC: total cholesterol; TG: triglycerides; WHR: waist-hip ratio
### Table S5. Age-adjusted association between quintiles of BMI and serum lipids in Malawian and UK adolescents and adults, by sex.

| Outcome | Quintile | Females | Adolescents | Males | Females | Adults | Males | p-value LRT | Beta (95% CI) | p-value LRT | Beta (95% CI) | p-value LRT | Beta (95% CI) | p-value LRT |
|---------|----------|---------|-------------|-------|---------|--------|-------|-------------|---------------|-------------|---------------|-------------|---------------|-------------|
| Malawi  |          |         |             |       |         |        |       |             |               |             |               |             |               |             |
| TC      | 2<sup>nd</sup> | 0.04 (-0.17; 0.26) | 0.815 | -0.20 (-0.50; 0.10) | 0.289 | 0.07 (-0.09; 0.23) | 0.690 | 0.24 (0.02; 0.46) | 0.084 |
|         | 3<sup>rd</sup> | 0.03 (-0.18; 0.25) |       | -0.01 (-0.32; 0.30) |       | 0.17 (0.00; 0.33) |       | 0.38 (0.16; 0.61) |       |
|         | 4<sup>th</sup> | 0.06 (-0.17; 0.28) |       | 0.13 (-0.16; 0.42) |       | 0.38 (0.21; 0.54) |       | 0.47 (0.24; 0.71) |       |
|         | 5<sup>th</sup> | 0.25 (0.03; 0.47) |       | 0.03 (-0.28; 0.34) |       | 0.38 (0.21; 0.55) |       | 0.67 (0.44; 0.91) |       |
| LDL     | 2<sup>nd</sup> | -0.08 (-0.30; 0.14) | 0.553 | -0.02 (-0.33; 0.28) | 0.757 | 0.13 (-0.03; 0.30) | 0.038 | 0.29 (0.08; 0.50) | 0.006 |
|         | 3<sup>rd</sup> | 0.02 (-0.20; 0.24) |       | 0.17 (-0.15; 0.48) |       | 0.26 (0.10; 0.43) |       | 0.47 (0.25; 0.69) |       |
|         | 4<sup>th</sup> | 0.06 (-0.17; 0.29) |       | 0.28 (-0.02; 0.57) |       | 0.51 (0.34; 0.68) |       | 0.59 (0.36; 0.81) |       |
|         | 5<sup>th</sup> | 0.32 (0.10; 0.55) |       | 0.26 (-0.06; 0.57) |       | 0.49 (0.32; 0.67) |       | 0.88 (0.66; 1.11) |       |
| HDL     | 2<sup>nd</sup> | -0.06 (-0.27; 0.15) | 1.000 | -0.29 (-0.57; 0.00) | 0.085 | -0.20 (-0.37; -0.04) | 0.142 | 0.04 (-0.18; 0.25) | 0.437 |
|         | 3<sup>rd</sup> | -0.05 (-0.26; 0.16) |       | -0.36 (-0.66; -0.06) |       | -0.27 (-0.43; -0.10) |       | -0.22 (-0.44; 0.00) |       |
|         | 4<sup>th</sup> | -0.15 (-0.37; 0.07) |       | -0.20 (-0.47; 0.08) |       | -0.44 (-0.61; -0.28) |       | -0.35 (-0.57; -0.12) |       |
|         | 5<sup>th</sup> | -0.30 (-0.51; -0.08) |       | -0.34 (-0.64; -0.04) |       | -0.53 (-0.70; -0.36) |       | -0.42 (-0.65; -0.19) |       |
| TG      | 2<sup>nd</sup> | 0.00 (-0.18; 0.18) | 0.825 | -0.03 (-0.31; 0.24) | 0.530 | 0.16 (-0.01; 0.34) | 1.000 | 0.05 (-0.20; 0.30) | 0.011 |
|         | 3<sup>rd</sup> | 0.08 (-0.10; 0.26) |       | 0.24 (-0.05; 0.53) |       | 0.28 (0.10; 0.45) |       | 0.27 (0.01; 0.52) |       |
|         | 4<sup>th</sup> | 0.14 (-0.05; 0.33) |       | 0.16 (-0.11; 0.43) |       | 0.47 (0.29; 0.65) |       | 0.62 (0.35; 0.89) |       |
|         | 5<sup>th</sup> | 0.30 (0.12; 0.49) |       | 0.41 (0.12; 0.70) |       | 0.55 (0.37; 0.73) |       | 0.77 (0.50; 1.03) |       |
| UK      |          |         |             |       |         |        |       |             |               |             |               |             |               |             |
| TC      | 2<sup>nd</sup> | 0.24 (0.05; 0.44) | 0.004 | 0.03 (-0.16; 0.22) | 1.000 | 0.10 (-0.02; 0.21) | 0.013 | 0.25 (0.08; 0.42) | 0.004 |
|         | 3<sup>rd</sup> | 0.36 (0.17; 0.54) |       | 0.11 (-0.08; 0.30) |       | 0.21 (0.09; 0.33) |       | 0.23 (0.07; 0.39) |       |
|         | 4<sup>th</sup> | 0.28 (0.09; 0.47) |       | 0.39 (0.20; 0.58) |       | 0.32 (0.20; 0.44) |       | 0.25 (0.10; 0.41) |       |
|         | 5<sup>th</sup> | 0.29 (0.10; 0.49) |       | 0.61 (0.42; 0.80) |       | 0.36 (0.24; 0.49) |       | 0.16 (0.00; 0.32) |       |
| LDL     | 2<sup>nd</sup> | 0.28 (0.09; 0.47) | 0.001 | 0.04 (-0.14; 0.23) | 1.000 | 0.19 (0.08; 0.30) | <0.001 | 0.17 (0.00; 0.34) | 0.125 |
|         | 3<sup>rd</sup> | 0.44 (0.25; 0.62) |       | 0.14 (-0.05; 0.33) |       | 0.37 (0.25; 0.49) |       | 0.12 (-0.05; 0.28) |       |
|         | 4<sup>th</sup> | 0.44 (0.25; 0.63) |       | 0.42 (0.23; 0.61) |       | 0.51 (0.39; 0.63) |       | 0.14 (-0.01; 0.30) |       |
|         | 5<sup>th</sup> | 0.52 (0.32; 0.72) |       | 0.72 (0.53; 0.91) |       | 0.59 (0.47; 0.72) |       | 0.04 (-0.12; 0.21) |       |
| HDL     | 2<sup>nd</sup> | -0.10 (-0.28; 0.08) | 1.000 | -0.04 (-0.22; 0.14) | 1.000 | -0.28 (-0.39; -0.18) | 0.881 | -0.19 (-0.34; -0.03) | 0.018 |
| Quintile | 3\textsuperscript{rd} | 4\textsuperscript{th} | 5\textsuperscript{th} | TG |
|---------------------------------|-----------------|-----------------|-----------------|-----|
| BMI                            | -0.23 (-0.41; -0.05) | -0.39 (-0.57; -0.21) | -0.67 (-0.86; -0.49) | 0.14 (-0.04; 0.33) |
| HDL-C                          | -0.10 (-0.28; 0.09)  | -0.19 (-0.38; -0.01)  | -0.60 (-0.78; -0.41)  | 0.04 (-0.13; 0.21)  |
| LDL-C                          | -0.46 (-0.57; -0.35) | -0.77 (-0.88; -0.66) | -1.05 (-1.16; -0.93) | 1.000 |
| LRT                            | -0.57 (-0.72; -0.42) | -0.61 (-0.76; -0.46) | -0.99 (-1.14; -0.84) | <0.001 |
| TC                             | 1.000            | 0.13 (0.03; 0.24)  | 0.61 (0.50; 0.71)  | 0.31 (0.15; 0.47)  |
| TG                             | <0.001           | <0.001           | <0.001           | <0.001 |

1\textsuperscript{st} quintile was considered the reference category.

BMI: body mass index; HDL-C: high density lipoprotein-cholesterol; LDL-C: low density lipoprotein-cholesterol; LRT: likelihood ratio test; TC: total cholesterol; TG: triglycerides.
### Table S6. Age-adjusted association between quintiles of WHR and serum lipids in Malawian and UK adolescents and adults, by sex.

| Outcome | Quintile | Sex          | Beta (95% CI) | p-value | LRT  | Beta (95% CI) | p-value | LRT  | Beta (95% CI) | p-value | LRT  |
|---------|----------|--------------|---------------|---------|------|---------------|---------|------|---------------|---------|------|
| Malawi  |          |              |               |         |      |               |         |      |               |         |      |
| TC      | 2<sup>nd</sup> | Females   | -0.03 (-0.24; 0.19) | 0.278 |      | 0.16 (-0.14; 0.47) | 0.958 |      | 0.06 (-0.09; 0.22) | 0.229 |      | 0.10 (-0.16; 0.35) | 0.493 |      |
|         | 3<sup>rd</sup> | Adolescents | 0.10 (-0.13; 0.32) |         |      | 0.12 (-0.18; 0.42) |         |      | 0.12 (-0.04; 0.27) |         |      | 0.12 (-0.11; 0.36) |         |      |
|         | 4<sup>th</sup> | Males     | -0.10 (-0.32; 0.13) |         |      | 0.03 (-0.27; 0.33) |         |      | 0.23 (0.07; 0.39) |         |      | 0.24 (0.01; 0.48) |         |      |
|         | 5<sup>th</sup> |            | 0.18 (-0.06; 0.41) |         |      | -0.07 (-0.37; 0.22) |         |      | 0.28 (0.11; 0.45) |         |      | 0.53 (0.31; 0.75) |         |      |
| LDL     | 2<sup>nd</sup> | Females   | 0.01 (-0.21; 0.24) | 0.385 |      | 0.21 (-0.10; 0.52) | 0.441 |      | 0.11 (-0.05; 0.27) | 0.030 |      | 0.07 (-0.17; 0.32) | 0.456 |      |
|         | 3<sup>rd</sup> | Adolescents | 0.09 (-0.14; 0.32) |         |      | 0.23 (-0.08; 0.54) |         |      | 0.17 (0.01; 0.33) |         |      | 0.15 (-0.08; 0.39) |         |      |
|         | 4<sup>th</sup> | Males     | -0.05 (-0.28; 0.19) |         |      | 0.17 (-0.14; 0.48) |         |      | 0.34 (0.17; 0.50) |         |      | 0.37 (0.14; 0.60) |         |      |
|         | 5<sup>th</sup> |            | 0.27 (0.03; 0.51) |         |      | 0.15 (-0.15; 0.46) |         |      | 0.43 (0.25; 0.60) |         |      | 0.60 (0.38; 0.82) |         |      |
| HDL     | 2<sup>nd</sup> | Females   | -0.04 (-0.25; 0.17) | 0.125 |      | 0.31 (0.02; 0.60) | 0.002 |      | -0.08 (-0.23; 0.08) | 0.371 |      | -0.07 (-0.31; 0.17) | 0.010 |      |
|         | 3<sup>rd</sup> | Adolescents | -0.02 (-0.24; 0.20) |         |      | 0.19 (-0.10; 0.47) |         |      | -0.30 (-0.46; -0.14) |         |      | -0.27 (-0.50; -0.05) |         |      |
|         | 4<sup>th</sup> | Males     | -0.21 (-0.43; 0.01) |         |      | 0.11 (-0.17; 0.39) |         |      | -0.37 (-0.53; -0.21) |         |      | -0.42 (-0.64; -0.19) |         |      |
|         | 5<sup>th</sup> |            | -0.18 (-0.41; 0.05) |         |      | -0.24 (-0.52; 0.04) |         |      | -0.51 (-0.69; -0.34) |         |      | -0.59 (-0.80; -0.38) |         |      |
| TG      | 2<sup>nd</sup> | Females   | -0.02 (-0.20; 0.17) | 0.020 |      | -0.11 (-0.40; 0.17) | 0.143 |      | 0.09 (-0.07; 0.25) | 0.005 |      | 0.05 (-0.23; 0.33) | 0.152 |      |
|         | 3<sup>rd</sup> | Adolescents | 0.04 (-0.14; 0.23) |         |      | 0.07 (-0.21; 0.35) |         |      | 0.39 (0.22; 0.55) |         |      | 0.24 (-0.02; 0.51) |         |      |
|         | 4<sup>th</sup> | Males     | 0.02 (-0.17; 0.21) |         |      | 0.16 (-0.12; 0.44) |         |      | 0.59 (0.43; 0.76) |         |      | 0.53 (0.27; 0.79) |         |      |
|         | 5<sup>th</sup> |            | 0.32 (0.12; 0.52) |         |      | 0.19 (-0.09; 0.47) |         |      | 0.71 (0.53; 0.89) |         |      | 0.84 (0.59; 1.09) |         |      |
| UK      |          |              |               |         |      |               |         |      |               |         |      |               |         |      |
| TC      | 2<sup>nd</sup> |             | WHR was not assessed in adolescents |   |      | 0.07 (-0.04; 0.19) | 0.010 |      | 0.09 (-0.08; 0.25) | 0.111 |      |
|         | 3<sup>rd</sup> |             | 0.30 (0.18; 0.42) |         |      | 0.21 (0.05; 0.38) |         |      |                 |         |      |                 |         |      |
|         | 4<sup>th</sup> |             | 0.39 (0.27; 0.51) |         |      | 0.20 (0.04; 0.36) |         |      |                 |         |      |                 |         |      |
|         | 5<sup>th</sup> |             | 0.45 (0.33; 0.58) |         |      | 0.12 (-0.05; 0.28) |         |      |                 |         |      |                 |         |      |
| LDL     | 2<sup>nd</sup> |             | 0.12 (0.01; 0.24) | 0.010 |      | 0.15 (-0.02; 0.31) | 0.041 |      |                 |         |      |                 |         |      |
|         | 3<sup>rd</sup> |             | 0.37 (0.25; 0.48) |         |      | 0.23 (0.07; 0.39) |         |      |                 |         |      |                 |         |      |
|         | 4<sup>th</sup> |             | 0.55 (0.43; 0.67) |         |      | 0.18 (0.01; 0.34) |         |      |                 |         |      |                 |         |      |
|         | 5<sup>th</sup> |             | 0.62 (0.50; 0.74) |         |      | 0.08 (-0.09; 0.25) |         |      |                 |         |      |                 |         |      |
| HDL     | 2<sup>nd</sup> |             | -0.18 (-0.28; -0.07) | 1.000 |      | -0.43 (-0.58; -0.27) | 0.324 |      |                 |         |      |                 |         |      |
|      | 3<sup>rd</sup> | 4<sup>th</sup> | 5<sup>th</sup> | 2<sup>nd</sup> | 4<sup>th</sup> | 5<sup>th</sup> |
|------|---------------|---------------|---------------|---------------|---------------|---------------|
| TG   | -0.34 (-0.45; -0.22) | -0.68 (-0.79; -0.56) | -0.89 (-1.01; -0.78) | 0.12 (0.02; 0.22) | 0.33 (0.22; 0.43) | 0.91 (0.80; 1.02) |
|      | -0.54 (-0.69; -0.39) | -0.75 (-0.90; -0.60) | -0.96 (-1.12; -0.81) | 1.000 | 0.46 (0.30; 0.62) | 0.89 (0.73; 1.05) |

1<sup>st</sup> quintile was considered the reference category

HDL-C: high density lipoprotein-cholesterol; LDL-C: low density lipoprotein-cholesterol; LRT: likelihood ratio test; TC: total cholesterol; TG: triglycerides; WHR: waist-hip ratio
Table S7. Adjusted association between BMI/WHR and serum lipids in Malawian and UK adolescents and adults

| Difference in mean TC (mmol/L) | Adjusted difference in outcome per 1 SD higher BMI | Adjusted difference in outcome per 1 SD higher WHR |
|-------------------------------|-----------------------------------------------|-----------------------------------------------|
|                               | (95% CI)                                      | (95% CI)                                      |
| Malawi female adolescents (N=774) | 0.05 (0.00; 0.11)                            | 0.05 (-0.01; 0.10)                           |
| UK female adolescents (N=1,657) | 0.03 (0.00; 0.06)                            | WHR not measured                             |
| Malawi male adolescents (N=474) | 0.04 (-0.01; 0.10)                            | -0.05 (-0.10; 0.00)                          |
| UK male adolescents (N=1,544)  | 0.15 (0.12; 0.18)                            | WHR not measured                             |
| P-values for difference between sex in Malawi | 0.662 | 0.003 |
| P-values for difference between sex in the UK | <0.001 | NA |
| Malawi female adults (N=1,487) | 0.15 (0.10; 0.20)                            | 0.10 (0.05; 0.15)                            |
| UK female adults (N=3,847)    | 0.11 (0.08; 0.13)                            | 0.15 (0.12; 0.17)                            |
| Malawi male adults (N=790)    | 0.20 (0.13; 0.27)                            | 0.15 (0.09; 0.21)                            |
| UK male adults (N=1,739)      | 0.02 (-0.02; 0.07)                            | 0.05 (0.01; 0.09)                            |
| P-values for difference between sex in Malawi | 0.417 | 0.193 |
| P-values for difference between sex in the UK | <0.001 | <0.001 |
| Malawi female adults (N=1,487) | 0.15 (0.10; 0.19)                            | 0.12 (0.07; 0.16)                            |
| UK female adults (N=3,847)    | 0.16 (0.14; 0.19)                            | 0.17 (0.15; 0.20)                            |
| Malawi male adults (N=790)    | 0.21 (0.15; 0.27)                            | 0.15 (0.10; 0.20)                            |
| UK male adults (N=1,739)      | 0.00 (-0.04; 0.04)                            | 0.03 (-0.01; 0.07)                           |
| P-values for difference between sex in Malawi | 0.126 | 0.203 |
| P-values for difference between sex in the UK | <0.001 | <0.001 |

Difference in mean LDL-C (mmol/L)

| Malawi female adolescents (N=774) | -0.04 (-0.06; -0.02) | 0.00 (-0.03; 0.03) |
|-----------------------------------|----------------------|---------------------|
| UK female adolescents (N=1,657)   | -0.07 (-0.09; -0.06) | NA                  |
| Malawi male adolescents (N=474)   | -0.02 (-0.04; 0.00)  | -0.02 (-0.04; 0.00) |
| UK male adolescents (N=1,544)     | -0.06 (-0.07; -0.05) | NA                  |
| P-values for difference between sex in Malawi | 0.238 | 0.258 |
| P-values for difference between sex in the UK | <0.001 | <0.001 |

Difference in mean HDL-C (mmol/L)

| Malawi female adolescents (N=774) | -0.05 (-0.06; -0.03) | -0.06 (-0.07; -0.04) |
|-----------------------------------|----------------------|---------------------|
| UK female adolescents (N=1,657)   | -0.14 (-0.15; -0.13) | -0.13 (-0.15; -0.12) |
| Malawi male adolescents (N=790)   | -0.05 (-0.08; -0.03) | -0.06 (-0.09; -0.04) |
| UK male adolescents (N=1,739)     | -0.08 (-0.09; -0.07) | -0.08 (-0.09; -0.07) |
| P-values for difference between sex in Malawi | 0.932 | 0.565 |
| P-values for difference between sex in the UK | <0.001 | <0.001 |

Difference in mean TG (mmol/L)

| Malawi female adolescents (N=774) | 0.04 (0.02; 0.06) | 0.04 (0.01; 0.06) |
|-----------------------------------|------------------|------------------|
| UK female adolescents (N=1,657)   | 0.07 (0.06; 0.09) | NA               |
| Malawi male adolescents (N=474)   | 0.06 (0.03; 0.09) | 0.02 (-0.01; 0.05) |
| UK male adolescents (N=1,544)     | 0.14 (0.12; 0.15) | NA               |
| P-values for difference between sex in Malawi | 0.290 | 0.295 |
| P-values for difference between sex in the UK | <0.001 | NA |
|-----------------|--------|----|
| Malawi female adults (N=1,487) | 0.10 (0.07; 0.14) | 0.15 (0.11; 0.18) |
| UK female adults (N=3,847) | 0.19 (0.17; 0.21) | 0.24 (0.22; 0.26) |
| Malawi male adults (N=790) | 0.23 (0.16; 0.29) | 0.23 (0.17; 0.29) |
| UK male adults (N=1,739) | 0.23 (0.20; 0.26) | 0.22 (0.19; 0.26) |

P-values for difference between sex in Malawi

| Malawi female adults (N=1,487) | 0.010 | 0.031 |
| UK female adults (N=3,847) | 0.010 | 0.031 |
| Malawi male adults (N=790) | 0.053 | 0.248 |

BMI: body mass index; HDL-C: high density lipoprotein-cholesterol; LDL-C: low density lipoprotein-cholesterol; NA: not assessed; TC: total cholesterol; TG: triglycerides; WHR: waist-hip ratio

**Malawi adolescents:** Adjusted for age, ethnicity, education, household assets score, marital status, parity (females), smoking status, alcohol intake, physical activity, and HIV status.

**UK Adolescents:** Adjusted for age, ethnicity, maternal education, smoking status, and alcohol intake.

**Malawi adults:** Adjusted for age, ethnicity, education, household assets score, marital status, parity (females), use of lipid-lowering medication, smoking status, alcohol intake, physical activity, and HIV status.

**UK adults:** Adjusted for age, ethnicity, education, family income, marital status, parity (females), use of lipid-lowering medication, smoking status, and alcohol intake.
Table S8. Adjusted association between BMI/WHR and dyslipidaemia in Malawian and UK adolescents and adults

|                          | Adjusted difference in outcome per 1 SD higher BMI (95% CI) | Adjusted difference in outcome per 1 SD higher WHR (95% CI) |
|--------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| **High TC**              |                                                             |                                                             |
| Malawi female adolescents (N=774) | 1.2 (0.9; 1.7)                                             | 1.0 (0.7; 1.4)                                             |
| UK female adolescents (N=1,657) | 1.0 (0.8; 1.3)                                             | NA                                                         |
| Malawi male adolescents (N=474) | 1.4 (1.0; 2.0)                                             | 1.4 (1.1; 1.7)                                             |
| UK male adolescents (N=1,544)   | 1.6 (1.2; 2.4)                                             | NA                                                         |
| P-values for difference between sex in Malawi | 0.471                                                       | 0.164                                                      |
| P-values for difference between sex in the UK   | 0.018                                                       | NA                                                         |
| Malawi female adults (N=1,487) | 1.3 (1.2; 1.5)                                             | 1.2 (1.1; 1.4)                                             |
| UK female adults (N=3,847) | 1.2 (1.1; 1.3)                                             | 1.4 (1.3; 1.5)                                             |
| Malawi male adults (N=790) | 1.5 (1.3; 1.8)                                             | 1.4 (1.2; 1.7)                                             |
| UK male adults (N=1,739)     | 1.1 (1.0; 1.2)                                             | 1.1 (1.0; 1.3)                                             |
| P-values for difference between sex in Malawi | 0.271                                                       | 0.179                                                      |
| P-values for difference between sex in the UK   | 0.005                                                       | <0.001                                                     |
| **High LDL-C**            |                                                             |                                                             |
| Malawi female adolescents (N=774) | 1.1 (0.9; 1.5)                                             | 1.4 (1.1; 1.7)                                             |
| UK female adolescents (N=1,657) | 1.3 (1.1; 1.6)                                             | NA                                                         |
| Malawi male adolescents (N=474) | 1.2 (0.8; 1.7)                                             | 1.0 (0.7; 1.4)                                             |
| UK male adolescents (N=1,544)   | 1.6 (1.2; 2.2)                                             | NA                                                         |
| P-values for difference between sex in Malawi | 0.998                                                       | 0.111                                                      |
| P-values for difference between sex in the UK   | 0.199                                                       | NA                                                         |
| Malawi female adults (N=1,487) | 1.4 (1.3; 1.6)                                             | 1.3 (1.1; 1.4)                                             |
| UK female adults (N=3,847) | 1.4 (1.3; 1.5)                                             | 1.5 (1.4; 1.7)                                             |
| Malawi male adults (N=790) | 1.6 (1.4; 1.9)                                             | 1.6 (1.4; 1.9)                                             |
| UK male adults (N=1,739)     | 1.0 (1.0; 1.2)                                             | 1.1 (1.0; 1.3)                                             |
| P-values for difference between sex in Malawi | 0.455                                                       | 0.010                                                      |
| P-values for difference between sex in the UK   | <0.001                                                       | <0.001                                                     |
| **Low HDL-C**             |                                                             |                                                             |
| Malawi female adolescents (N=774) | 1.3 (1.1; 1.5)                                             | 1.2 (1.0; 1.4)                                             |
| UK female adolescents (N=1,657) | 1.6 (1.4; 1.9)                                             | NA                                                         |
| Malawi male adolescents (N=474) | 1.3 (1.0; 1.6)                                             | 1.1 (0.9; 1.3)                                             |
| UK male adolescents (N=1,544)   | 1.6 (1.4; 1.8)                                             | NA                                                         |
| P-values for difference between sex in Malawi | 0.892                                                       | 0.808                                                      |
| P-values for difference between sex in the UK   | 0.914                                                       | NA                                                         |
| Malawi female adults (N=1,487) | 1.3 (1.2; 1.5)                                             | 1.5 (1.3; 1.7)                                             |
| UK female adults (N=3,847) | 1.9 (1.7; 2.1)                                             | 2.2 (2.0; 2.5)                                             |
| Malawi male adults (N=790) | 1.2 (1.0; 1.4)                                             | 1.3 (1.1; 1.5)                                             |
| UK male adults (N=1,739)     | 2.0 (1.8; 2.3)                                             | 1.7 (1.5; 2.0)                                             |
| P-values for difference between sex in Malawi | 0.425                                                       | 0.228                                                      |
| P-values for difference between sex in the UK   | 0.306                                                       | 0.007                                                      |
| **High TG**               |                                                             |                                                             |
| Malawi female adolescents (N=774) | 1.6 (0.8; 3.3)                                             | 1.7 (1.1; 2.6)                                             |
| UK female adolescents (N=1,657) | 1.7 (1.4; 2.1)                                             | NA                                                         |
| Malawi male adolescents (N=474) | 5.4 (1.8; 15.7)                                            | 1.5 (1.0; 2.2)                                             |
| UK male adolescents (N=1,544)   | 2.4 (1.9; 3.0)                                             | NA                                                         |
| P-values for difference between sex in Malawi | 0.021                                                       | 0.915                                                      |
|                                | P-values for difference between sex in the UK | Malawi female adults (N=1,487) | UK female adults (N=3,847) | Malawi male adults (N=790) | UK male adults (N=1,739) |
|--------------------------------|---------------------------------------------|--------------------------------|---------------------------|---------------------------|-------------------------|
|                                | 0.031                                       | 1.5 (1.3; 1.7)                  | 1.9 (1.6; 2.2)            | 2.4 (2.2; 2.7)            | 1.9 (1.6; 2.3)          |
|                                | NA                                          |                                |                           |                           |                         |
|                                | 0.274                                       | 1.8 (1.5; 2.1)                  | 1.9 (1.6; 2.3)            | 1.9 (1.6; 2.0)            |                         |
|                                | 0.967                                       |                                |                           |                           |                         |
|                                | 0.652                                       |                                |                           |                           |                         |
|                                | <0.001                                      |                                |                           |                           |                         |

BMI: body mass index; HDL-C: high density lipoprotein-cholesterol; LDL-C: low density lipoprotein-cholesterol; NA: not assessed; TC: total cholesterol; TG: triglycerides; WHR: waist-hip ratio

**Malawi adolescents:** Adjusted for age, ethnicity, education, household assets score, marital status, parity (females), smoking status, alcohol intake, physical activity.

**UK adolescents:** Adjusted for age, maternal education, smoking status, and alcohol intake.

**Malawi adults:** Adjusted for age, ethnicity, education, household assets score, marital status, parity (females), use of lipid-lowering medication, smoking status, alcohol intake, physical activity, and HIV status.

**UK adults:** Adjusted for age, ethnicity, education, family income, marital status, parity (females), use of lipid-lowering medication, smoking status, and alcohol intake.
| Difference in mean TC (mmol/L) | Adjusted difference in outcome per 1 SD higher BMI (95% CI) | Adjusted difference in outcome per 1 SD higher WHR (95% CI) |
|--------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| Malawi female adolescents (N=774) | 0.06 (0.00; 0.13) | 0.06 (-0.01; 0.12) |
| Malawi male adolescents (N=474) | 0.06 (-0.02; 0.14) | -0.07 (-0.13; 0.00) |
| P-values for difference between sex in Malawi | 0.759 | 0.004 |
| Malawi female adults (N=1,487) | 0.14 (0.10; 0.19) | 0.09 (0.04; 0.14) |
| Malawi male adults (N=790) | 0.19 (0.12; 0.26) | 0.14 (0.08; 0.19) |
| P-values for difference between sex in Malawi | 0.393 | 0.208 |

| Difference in mean LDL-C (mmol/L) | Adjusted difference in outcome per 1 SD higher BMI (95% CI) | Adjusted difference in outcome per 1 SD higher WHR (95% CI) |
|----------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| Malawi female adolescents (N=774) | 0.10 (0.03; 0.17) | 0.08 (0.00; 0.16) |
| Malawi male adolescents (N=474) | 0.10 (0.02; 0.18) | 0.00 (-0.07; 0.07) |
| P-values for difference between sex in Malawi | 0.760 | 0.070 |
| Malawi female adults (N=1,487) | 0.17 (0.12; 0.22) | 0.13 (0.08; 0.18) |
| Malawi male adults (N=790) | 0.24 (0.18; 0.31) | 0.17 (0.11; 0.22) |
| P-values for difference between sex in Malawi | 0.100 | 0.227 |

| Difference in mean HDL-C (mmol/L) | Adjusted difference in outcome per 1 SD higher BMI (95% CI) | Adjusted difference in outcome per 1 SD higher WHR (95% CI) |
|----------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| Malawi female adolescents (N=774) | -0.12 (-0.18; -0.07) | -0.01 (-0.11; 0.08) |
| Malawi male adolescents (N=474) | -0.07 (-0.14; 0.00) | -0.07 (-0.15; 0.01) |
| P-values for difference between sex in Malawi | 0.359 | 0.285 |
| Malawi female adults (N=1,487) | -0.15 (-0.19; -0.10) | -0.17 (-0.22; -0.12) |
| Malawi male adults (N=790) | -0.15 (-0.21; -0.08) | -0.18 (-0.24; -0.12) |
| P-values for difference between sex in Malawi | 0.914 | 0.683 |

| Difference in mean TG (mmol/L) | Adjusted difference in outcome per 1 SD higher BMI (95% CI) | Adjusted difference in outcome per 1 SD higher WHR (95% CI) |
|--------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| Malawi female adolescents (N=774) | 0.10 (0.04; 0.17) | 0.10 (0.02; 0.17) |
| Malawi male adolescents (N=474) | 0.17 (0.08; 0.27) | 0.04 (-0.04; 0.13) |
| P-values for difference between sex in Malawi | 0.214 | 0.335 |
| Malawi female adults (N=1,487) | 0.18 (0.13; 0.23) | 0.24 (0.18; 0.30) |
| Malawi male adults (N=790) | 0.25 (0.18; 0.32) | 0.26 (0.19; 0.32) |
| P-values for difference between sex in Malawi | 0.218 | 0.910 |

BMI: body mass index; HDL-C: high density lipoprotein-cholesterol; LDL-C: low density lipoprotein-cholesterol; NA: not assessed; TC: total cholesterol; TG: triglycerides; WHR: waist-hip ratio

Malawi adolescents: Adjusted for age, ethnicity, education, household assets score, smoking status, alcohol intake, and HIV status.

Malawi adults: Adjusted for age, ethnicity, education, household assets score, marital status, parity (females), use of lipid-lowering medication, smoking status, alcohol intake, and HIV status.
Figure S1. Age-standardised prevalence of overweight, obesity and central obesity in Malawian and UK adolescents and adults, by sex.
Figure S2. Age-standardised prevalence of dyslipidaemia in Malawian and UK adolescents and adults, by sex.

HDL-C: high density lipoprotein-cholesterol; LDL-C: low density lipoprotein-cholesterol; TC: total cholesterol; TG: triglycerides
Figure S3. Adjusted association between quintiles of BMI/WHR in adolescents and adults from Malawi (a) and ALSPAC (b).

BMI: body mass index; HDL-C: high density lipoprotein-cholesterol; LDL-C: low density lipoprotein-cholesterol; NA: not assessed; TC: total cholesterol; TG: triglycerides; WHR: waist-hip ratio
Figure S4. Age-adjusted association between BMI/WHR and serum lipids in Malawi and the UK

BMI: body mass index; HDL-C: high density lipoprotein-cholesterol; LDL-C: low density lipoprotein-cholesterol; TC: total cholesterol; TG: triglycerides; WHR: waist-hip ratio