

Evaluation of the Mwangaza Mashinani pilot project in Kilifi and Garissa counties, Kenya

Volume II: Endline technical annexes

Evaluation period: 2019 - 2021

Evaluation location: Kenya



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ACRONYMS

ARI	Acute Respiratory Infection
ATT	Average Treatment Effect on the Treated
BCC	Behaviour Change Communication
BWC	Beneficiary Welfare Committee
CATI	Computer-assisted Telephone Interview
CC	Community Champion
CT-OVC	Cash Transfer for Orphans and Vulnerable Children
DEQ	Detailed Evaluation Question
DID	Difference-in-differences
DSA	Directorate for Social Assistance
E4I	Energy4Impact
FCDO	Foreign, Commonwealth and Development Office
ITT	Average treatment effect on the intended to be treated
KEQ	Key Evaluation Question
KOSAP	Kenya Off-Grid Solar Access Project
KSh	Kenyan shilling
NSNP	National Safety Net Programme
OP-CT	Older Persons Cash Transfer
OPM	Oxford Policy Management
PAYG	Pay As You Go
PSM	Propensity Score Matching
QA	Quality Assurance
RA	Research Assistant
RCT	Randomised Control Trial

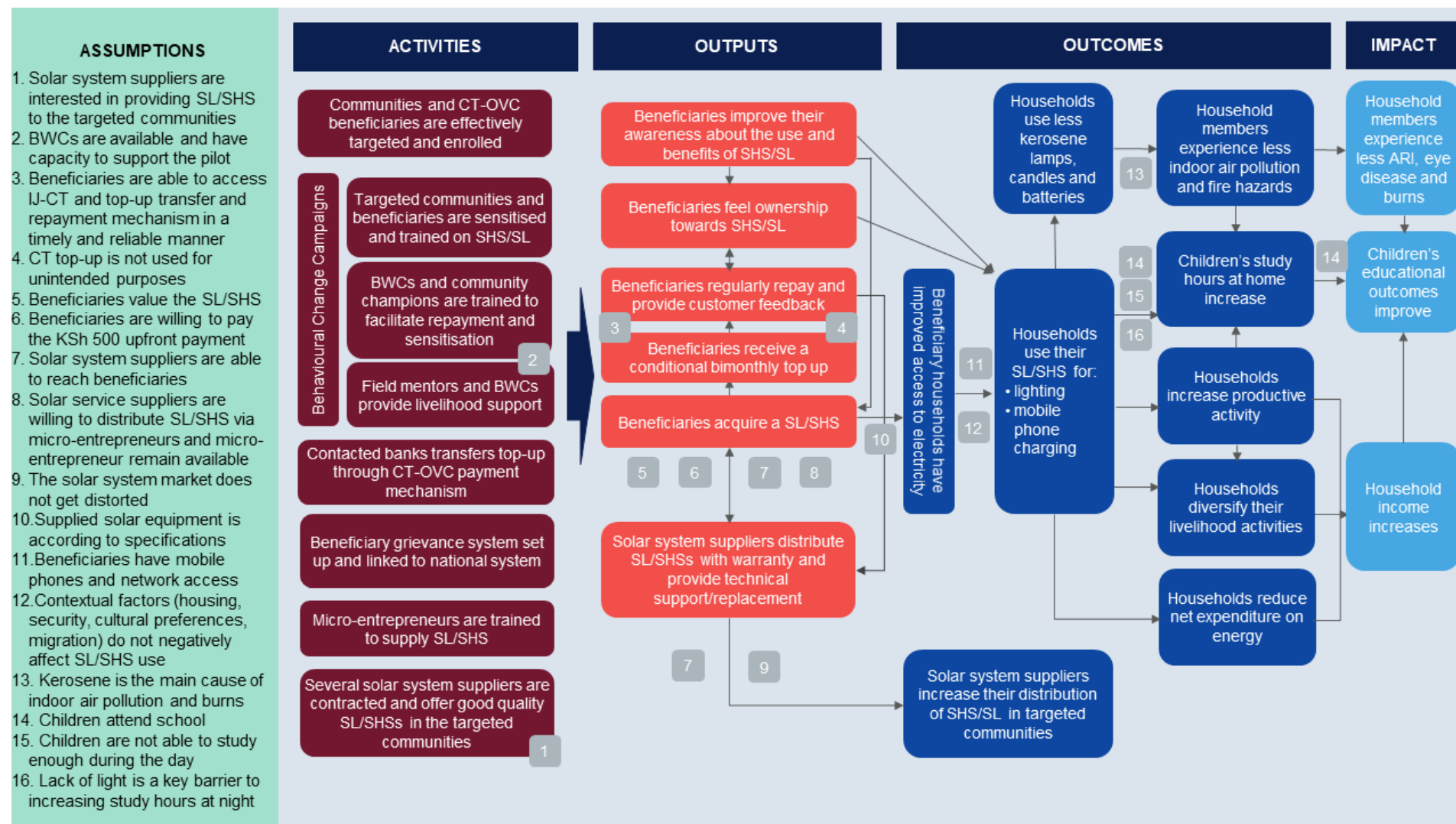
RG	Research Guide Africa
SHS	Solar Home System
SIDA	Swedish International Development Agency
SL	Solar Lantern
SPS	Social Protection Secretariat
ToC	Theory of Change
TWG	Technical Working Group
UNICEF	United Nations Children's Fund
VfM	Value for Money

INTRODUCTION

Oxford Policy Management (OPM) has been contracted by UNICEF to conduct an independent evaluation of the Mwangaza Mashinani pilot project. This endline report draws on findings from all research activities conducted throughout the lifetime of the mixed methods evaluation, and which include quantitative endline, midline and baseline surveys, a qualitative study, an implementation review and a value-for-money analysis. This report is presented in two volumes. Volume I presents the endline findings and discussion and Volume II contains the technical annexes to the endline report.

Volume II is structured as follows: Annex A presents the pilot project's Theory of Change. Annex B presents the evaluation matrix which guides our assessment of the project. Annex C provides technical details on the design and implementation of the quantitative endline survey. Annex D presents a comparison between the compliant and non-compliant households in the treatment sub-counties. Annex E provides technical details of our approach to quantitatively estimating impact at endline. Annex F provides details on the qualitative approach. Annex G provides technical details related to the implementation review. Annex H provides details on the approach to the value-for-money analysis. Annex I contains statistical tables across all indicators for the treatment group at endline. Annex J provides technical details on calculating energy access using the multi-tier framework approach. Annex K presents the approval letters from the ethical review committee and consent forms used as part of the research. Annex L contains the terms of reference for this evaluation.

ANNEX A THEORY OF CHANGE



ANNEX B EVALUATION MATRIX

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
Relevance				
KEQ1. How well is the pilot project suited to the needs of the target population, their community and private sector solar device suppliers?				
DEQ 1.1. Is the pilot project's objective of improving access to off-grid solar device relevant to the target population's energy and welfare (education, health and livelihood) needs?	<ul style="list-style-type: none"> The market penetration of solar device in targeted communities was limited at the start of the pilot 	<ul style="list-style-type: none"> Prevalence of solar devices in sample population's homes in control or target groups at baseline Distribution of solar devices and PAYG mechanisms in local markets as perceived by suppliers 	Quantitative survey Key informant interviews (suppliers, last mile distributors)	Baseline Midline Endline
	<ul style="list-style-type: none"> Affordability and cash constraints are the main barriers to the target population's acquisition of off-grid solar device 	<ul style="list-style-type: none"> Reasons for not having a solar device Take up of solar device options amongst target population, compared to comparison population, once cash transfer plus option introduced 	Quantitative survey	Baseline Endline
	<ul style="list-style-type: none"> Solar devices are suited to address the target population's energy needs, particularly related to education, health and productive activity 	<ul style="list-style-type: none"> Children's school attendance Children's study hours Prevalence of respiratory diseases and burns Number of hours spent on productive activities including during darkness hours Beneficiaries' perception of relevance of solar device 	Quantitative survey Household and community qualitative research	Baseline Midline Endline
DEQ1.2. Is the intervention approach acceptable to the target population, their community and private solar device suppliers?	<ul style="list-style-type: none"> The target population perceive the acquisition of solar devices through the contracted suppliers, the down-payment and repayment following cash top-ups as acceptable 	<ul style="list-style-type: none"> Affordability of down-payment as perceived by the target population Frequency and reliability of cash top-ups in relation to the PAYG repayment schedule Availability of last mile distributors Target population's trust in last mile distributors 	Household and community qualitative research	Midline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		- Acceptability of mechanism for both receiving cash top-up and making PAYG repayments		
	<ul style="list-style-type: none"> Community leaders and other representatives perceive the intervention as well targeted and beneficial to the community 	In the view of community leaders: <ul style="list-style-type: none"> Perception of who is being targeting Knowledge and perceptions of targeting criteria Reason why some households did not take up the project Perception of solar device systems provided to households 	Household and community qualitative research	Midline
	<ul style="list-style-type: none"> Solar suppliers are interested in providing solar devices to the entire target population according to the planned intervention specifications 	<ul style="list-style-type: none"> Suppliers interest in continuing / engaging in supply Suppliers plans to continue to supply the target population 	Key informant interviews (contracted suppliers, suppliers not contracted)	Midline
KEQ2. Is the pilot project ToC internally and externally coherent?				
DEQ2.1. Is the pilot project's ToC valid, comprehensive and commonly understood by the main stakeholders?	<ul style="list-style-type: none"> Key ToC assumptions are likely to hold true and pathways are plausible 	<ul style="list-style-type: none"> Evidence that key assumptions are holding true at outset of project, namely: <ul style="list-style-type: none"> competition results in supplier being contracted (assumption 1) beneficiaries demonstrate demand by making KSh 500 deposit (assumption 6) beneficiaries can access cash top-up in a timely manner to make repayments (assumption 3) solar device suppliers are able to reach beneficiaries (assumption 7) beneficiaries have mobile phones (assumption 11) Children attend school and would study more if light were available after dark (assumptions 14,15 and 16) 	Quantitative survey Household and community qualitative research Literature review	Inception Baseline Midline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		<ul style="list-style-type: none"> ○ cooking occurs outdoors or in separate building (making kerosene lighting more likely to be the most significant source of indoor air pollution) (assumption 13) - Evidence that key assumptions hold at baseline: <ul style="list-style-type: none"> ○ solar equipment supplied matches required specifications (assumption 10) - Literature review findings on pathways to impacts on health, education and productive use for solar devices. 		
	<ul style="list-style-type: none"> • The objectives of enhancing access to energy to the most vulnerable segment of the population and increasing market penetration in vulnerable communities can plausibly be achieved through the intervention approach 	<ul style="list-style-type: none"> - Reasons for not joining the project - Specifications of solar equipment supplied - Number of household members - Number of rooms in household 	Quantitative survey Household and community qualitative research Key informant interviews (implementing partner, community leaders) Documentation review	Baseline Endline
	<ul style="list-style-type: none"> • Key programme stakeholders commonly understand the objectives and intervention approach 	<ul style="list-style-type: none"> - Stakeholder understanding of the pilot project's target population - Stakeholder understanding of level of impact expected on target population - Stakeholder understanding of methodological approach to extending PAYG market delivery mechanism 	Key informant interviews	Midline
DEQ2.2. Are the pilot project's objectives and approach aligned with government policies?	<ul style="list-style-type: none"> • The pilot project is aligned with government's energy policies 	<ul style="list-style-type: none"> - Degree of alignment with the Kenya Rural Electrification Authority's own off grid solar access project (KOSAP) in terms of approach or counties selected - Specifications of solar devices supplied in relation to Kenya standards 	Key informant interviews Documentation review	Midline
	<ul style="list-style-type: none"> • The pilot project is aligned with government's social protection policies 	<ul style="list-style-type: none"> - Alignment with the NSNP's targeting procedures 	Key informant interviews (SPS, DSA) Documentation review	Midline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
	<ul style="list-style-type: none"> The pilot project is aligned with the development plans of the targeted counties 	<ul style="list-style-type: none"> Alignment with plans for rural electrification as perceived by local county planners 	Key informant interviews (county authorities)	Endline
Effectiveness				
KEQ3. To what extent have beneficiary households improved their awareness about and feel a sense of ownership towards their solar device?				
DEQ3.1. To what extent have beneficiary households improved their awareness about the use and benefits of solar devices?	<ul style="list-style-type: none"> Increased awareness of existence and application of solar devices 	<ul style="list-style-type: none"> Proportion of households without a solar device that are aware of solar devices Households awareness of devices and their benefits Households use of solar device 	Quantitative survey Household and community qualitative research	Baseline Midline Endline
	<ul style="list-style-type: none"> Increased knowledge of potential benefits of solar devices for household members' quality of life and welfare 	<ul style="list-style-type: none"> Proportion of households aware of at least one benefit of solar devices Proportion of households aware of more than one benefit of solar devices 	Quantitative survey Household and community qualitative research	Baseline Midline Endline
	<ul style="list-style-type: none"> Increased awareness and knowledge of solar devices within the community 	<ul style="list-style-type: none"> Proportion of households that have been approached by BWC members or community champions to discuss use and benefits of solar devices Proportion of households that have discussed use and benefits of solar devices with other households in the community Community leaders understanding of the application of solar devices and their use Community leaders understanding of the benefits of solar devices at the community level 	Quantitative survey Household and community qualitative research	Baseline Midline Endline
DEQ3.2. To what extent do beneficiary households feel a sense of ownership towards their solar device?	<ul style="list-style-type: none"> Willingness to own a solar device 	<ul style="list-style-type: none"> Number of households willing to pay deposit for a solar device Average monetary value attached by households to the solar device Proportion of households without a solar device that would like a solar device 	Quantitative survey Household and community qualitative research	Midline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
	<ul style="list-style-type: none"> Regular use and payment for solar devices 	<ul style="list-style-type: none"> Proportion of households that have repaid the solar systems, including repayment schedule and overall repayment Households' perception of the value in paying/identifying ways to pay for solar systems beyond the end of the pilot project, including gendered differences 	Quantitative survey Household and community qualitative research	Midline Endline
	<ul style="list-style-type: none"> Regular maintenance of solar systems 	<ul style="list-style-type: none"> Proportion of households whose solar devices are not working Proportion of households who have taken their solar device to be repaired Proportion of households who have paid to repair their solar device Households' perception of the value and benefits of the solar device Households' willingness to keep devices functioning 	Quantitative survey Household and community qualitative research	Midline Endline
KEQ4. How effectively have the operational modalities been taken up by the targeted beneficiaries and private sector suppliers? What are lessons for scale-up and replication in the NSNP?				
DEQ4.1. How well was the pilot project able to generate take up of the solar device among the target population?	<ul style="list-style-type: none"> The pilot project is able to enrol the target population as planned 	<ul style="list-style-type: none"> Number of target population enrolled, by gender and location Proportion of targeted population that accept enrolment and take up of solar device Proportion of enrolled beneficiaries that satisfy the beneficiary targeting criteria Proportion of selected/enrolled beneficiaries that pay the initial down-payment as planned Lessons learnt about enrolment process 	Quantitative survey Household and community qualitative research Key informant interviews (implementing partner)	Baseline Midline Endline
	<ul style="list-style-type: none"> The enrolled beneficiaries are able to choose between types of solar device, and take up the selected solar device 	<ul style="list-style-type: none"> Proportion of enrolled beneficiary HHs that choose a solar device Proportion of enrolled beneficiary HHs that received a solar device (compared to planned) 	Quantitative survey Household and community qualitative research	Midline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		<ul style="list-style-type: none"> - Proportion of enrolled beneficiary that made use of warranty or after sales service - Proportion of enrolled beneficiary HHs that have a functioning installed solar device at the end of the pilot - Information received by the enrolled beneficiary to make an informed choice - Lessons learnt about supply and demand of solar device and after sales services 	Key informant interviews (implementing partner, suppliers)	
	<ul style="list-style-type: none"> • The enrolled beneficiaries are satisfied with the solar device delivered 	<ul style="list-style-type: none"> - Households' satisfaction with delivery system of the solar device - Households' satisfaction with the solar device products 	Household and community qualitative research Quantitative survey	Midline Endline
DEQ4.2. To what extent did beneficiary household take up the bi-monthly top-up and payment modality?	<ul style="list-style-type: none"> • The cash top-ups were paid and received according to plan and conditionality 	<ul style="list-style-type: none"> - Proportion of beneficiaries that are paid the top-up amount on a bi-monthly basis - Proportion of beneficiaries that do not comply with conditionality whose payment is stopped - Proportion of beneficiaries that accessed the last bi-monthly payment - Beneficiaries' understanding and experience with top-up payments - Lessons learnt about top-up payment modality 	Quantitative survey Household and community qualitative research Key informant interviews (implementing partner, DSA, UNICEF)	Midline
	<ul style="list-style-type: none"> • The enrolled beneficiaries repay the price of the solar device 	<ul style="list-style-type: none"> - Proportion of beneficiaries that complete repayment - Proportion of repayments to suppliers that have been delayed by x days - Average length of payment delays - Beneficiaries' understanding and acceptance of the repayment modality - Households' perception of feasibility of repayment mechanisms - Barriers to or reasons for delayed or non-repayment 	Quantitative survey Household and community qualitative research Key informant interviews (implementing partner, suppliers, UNICEF)	Midline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		<ul style="list-style-type: none"> - BWCs and community champions follow ups with households - Lessons learnt about repayment modalities 		
DEQ4.3. How well were the solar device suppliers able to distribute the solar devices among the enrolled beneficiaries and other community members?	<ul style="list-style-type: none"> • The suppliers set up a supply chain to deliver the solar device and after sales services in the targeted communities 	<ul style="list-style-type: none"> - Location of point of sales and after sales services by supplier - Number of trained micro-entrepreneurs/last mile distributors - Extent of after sales services provided by suppliers in targeted communities - Lessons learnt in the creation of a supply chain 	Key informant interviews (implementing partner, suppliers, UNICEF, energy experts)	Midline
	<ul style="list-style-type: none"> • The suppliers supply solar device to the beneficiaries according to MoU specifications 	<ul style="list-style-type: none"> - Specifications of solar device received by beneficiary households - Date of delivery of solar device to beneficiary households - Barriers to supplying the specified solar device to the enrolled beneficiaries - Lessons learnt about the feasibility of supplying the solar device according to MoU specifications 	Household and community qualitative research Key informant interviews (implementing partners, suppliers, UNICEF, energy experts)	Midline
	<ul style="list-style-type: none"> • The suppliers expand their supply solar device in the targeted communities beyond the beneficiaries 	<ul style="list-style-type: none"> - Sales of specified solar device in the targeted communities - Sales of other energy products in the targeted communities - Barriers to expanded distributions of solar device in the targeted communities - Lessons learn about expanded distribution of solar device in the targeted communities 	Household and community qualitative research Key informant interviews (implementing partners, suppliers, UNICEF, energy experts)	Midline
Impact				
KEQ5. To what extent did the pilot project have an attributable significant impact on beneficiary households' access to energy and use of the solar device for energy services?				

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
DEQ5.1. To what extent did the pilot project have an attributable significant impact on beneficiary households' access to energy?	<ul style="list-style-type: none"> • Increase in household level energy access between Tier 0 and Tier 1 	<ul style="list-style-type: none"> - Proportion of households falling into tier 0 and tier one using the multi-tier measurement of energy access (capacity and availability of supply) - Number of people who are served with a tier 1 level of energy access (equivalent to a lighting system that provides 1000 lumen hours of light for a household of 5 persons) 	Quantitative Survey	Baseline Endline
	<ul style="list-style-type: none"> • Increase in number of energy sources used by the household 	<ul style="list-style-type: none"> - Proportion of households with access to mini grid and/or national grid - Proportion of households owning a solar device 	Quantitative Survey	Baseline Midline Endline
DEQ5.2. To what extent did the pilot project have an attributable significant impact on beneficiary households' use of solar device for energy services?	<ul style="list-style-type: none"> • Beneficiary households use own solar device for lighting 	<ul style="list-style-type: none"> - Sources of energy used for lighting - Proportion of households using solar device for lighting - Average hours solar system is used for lighting each day 	Quantitative Survey	Baseline Midline Endline
	<ul style="list-style-type: none"> • Beneficiary households use own solar device for mobile phone charging 	<ul style="list-style-type: none"> - Proportion of households using solar device for charging their household's mobile phone - Proportion of households using solar device for charging other household's mobile phone - Proportion of households using solar device for charging other household's mobile phone for a fee 	Quantitative Survey	Baseline Midline Endline
	<ul style="list-style-type: none"> • Beneficiary households use own solar device for productive activities and/or study time 	<ul style="list-style-type: none"> - Proportion of households using solar device for charging other household's mobile phone for a fee - Proportion of households using solar device for productive purposes - Proportion of women using solar device for productive or social purposes - Proportion of children using solar device for studying 	Quantitative Survey	Baseline Midline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
	<ul style="list-style-type: none"> Beneficiary households use less kerosene lamps, candles and batteries 	<ul style="list-style-type: none"> Number of kerosene lamps in use in household Number of candles used in the household each month Number of batteries used in the household month 	Quantitative Survey	Baseline Endline
KEQ6. To what extent and how did the pilot project have an attributable significant impact on the quality of life of beneficiary households, especially children?				
DEQ6.1. To what extent and how did the pilot project have an attributable significant impact on the education of children, girls and boys, in beneficiary households?	<ul style="list-style-type: none"> Girls' and boys' study hours at home increase 	<ul style="list-style-type: none"> Children's time spent (in hours on a typical day): studying at home (in daylight) Children's time spent (in hours on a typical day): studying at home (during darkness using lighting) Proportion of children doing homework outside of school 	Quantitative Survey	Baseline Endline
	<ul style="list-style-type: none"> Girls' and boys' school attendance increases 	<ul style="list-style-type: none"> Proportion of children attending school Proportion of children regularly attending school 	Quantitative Survey	Baseline Endline
	<ul style="list-style-type: none"> Girls and boys are promoted to the following grade 	<ul style="list-style-type: none"> Proportion of children graduating to their next grade 	Quantitative Survey	Baseline Endline
DEQ6.2. To what extent did the pilot project have an attributable significant impact on the household members' health in beneficiary households?	<ul style="list-style-type: none"> Household members report fewer symptoms of respiratory illness due to indoor air pollution 	<ul style="list-style-type: none"> Proportion of household members reporting symptoms of acute respiratory infections (ARI) Proportion of households burning kerosene inside the home Proportion of households cooking indoors Type of cooking fuel used by household 	Quantitative Survey	Baseline Midline Endline
	<ul style="list-style-type: none"> Household members report fewer symptoms of ocular disease due to indoor air pollution 	<ul style="list-style-type: none"> Proportion of school going children reporting symptoms of eye irritation 	Quantitative Survey	Baseline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
	<ul style="list-style-type: none"> Household members report fewer incidences of burns due to lighting fuel fire hazards 	<ul style="list-style-type: none"> Proportion of household members reporting burns related to lighting fuel in past six months 	Quantitative Survey	Baseline Endline
DEQ6.3. To what extent and how did the pilot project have an attributable significant impact on beneficiary household income by increasing men and women's livelihood opportunities and reducing household energy expenditure?	<ul style="list-style-type: none"> Increase in number and type of income-generating activities for household 	<ul style="list-style-type: none"> Proportion of household members engaged in income-generating activities, by gender Number of new income-generating activities started in the past 12 months (including enterprises promoted by project's engagement strategy) 	Quantitative Survey	Baseline Midline Endline
	<ul style="list-style-type: none"> Increase in engaging in income-generating activities during darkness hours 	<ul style="list-style-type: none"> Proportion of household members engaged in income generating activities undertaken during darkness hours, by gender Hours spent on income generating activities undertaken during darkness hours 	Quantitative Survey	Baseline Midline Endline
	<ul style="list-style-type: none"> Increase in hours spent on income generating activities 	<ul style="list-style-type: none"> Number of hours worked in the last one week (for working household members) Women's time spent (in hours on a typical day): paid labour Women's time spent (in hours on a typical day): unpaid labour 	Quantitative Survey	Baseline Midline Endline
	<ul style="list-style-type: none"> Increase in total household income 	<ul style="list-style-type: none"> Total monthly household income 	Quantitative Survey	Baseline Midline Endline
	<ul style="list-style-type: none"> Decrease in household energy expenditure 	<ul style="list-style-type: none"> Monthly energy expenditure on fuel by type of fuel (kerosene, battery, solar device, SL, candles) Monthly expenditure on mobile phone charging Monthly expenditure on cooking fuel 	Quantitative Survey	Baseline Endline
KEQ7. What have been unintended and/or unexpected outcomes of the pilot project?				

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
No DEQ – one KEQ	<ul style="list-style-type: none"> Unintended and/or unexpected uses of the solar device among beneficiary households 		Quantitative Survey Household and community qualitative research	Midline Endline
	<ul style="list-style-type: none"> Unintended and/or unexpected effects of solar device use on beneficiary households' quality of life 	<ul style="list-style-type: none"> Primary cooking fuel used by household Female household member's time poverty Uses of solar device Gendered differences in terms of quality of life: additional hours of light contribute to/hinder girls' ability to study Gendered differences in terms of labour market outcomes based on increased working days for women (reallocation of existing work burdens) Gendered differences in terms of health based on reduction of indoor air pollution, preventing women from exposure to kerosene-related health risks Child labour outcomes Improved ability to take loans based on re-paying of solar device loan that builds up beneficiaries' credit rating 	Quantitative Survey Household and community qualitative research	Midline Endline
	<ul style="list-style-type: none"> Unintended and/or unexpected outcomes of the pilot project at community level 	<ul style="list-style-type: none"> Household and community perceptions of personal safety Changes in communication within community 	Quantitative Survey Household and community qualitative research	Midline Endline
Efficiency				
KEQ8. What have been the strengths and weaknesses of the coordination process among key stakeholders involved in the	<ul style="list-style-type: none"> Strengths and weaknesses of the functioning of the coordination mechanisms at county and national level 	<ul style="list-style-type: none"> Type of coordination mechanism established Roles of coordination mechanisms Ongoing functioning of the coordination mechanism (county TWGs, national advisory committee) 	Documentation review (MoUs and minutes of coordination meetings) Key informant interviews (implementing partners, UNICEF, Sida, national and county government stakeholders, experts)	Midline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
implementation of the pilot project? What are lessons for scale-up and replication?		<ul style="list-style-type: none"> - Integration/alignment of coordination mechanism with existing coordination mechanisms and coordination practices 	and development partners in the energy and social protection sectors, suppliers)	
	<ul style="list-style-type: none"> • Strengths and weaknesses of stakeholder participation in the coordination process 	<ul style="list-style-type: none"> - Core national Ministries (Energy and Labour & Social Protection) and county government departments involved in the design of the pilot project - Degree and frequency of participation of relevant stakeholders to supervise and provide guidance during implementation - Government leadership in coordination process - Coordination with private sector stakeholders during the design and implementation of the pilot project 	<p>Documentation review (MoUs and minutes of coordination meetings)</p> <p>Key informant interviews (implementing partners, UNICEF, Sida, national and county government stakeholders, experts and development partners in the energy and social protection sectors, suppliers)</p>	Midline
	<ul style="list-style-type: none"> • Strengths and weaknesses of the content of the coordination process 	<ul style="list-style-type: none"> - Coordination about the design and targeting of the pilot project - Coordination about community engagement and communication - Communication about programme progress, challenges and results - Coordination about expansion and scale-up of the pilot project 	<p>Documentation review (MoUs and minutes of coordination meetings)</p> <p>Key informant interviews (implementing partners, UNICEF, Sida, national and county government stakeholders, experts and development partners in the energy and social protection sectors, suppliers)</p>	Midline
KEQ9. What have been the strengths and weaknesses of the engagement of community structures and leaders in the implementation of the pilot project? What are	<ul style="list-style-type: none"> • Strengths and weaknesses of beneficiary engagement processes 	<ul style="list-style-type: none"> - Communication about the cash top-up and value of solar device to beneficiaries - Training on the use of the solar device and payment modalities - Training on livelihood activities - Access and use of beneficiary feedback/grievance mechanisms - Involvement of suppliers in beneficiary sensitisation 	<p>Quantitative survey</p> <p>Household and community qualitative research</p> <p>Key informant interviews (implementing partners, suppliers, county government staff)</p>	<p>Midline</p> <p>Endline</p>

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
Lessons for scale-up and replication in the NSNP?	<ul style="list-style-type: none"> Strengths and weaknesses of the engagement of Beneficiary Welfare Committees (BWC) or community champions (CC) 	<ul style="list-style-type: none"> Availability and capacity of BWCs or CCs to perform planned roles Training and support that BWCs or CCs receive to perform planned roles Support provided by BWCs and community champions in solar device repayment Support provided by BWCs and community champions in sensitisation and BCC Monitoring, grievance resolution and reporting practices of BWCs and community champions Communication between BWC/community champions and suppliers 	Quantitative survey Household and community qualitative research Key informant interviews (implementing partners, suppliers, county government staff, DSA)	Midline
	<ul style="list-style-type: none"> Strengths and weaknesses of the engagement with micro-entrepreneurs and last mile distributors 	<ul style="list-style-type: none"> Selection and mobilisation of micro-entrepreneurs and last mile distributors Training and support that micro-entrepreneurs/last mile distributors receive to perform planned roles Linkages between micro-entrepreneurs/last mile distributors and suppliers 	Key informant interviews (implementing partners, suppliers, county government staff)	Midline
Sustainability				
KEQ10. How well are factors that are likely to affect the sustainability and scalability of the pilot project addressed?				
DEQ10.1. How strong is stakeholder commitment to sustain and scale-up the pilot project?	<ul style="list-style-type: none"> Suppliers are interested in maintaining and expanding their supply chain in the targeted communities based on existing or changed delivery models and prices 	<ul style="list-style-type: none"> Interest in continuing / engaging in supply expressed by suppliers contracted by programme and others (as per 1.2 above). Delivery model that suppliers intend to use for expansion uses approaches that mean it is likely that most vulnerable households will be able to continue to participate 	Key informant interviews (suppliers, suppliers not contracted)	Midline
	<ul style="list-style-type: none"> Beneficiary households feel a sense of ownership towards the solar device 	<ul style="list-style-type: none"> Frequency of use of solar device in beneficiary households Condition of solar device 	Quantitative survey Household and community qualitative research	Midline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		<ul style="list-style-type: none"> - Beneficiaries understanding solar device ownership after 12 months 		
	<ul style="list-style-type: none"> • Key government stakeholders and/or development partners show interest/commitment to continuing, expanding and scaling up the pilot project using the existing or a changed approach 	<ul style="list-style-type: none"> - Government department (REA or Ministry of Labour and Social Protection) that takes ownership of the pilot project. - Degree of effort by appropriate government department(s) to either allocate budget or engage with other donor programmes (e.g. World Bank) to allocate funding to larger programmes based on learning from this pilot. - Development partners' interest in the pilot project 	Key informant interviews (Ministry of Energy, REA, DSA, SPS, county authorities and key donors)	Midline
DEQ10.2. How financially sustainable is the intervention approach?	<ul style="list-style-type: none"> • The beneficiary households are likely to be able to cover the replacement costs of solar device or its components 	<ul style="list-style-type: none"> - The costs of PAYG payments compared to typical household expenditure on kerosene, batteries and phone charging - Households' understanding of lifetime of product - Households' understanding of maintenance requirements and costs - Ways to pay for solar systems beyond the end of the pilot project identified by households 	Quantitative survey Household and community qualitative research	Baseline Midline Endline
	<ul style="list-style-type: none"> • The payment modalities facilitate sustained repayment of the solar device by the beneficiary households 	<ul style="list-style-type: none"> - Suppliers' plans to offer PAYG approaches for replacement parts / systems after the pilot project ends - The costs of PAYG payments compared to typical household expenditure on kerosene, batteries and phone charging. - Lessons learned from household experience with payment modalities 	Quantitative survey Household and community qualitative research Key informant interviews (implementing partners, suppliers, UNICEF, energy expert, micro-entrepreneurs/last mile distributors)	Midline Endline
	<ul style="list-style-type: none"> • Government stakeholders perceive the cash top-up priority use of public money 	<ul style="list-style-type: none"> - Public fund priorities in the government departments responsible for energy and social protection 	Key informant interviews (Ministry of energy, SPS, DSA, county authorities)	Midline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		- Perceived reason why the cash top-up subsidy is considered priority or not for use of public money by government stakeholders		
DEQ10.3. How well have operational modalities of the pilot project been integrated or aligned with the NSNP?	• The beneficiary targeting and enrolment is well integrated or aligned with NSNP mechanisms	- Alignment of targeting mechanism with NSNP targeting guidelines	Documentation review Key informant interviews (SPS, DSA)	Midline
	• The cash top-up is well integrated or aligned with the NSNP mechanisms	- Timing of cash top-up payments - Timing of regular CT payments	Key informant interviews (SPS, DSA)	Midline
	• The beneficiary grievance system is well integrated or aligned with the NSNP mechanisms	- Number of grievances received - Channels used to report grievances - Types of grievances received		Midline
	• Coordination of the pilot project is well integrated or aligned with the NSNP mechanisms	- Role of SPS, DSA in coordinating the pilot	Key informant interviews (SPS, DSA)	Midline

Note: Originally, we had intended to use programme monitoring data as a source of evidence to complement the primary data collection as part of this evaluation. However, the implementing consortium used different unique identifiers for households, and we were unable to match the monitoring data to data collected as part of this evaluation. Further, due to the COVID-19 pandemic, county-level consultations were not feasible as these were intended to take place during 2020 when travel was not possible. Finally, baseline activities include the baseline quantitative household survey; midline activities include the implementation review, the quantitative mobile phone survey, the qualitative research at the household and community level, and the economy and efficiency analysis; endline activities include the quantitative household survey and the cost-effectiveness analysis.

ANNEX C SURVEY DESIGN AND IMPLEMENTATION

This Annex presents detail on the design of the quantitative endline survey and the implementation of the endline data collection.

C.1 Survey Instrument

The quantitative household impact evaluation relies on a panel survey, collecting data from the same households at baseline, midline and endline. Due to the COVID-19 pandemic, the midline survey took place remotely while the endline survey was delayed until 2021 and was conducted face-to-face with households. The midline survey had to be short because it was conducted over the phone and therefore it relied on a concise instrument to collect data on key outcome areas related to the Mwangaza Mashinani pilot as well as data relevant to the COVID-19 response. The endline survey collected data on all the key outcomes that were assessed at baseline, in addition to new questions related to the maintenance and sustainability of the solar devices and questions relevant to the COVID-19 response.

The endline household survey includes the following modules:

- Household member identification and basic information;
- Household member education outcomes and household education expenses;
- Household livelihoods and remittances;
- Household member health;
- Household assets and cooking habits;
- Access to energy for lighting and mobile phone charging;
- Awareness of alternative sources of energy;
- Household use of the solar devices, history of repair and maintenance, and willingness to maintain the devices;
- Women's time use;
- Children's time use;
- COVID-19 behaviour and access to WASH and health services.

The survey instrument was designed by OPM and as much as possible, questions were aligned with those asked during the baseline and midline surveys. For the new modules, we drew on many widely used questionnaires and our own findings from the qualitative research and implementation review. The instrument was programmed using a computer-assisted personal interview (CAPI) software platform and was comprehensively desk-tested ahead of the training, pilot and main survey implementation. Comments from UNICEF were incorporated into the final survey instrument.

We conducted a small pre-test, remotely, during which interviewers called a small number of households that were interviewed as part of the baseline pre-test. The purpose of the pre-test was to test the newly added modules and get a sense of the interview duration. The pre-test was used to refine the survey instrument, including the phrasing of questions, answer options and translations.

C.2 Fieldwork

C.2.1 Fieldwork protocols

Data collection for the quantitative endline household survey was conducted in-person separately in Kilifi and Garissa. Interviews in Kilifi were conducted from 20 April to 5 May 2021, while interviews in Garissa were conducted from 30 May to 14 June 2021. The fieldwork was not conducted simultaneously in the two counties because there were delays in obtaining approvals from the Garissa county government to conduct the survey.

Fieldwork was undertaken by 5 field teams comprised of 3 people each, accompanied by one supervisor. Supervisors from OPM's survey partner RGA's headquarters were responsible for supervising ongoing fieldwork, while a fieldwork manager was in charge of managing the overall activities.

Data collection was conducted using electronic tablets and the World Bank's Survey Solutions CAPI application. Questionnaires were prefilled with data collected at baseline and midline to facilitate the endline interview (for instance, the household roster data was prefilled and enumerators were asked to update the roster as opposed to collecting data from scratch).

A key element of the in-person fieldwork protocol was the adoption of COVID-19 mitigation measures. We implemented a COVID-19 mitigation protocol that entailed a number of measures including: fieldworkers and drivers taking a COVID-19 test prior to training and a test prior to fieldwork (and only allowing fieldworkers to join the team if they tested negative); wearing masks during the training and adopting social distancing measures; measuring the temperature of fieldworkers twice a day during the training, and making available hand washing facilities and sanitisers; measuring the temperature of fieldworkers every morning during fieldwork; wearing masks during interviews with households and encouraging respondents to also wear masks; if possible, conducting the interviews in an open location, or else conducting it in a well ventilated room; administering a COVID-19 screening module to households to check if anyone in the household has COVID-19 or has been in contact with someone who had the virus, and to check if the respondent was displaying symptoms of COVID-19 (households that did not pass the screening module were not interviewed for the endline survey); asking fieldworkers and everyone else in their team to self-isolate should they develop COVID-19 symptoms; providing fieldworkers with sufficient insurance to cover medical expenses as well as remuneration should they be prohibited from continuing work if they get infected with the virus or develop COVID-19 symptoms. None of the fieldworkers developed any symptoms of COVID-19 during the fieldwork.

C.2.2 Fieldwork challenges and mitigation

We encountered a number of challenges during the fieldwork. In this section, we describe the challenges experienced and the mitigation measures.

- **Finding respondents:** a key challenge was to find and locate respondents in a panel survey. The team used tracking forms with information about each household in the sample (drawn from the baseline and midline data) such as phone numbers and GPS coordinates to help them identify the households. If households could not be reached through their phones or located using the GPS coordinates, the teams worked closely with the implementing consortium and community structures, such as the community champion or chief/assistant chief, to track respondents. We also attempted to contact households repeatedly, and we tracked households that had relocated within the

subcounty to their new location. These different strategies enabled the teams to achieve a very high response rate.

- **Language:** all supervisors and interviewers were fluent in Swahili. However, we recruited enumerators that also had specific language skills as Somali is widely spoken in Garissa and many respondents in Kilifi were found to be Giriama-speaking during the baseline survey.
- **Literacy:** literacy levels of the respondents is generally low with many respondents never having attended school. The pre-test and pilot were used to ensure questions and answers were clearly understood.
- **Community access and legitimacy:** ensuring legitimacy of the survey was crucial to the success of contacting and interviewing households. It was important to obtain the requisite permissions from all levels of government and local leadership to ensure that leaders and households were aware of the scope and modalities of the survey. We obtained permission from the county commissioner as well as deputy sub-commissioners, assistant county commissioners, chiefs and assistant chiefs. As mentioned above, we also worked closely with local project structures, including the BWCs and community champions, to ensure that households were aware of the survey and the COVID-19 measures that were being implemented by the fieldworkers.
- **COVID-19 restrictions:** the endline quantitative household survey was conducted during the COVID-19 pandemic. To ensure the safety of both the field teams and our respondents, OPM developed a detailed set of COVID-19 protocols that included mitigation measures, testing requirements and social distancing protocols to be followed during interviews.

C.2.3 Fieldwork ethical standards

Conducting quantitative and qualitative data collection generally, and particularly for vulnerable populations in Kenya, requires high ethical standards. This is important to ensure that expectations are not unduly raised, confidentiality is maintained, respondents are never forced to participate or encouraged to speak about subjects that may be traumatising and that all activities are appropriate (including with regards to age, disability, gender, diversity, among other dimensions). These considerations are even more important during a public health emergency when households may be facing stressful circumstances.

Regarding the implementation of the household survey, the following principles were followed:

- **Seeking the informed consent of all participants in data collection.** In practice, this entailed providing potential survey respondents with information about the content of the study and how their information would be used, as well as seeking to make them feel comfortable and empowered to refuse to participate or not answer any questions if they did not want to. The importance of seeking informed consent was emphasised during enumerator training.
- **Maintaining confidentiality and anonymity.** This means ensuring that participants would not have their personal information shared, or be at risk of being individually identified as a result of their participation in the survey. During fieldwork every effort was made to ensure that interviews were always conducted in a quiet and private location. During data analysis and the writing up of results, households' identifying information was not shared with anyone beyond the small analysis team, and it was ensured that no individuals could be identified in any reports written using the data collected from this survey. This is particularly challenging during mobile phone surveys as the interviewer is not able to ensure that the respondent is alone during the interview. We ensured that part of the consent procedure ascertains whether the respondent is comfortable to proceed

with the interview at that time and, if not, another time was arranged to ensure that the respondent is afforded privacy.

- **Ensuring the safety of research participants** and respecting cultural sensitivities throughout all interactions with participants. All OPM employees have completed mandatory safeguarding training and have signed the Safeguarding Policy, Principles for Practice. As part of fieldwork training, all fieldworkers and enumerators received safeguarding training including on the processes to follow should a safeguarding issue arise.
- **Provision of information on COVID-19.** At the end of each interview, we provided respondents with information related to COVID-19 and details on toll-free numbers in Kenya that have been set up for this purpose.
- **Protecting the safety of the local researchers who conducted data collection and respondents.** To protect local researchers during this assignment, close communication between all teams and OPM was maintained during the data collection, to allow any emerging concerns to be communicated, adhering to strict security protocols, and ensuring that the teams obtained all relevant permissions and authorisations to conduct data collection in each location. Furthermore, appropriate COVID-19 mitigation protocols were put in place to protect the researchers and respondents including wearing of masks, maintaining social distancing, testing researchers prior to fieldwork and administering a COVID-19 screening module to all respondents.

C.2.4 Quality assurance (QA)

To provide ongoing support to field teams during their assignment and protect the quality of the data, a rigorous QA process for the Mwangaza Mashinani endline survey was established.

Our quality control process included careful training of enumerators, a pre-test, during which the questions were tested and refined, and a pilot. The pre-test of the survey instrument helped ensure that the questions were well-understood by respondents and answer options were appropriate, especially for the new modules. A remote cascaded training was conducted in which OPM consultants trained the RGA team (fieldwork manager, project manager and supervisors) on the survey instrument. The RGA team then trained the interviewers on the survey instrument. Once the interviewers had been trained on the instrument, we conducted a pilot during which interviewers visited and interviewed households that were interviewed as part of the baseline pilot. This ensured that interviewers were familiar with the questionnaire and software prior to the data collection.

Another element of the QA approach was to develop a fieldwork model that emphasised close and regular communication between fieldwork teams, and between RGA field staff and OPM. The OPM team provided remote support to RGA fieldwork staff for the initial roll-out of the survey to support resolution of early challenges faced in implementation of the survey. This communication allowed teams to raise any issues they were facing and seek support early.

In terms of the integrity of the data itself, there were two safeguards in place. The first was a series of basic consistency and range checks that were built into the CAPI software. These checks meant that interviewers would immediately be notified (during the interview) if data that they had entered fell outside an acceptable range or were inconsistent with a previous answer. Second, the OPM and RGA teams were able to monitor data on an ongoing basis throughout the fieldwork to identify and respond quickly to any issues as they arose. The ability to closely track quantitative data quality during its collection is an opportunity provided by electronic data collection that is not generally possible with paper-based surveys, where

there is a lag in receiving data due to the need to enter them first. A systematic set of cleaning checks that each batch of new data was subject to was set up to check for consistency errors and high rates of anomalous responses. This was then fed back immediately to teams if any concerns became apparent.

C.3 Sample achievement

Given the longitudinal nature of the evaluation, the same baseline respondents were tracked and re-interviewed at endline so as to create a panel of survey respondents. At endline, the quantitative survey respondents are therefore those who were successfully interviewed for the baseline survey and then again successfully traced and interviewed for the endline survey. The final quantitative survey sample achievement at endline is shown in Table 1 below, including the distribution by evaluation group, county and sub-county.

Table 1: Final endline sample (target and actual)

County	Sub-county	Number of households in sample	Number of completed interviews	Percentage completed
Treatment		600	567	94.5%
Kilifi	Ganze	173	173	100%
Kilifi	Magarini	214	205	95.8%
Garissa	Dadaab	128	111	86.7%
Garissa	Ijara	59	57	96.6%
Garissa	Fafi	26	21	80.8%
Comparison		586	547	93.3%
Kilifi	Kaloleni	373	366	98.1%
Garissa	Balambala	213	181	85.0%
Total		1,186	1,114	93.9%

When taking into account sample attrition between the two survey rounds as well as incomplete and/or unusable interviews, we successfully re-interviewed 94% of the baseline sample at endline. Given the low attrition rate, no additional adjustment or attrition weights need to be used for correcting a potential attrition bias.

The sampling strategy adopted to select the sample at baseline as well as the full technical details concerning the sampling frame, sampling weights and baseline sample distribution are presented in detail in the evaluation Baseline Report.¹

¹ See Section 4.3 of the Evaluation Baseline Report in Volume I and Annex C in Volume II.

ANNEX D COMPARISON BETWEEN COMPLIANT AND NON-COMPLIANT HOUSEHOLDS IN TREATMENT SUB-COUNTIES

As reported in Section 5.2 of Volume I of this report, not all households in the evaluation sample at baseline that were intended to be treated ended up enrolling in the Mwangaza Mashinani pilot project and receiving a solar device. In this annex, we show the size and distribution of the sub-sample of households that were actually enrolled into the pilot project and investigate how this group of households differs from the group of non-compliant households that did not end up enrolling in the project.

Table 2 shows that 68% of the households that originally registered for the pilot (and were therefore part of our baseline evaluation treatment group) ended up being enrolled. This discrepancy between registration and enrolment is particularly marked in Garissa, where only 59% of the originally registered households were actually enrolled in the pilot (treated). As explained in Section 4.2 of Volume I, this sample forms the basis for the ATT estimation of impact and is also used as part of the descriptive results, when focusing on the enrolled households only.

Table 2: Actually enrolled (treated) sample achievement

County	Number of treatment households interviewed at baseline (<i>intended treatment sample</i>)	Number of treatment households that enrolled in the Mwangaza Mashinani pilot project (<i>actually treated sample</i>)	Proportion of the intended treatment sample that was actually treated
Kilifi	378	271	72%
Garissa	189	112	59%
Total	567	383	68%

To gain an understanding of the potential bias in the ATT estimation of impact, we explore how the actually treated sample of households differs from the non-compliant households. To do so, we conduct a comparison of means between the two samples across a range of key characteristics and outcomes at baseline that may affect outcomes at endline. Table 3 presents the results of this comparison. The indicators in the table were selected as those that were deemed essential characteristics that could affect household outcomes such as location, gender, cash transfer type (as a proxy for age of beneficiary), education, and wealth index, as well as other factors that were selected as covariates in the baseline matching models, and key outcome indicators at baseline. All indicators represent baseline data for the two groups of households.

We find that while the two groups are similar across many indicators, there are some significant differences. Most notably, the actually treated households were much more likely to reside in Kilifi as opposed to the non-compliant households (by 13 percentage points). The actually treated sample also has more CT-OVC beneficiaries and less OP-CT beneficiaries, compared to the non-compliant households, and more female-headed households (although the difference is weakly significant). Compared to the non-compliant households, households in the actually treated sample have a higher wealth index and they also have more lamps,

lanterns and bulbs, are more likely to burn kerosene inside the home, and more likely to use the last cash transfer for school fees and materials. Women in the actually treated sample also spend more time per day on productive activities compared to women in the non-compliant group.

Table 3: Comparison between compliant and non-compliant treatment households

Indicator	Non-compliant households		Actually treated households		Difference
	N	Estimate	N	Estimate	
Household resides in Kilifi (%)	184	58.15	383	70.76	12.6***
Household head is male (%)	184	52.17	383	43.86	-8.3*
Household enrolled in CT-OVC (%)	184	42.93	383	57.18	14.3***
Household enrolled in OP-CT (%)	184	55.43	383	43.6	-11.8***
Size of household (mean)	184	7.61	383	7.26	-0.31
Number of female household members (mean)	184	4.07	383	3.97	-0.07
Household wealth index (standardised mean)	184	-0.22	383	-0.01	0.2***
Household head never attended school (%)	184	83.7	383	82.25	-1.5
Number of children enrolled in primary school (mean)	184	2.92	383	2.83	-0.12
Household used solar energy for lighting in last 30 days (%)	184	9.78	383	9.66	-0.08
Number of lamps/bulbs/lanterns (mean)	184	0.57	383	0.77	0.2**
Household burns kerosene inside the home (%)	184	36.41	383	44.91	8.5**
Household has discussed solar systems with others (%)	184	21.74	383	21.93	0.16
Household aware of solar energy (%)	184	72.83	383	71.02	-1.83
Number of household members >14 years old engaged in work (mean)	184	2.38	383	2.42	0.02
Household head belongs to savings group (%)	179	13.41	378	19.05	5.6*
Household monthly total income (mean KSH)	182	4488.51	373	3781.56	-706.91
High risk to average household member's health (%)	184	14.13	383	19.06	4.97
Proportion of household members with ARI symptoms (mean %)	184	6.02	383	6.78	0.78
Proportion of household members with eye irritation (mean %)	184	11.71	383	13.65	1.89
Use of last cash transfer for food (%)	179	80.45	382	81.94	1.45

Indicator	Non-compliant households		Actually treated households		Difference
	N	Estimate	N	Estimate	
Use of last cash transfer for school fees and materials (%)	179	64.8	382	73.3	8.5**
Proportion of 3-18 year olds currently attending school (mean %)	184	82.17	383	85.74	3.5*
Number of hours spent on productive activities (mean, for one selected woman per household)	167	9.18	367	9.95	0.7**

Source: OPM Mwangaza Mashinani Baseline Survey (2019). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

It is important to note, that household head gender is correlated with cash transfer type and both are correlated with county. The baseline and midline reports also found that the location of households was highly correlated with most indicators at baseline and midline suggesting that the profile of households in Kilifi differs significantly from those in Garissa. As a result, we attempt to isolate the correlations between these different characteristics discussed above, and the enrolment status of households by conducting a simple probit regression analysis. The dependent variable in this case is a dummy variable that takes the value 1 if the household in the treatment sample actually enrolled in the project and received the treatment. The independent variables are all those indicators listed in Table 3. We find that only the type of cash transfer (which can be a proxy for age of beneficiary) is significantly and independently correlated with the probability of households enrolling in the project – that is, CT-OVC beneficiary households (i.e. younger beneficiaries) are more likely to enrol in the project than OP-CT beneficiary households. All other indicators identified as significant in Table 3 (i.e. showed differences across the two samples of households) are not significant in the regression once other factors are controlled for. While this is a simple regression analysis with limitations, it does provide an indication that cash transfer type seems to be the primary factor affecting the probability of enrolment into the project among households that were offered the treatment.

Results of the regression are available upon request.

ANNEX E IMPACT ESTIMATION

The quasi-experimental design for the impact evaluation of the Mwangaza Mashinani pilot project relies on Propensity Score Matching (PSM) techniques to estimate impact on indicators across all impact areas at endline. The first stage of this approach requires the household samples used to generate the impact indicators to be balanced across treatment and control groups, which was done at the baseline stage and reported on in the Baseline Report Volumes I and II. At endline, two additional steps were undertaken. First, further balancing checks were undertaken in light of the high proportion of households in the treatment sample at baseline that did not end up being treated at endline, and therefore the need to additionally balance the sample of households that were actually treated with the non-treated group (given that at baseline, only the intended to be treated group and the comparison group were balanced). Second, once the matching and balancing were achieved, the impact estimations on the endline outcome indicators were carried out.

Table 4 lists the outcome indicators covered by the endline survey and for which impact was estimated.

Table 4: Impact indicators for endline PSM estimation

Impact area	Impact indicators	Sample for the impact evaluation
Energy	Proportion of households who used kerosene or paraffin for lighting in the last month (%)	All households
	Total household expenditure on all lighting sources in the last month (in KSH)	
	Total household expenditure on mobile phone charging in the last month (in KSH)	
	Proportion of households with access to tier 1 or above energy for lighting (%)	
Child time use	Number of hours per day spent by children studying outside school	All households
	Number of hours per day spent by children studying at home at night	
Education	Proportion of children (aged 3-18) currently attending school (mean %)	All households with a child aged 3-18 years
	Proportion of children (aged 3-18) regularly attending school (mean %)	
	Proportion of children (aged 3-18) who got promoted to next academic grade (mean %)	
Livelihoods	Total household monthly income (in KSH)	All households
	Number of working household members per household	
	Number of productive activities per household	
	Number of productive activities per household started in last 12 months	
	Proportion of productive activities per household conducted at home (mean %)	

Impact area	Impact indicators	Sample for the impact evaluation
Woman time use	Number of hours per day spent by women on productive activities	All households
	Number of hours per day spent by women on productive activities at home at night	
	Number of hours per day spent by women on leisure activities	
	Proportion of women who are time poor	
Health	Proportion of household members per household with symptoms of eye irritation (mean %)	All households
	Proportion of household members per household with burns related to lighting fuel (mean %)	

The rest of this section explains in detail the measurement approach taken to impact estimation, and presents the detailed results.

E.1 Impact identification strategy

A rigorous identification of programme impact in quantitative studies generally builds on the idea that such impact can be defined as the difference in the outcomes measured among individuals that participate in a programme compared to the outcomes measured among the same individuals in a theoretical state of the world where the programme is not implemented but where everything else, except the programme, stays the same. This is normally referred to as the counterfactual and, because it is purely hypothetical, the key challenge that impact evaluations face is to find alternative observed counterfactual measures that can credibly be used to infer programme impact.

A Randomised Controlled Trial (RCT), where observations are randomly assigned to a treatment and control group, is commonly considered as one of the most robust designs to deal with the problem of the counterfactual. Because treatment assignment is implemented randomly in these trials, individuals from control and treatment groups are, on average, the same. This means that after the implementation of the programme, averages of outcomes measured among participants and non-participants can be compared directly and differences can be attributed to the programme, rather than any other confounding factors. Sometimes, however, implementing an RCT is not feasible or not appropriate. Alternative identification strategies use econometric modelling techniques to try to come as close as possible to replicating the situation of such an experimental design.

This was the case in the present evaluation, where an RCT was not feasible given that the Mwangaza Mashinani pilot project beneficiaries were purposefully selected on the basis of a series of specific criteria. As discussed in Volume I of this endline report, the impact estimation is therefore based on a quasi-experimental design, which approximates the results of an experimental design by constructing a valid counterfactual. In particular, we have implemented a matching approach to build the control group² using PSM whereby control households were selected to match pilot beneficiary households (i.e. the treatment group) on the basis of the criteria that was used by the programme to enrol beneficiaries.

² Note that the term 'control group' is used throughout this document to refer to the comparison group.

At baseline we had also mentioned the possibility of augmenting the PSM impact estimation with a Difference-in-Differences (DID) analysis. DID would exploit the longitudinal nature of this study to control for any remaining imbalances at baseline across the treatment and comparison groups, however there is no need to augment the PSM impact estimation with a DID, given the balance achieved at baseline across all impact indicators. That said, we performed a DID analysis at endline to check the robustness of the results, and we found that the results from the PSM were, overall, very similar to the results from the PSM-DID analysis and therefore we only report on the PSM results in Volumes I and II of this endline report.

The following sections elucidate how the PSM was implemented and present the results of the balancing tests and the impact estimates for each impact indicator.

E.2 Propensity Score Matching

The key problem that PSM attempts to solve is selection bias. In the present case, this problem appears because households that enrolled into the Mwangaza Mashinani programme and received the solar device could be systematically different from households that did not receive such support and form part of the comparison group – because the assignment to treatment status was not implemented randomly. Such systematic differences could plausibly be related to outcome measures that this evaluation is interested in. This in turn implies that observed dissimilarities in outcome measures across households from treatment and control groups could be due to underlying systematic differences and not the programme itself. Simple comparisons of indicators across such groups would be invalid and biased to infer programme impact, because these groups cannot be assumed to be alike. This is the problem of selection bias.

PSM tackles this problem by using data from the control group to construct appropriate comparisons to households in the treatment group, thus building a valid counterfactual. This happens by matching and comparing outcomes for units in the treatment group with control units that are as similar as possible to each other according to a set of relevant observable characteristics, i.e. comparing like with like only. Relevant characteristics are the ones that are thought to be driving selection bias. These are the characteristics that are systematically different across treatment groups and are related to outcome measures of interest. When appropriately controlling for all of those characteristics, selection bias is also controlled for. A good example is represented by the education level of the household head. In the present analysis, this is found to be correlated with livelihood outcome measures. It is therefore a ‘relevant’ characteristic to control for in the PSM model. While the variable mean value is unbalanced between treatment and control groups before matching, the model achieves balance on this after the PSM matching procedure. The matching therefore successfully controls for this sample characteristic, increasing the comparability between treatment and control groups and making the estimation of impact more robust.

Specifically, PSM is a two-stage analytical approach that employs a propensity score as a ‘comparator metric’ that summarises the information of the set of relevant characteristics, i.e. the ones that drive selection bias. This propensity score can also be interpreted as an estimation of the hypothetical probability of any unit to be in the treatment group, given its characteristics. The first stage of any PSM analysis is to compute a valid propensity score for each unit of observation. The second stage is to then compare outcome indicators of interest across units (i.e. households in this case) with similar propensity scores. Note that because outcome indicators from treatment units are compared to outcome indicators from specific control units based on the propensity score, the estimated average treatment effect will be

valid for the group of treatment observations only. This means that PSM allows to estimate an Average Treatment Effect on the Treated (ATT) or Average Treatment Effect on the Intended to be Treated (ITT) (see Section E3 for further discussion on treatment effects measured by PSM).

It is important to note that, for PSM to work appropriately, the comparator metric constructed in the first stage needs to be valid. For that to be the case, it needs to be calculated using variables that are ‘relevant’ for the construction of the counterfactual. As described above, ‘relevant’ here means that these are variables which are driving selection bias. To meet this, researchers typically argue from a theoretical perspective about which variables could be relevant to control for selection bias. This study improves this selection of relevant variables by using a data-driven algorithmic approach that aims to reduce researcher discretion in the choice of variables.

The validity of any PSM approach also depends on how well it reduces any imbalance, and thereby selection bias, between treatment and control groups. Achieving balance means that if matched appropriately treatment and control groups’ characteristics will not be significantly different from each other. In other words, this means that, across the list of relevant characteristics that are assumed to drive selection bias, the treatment and control groups will be statistically similar to each other.

PSM first stage model selection

To estimate the propensity score in the first stage, this study followed the procedure suggested by Imbens and Rubin (2015, p. 281 ff.). The underlying model specification for this procedure is either a logit or probit regression for the first stage. This means that the propensity scores are estimated by first specifying treatment and control assignment as a binary variable that has the values 0 (for control) and 1 (for treatment). The estimated scores are then modelled as the fitted values that are derived from a logit or probit estimation, with the binary treatment variable as dependent variable and the covariates across which balance is supposed to be achieved as the regressors. These fitted values lie between 0 and 1.

To be more concrete, in the case of a logistic regression specification, the binary response variable is modelled as follows:

$$\Pr(T = 1 | X_i) = \frac{e^{f(X_i)}}{1 + e^{f(X_i)}}, (1)$$

where $\Pr(T = 1 | X_i)$ is the probability of the treatment indicator (T) being equal to one, conditional on the covariates (X_i) for unit i . The function $f(X)$ is normally modelled linearly, i.e. is of the form $f(X) = X\beta$. The coefficients of this function (β) are estimated using maximum likelihood techniques. The fitted values, i.e. the predicted probabilities that follow from this procedure, are the propensity scores for each unit of observation.

The key question for the first stage is which covariates to include in $f(X)$ so that this procedure produces a valid estimate of the propensity score. Building on the procedure described in Imbens and Rubin (2015) for selecting covariates, this study implemented a three-step approach to make this decision:

1. Select a set of basic covariates based on substantive grounds

The starting point for the PSM analysis was to select variables that were likely to be relevant to be used for this analysis from a theoretical perspective. ‘Relevant’ in this case meant that variables had to be selected that were theoretically expected to be correlated with treatment

status and treatment effects, thereby introducing selection bias in a simple comparison of treatment outcomes between control and treatment groups. This requires a theoretically substantiated understanding of the relationships that were being analysed.

2. Increase the set of valid covariates based on algorithmic approaches

In addition, this study employed variable selection algorithms to identify valid variables, i.e. variables that were not affected by the programme, and that are significantly correlated both with the treatment status and the outcome variable. There are a variety of methods available to do this. This study's approach was to implement stepwise regressions. Such regressions are commonly used and easily implemented algorithms to select independent variables based on significant correlations with certain dependent variables.

There are two stepwise regression approaches that can be employed for this: backward and forward stepwise regression. The underlying idea behind both approaches is to check each covariate, step-by-step, for significant correlation with the outcome and treatment assignment variable separately. Such a correlation is relevant because variables that possibly bias impact estimates will have some relation to both the treatment status and the outcome looked at.

Backward selection starts with the full set of covariates, i.e. a regression including all variables, and then discards the term that is least significantly correlated with the dependent variable. It continues to do so until all variables that are uncorrelated with the dependent variable are discarded. Forward selection, instead, starts with an empty set of covariates, i.e. a regression on a constant, and then checks the significance of each covariate if it is included in the regression. It then adds the most significantly correlated variable to the model. This step is repeated until all significant covariates are included in the model.

Both for backward and forward estimation a threshold p-value for what is considered to be significant needs to be specified. For backward selection, this means setting the level for identifying whether all variables that are uncorrelated with the outcome variable have been discarded: if the p-value of the least significant variable remaining is under the threshold, i.e. all the variables still included in the model are even more significant, the procedure stops. For forward selection, this means setting the level for identifying whether all significant covariates have been included in the model: if the p-value of the most significant variable to be added is equal to the threshold, i.e. the significance level of all variables that have not yet been included in the model is equal or below the threshold, the procedure stops. Setting this threshold therefore influences the variables that are selected in stepwise regressions.

This study implemented both backward and forward selection, using baseline data and using thresholds of $p = 0.05$. The analysis is employing this covariate selection procedure on both relevant outcome variables and treatment status, given the importance of determining the significance of covariate correlation on both, as explained when discussing our approach above. A common set of variables for the models were then selected based on whether they were selected in either of the forward or backward stepwise regressions.

3. Increasing the set of covariates with polynomial and interaction terms using algorithmic selection

In a third step, the same method of stepwise regressions (backwards and forwards) was employed to augment the set of covariates by quadratic terms or interactions of variables that had already been selected in steps one and two. The rationale behind this is the fact that balance might only be achieved if the propensity score is estimated using non-linear transformations of the variables selected in the first two steps (Imbens and Rubin 2015, p.

287). Again, the stepwise regression approach helped to decide which of these non-linear terms were significant predictors of differences across control and treatment groups, and should therefore be controlled for.

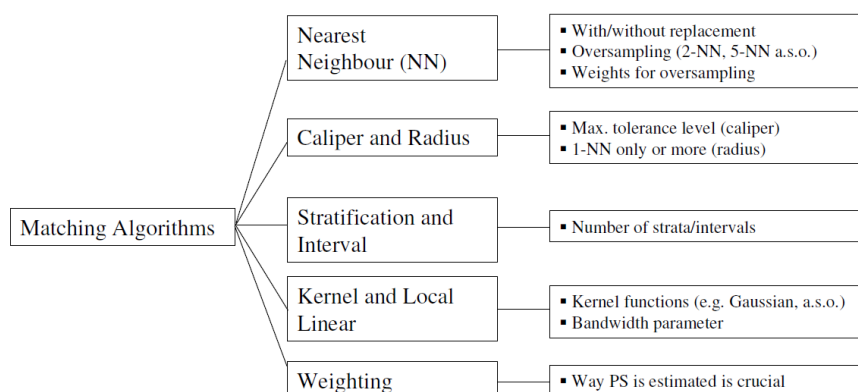
The result of this process was the identification of an optimal selection model comprising a set of covariates that were included in the first stage estimation of the propensity score. This three-step approach was conducted for every estimation strategy for each of the outcome variables. It is important to note, however, that good balancing properties using PSM also depend on the matching algorithm used in the second stage of the PSM analysis described in the next section.

Second stage algorithm selection

There are a variety of algorithms available to implement the second stage of PSM, i.e. to match control and treatment units to each other based on the propensity score estimated in the first stage. Figure 1 shows algorithm options and sub-options for each of these possibilities. It is beyond the scope of this report to explain in detail the technicalities of each of these approaches.³ For all approaches the goal is to find appropriate, i.e. sufficiently similar, control group members for treatment group members. Differences between these approaches can be defined along three main dimensions: first, which estimated propensity scores are considered to be valid for inclusion in the analysis? Second, what is the appropriate range of propensity scores that define control comparators for treatment units? Finally, how are these comparators used when estimating the treatment effects?

The first dimension relates to the fact that within both control and treatment groups there could be estimated propensity scores that lie either at the upper or lower bound of the distribution, i.e. close to 0 or 1. For such values, there might not be an appropriately similar propensity score in the respective comparison group. However, for matching to work appropriately, there must be comparable propensity scores in both control and treatment groups – the so-called common support condition. Hence, matching algorithms employ cut-offs or trimming procedures by which some proportion of observations with propensity scores that are not comparable are dropped from the analysis.

Figure 1: Matching algorithms selection



NN: Nearest Neighbour, PS: Propensity Score

Note: Figure taken from Caliendo and Kopeinig (2005, p. 9).

The second dimension relates to how units in the control group with propensity scores close to a treatment group observation are treated. For instance, kernel matching, which was

³ See Caliendo and Kopeinig (2005) for a summary overview.

selected to be used in this endline impact estimation for the Mwanzanza Mashinani programme, is a non-parametric matching estimator that uses the weighted averages of all units in the control groups to create the counterfactual outcome. The weights are determined by the distance between each unit from the control group and the participant observation for which the counterfactual is estimated. Therefore, higher weights are given to units closer in terms of the propensity score of a treated unit (Caliendo and Kopeinig (2005), p.10–11). Alternatively, Nearest Neighbour (NN) matching with just one unit looks for the one control observation that has the closest propensity score to a treatment unit and compares the outcome measure for those observations. NN matching with more than one neighbour looks for several control units with similar propensity scores and compares the treatment outcome to an average of these neighbours. Caliper matching is similar to NN matching but does not include a fixed number of neighbours. Instead, the comparators are selected based on a maximum difference in propensity scores allowed.

Finally, the third dimension refers to how, once comparator units are found, the outcome measures are compared across treatment and control. For example, with NN matching and more than one neighbour simple averages are calculated. Similarly, with kernel functions a form of weighted averages are calculated to estimate treatment effects.

Selecting the appropriate matching algorithm for a PSM exercise is not straightforward and requires careful analysis of how well-balanced samples are after employing algorithms with certain sub-specifications. In general, however, the selection of models in this study was based on the fact that discriminating between models poses a bias/variance trade-off in the estimated treatment effect. For instance, in the extreme case of NN matching with just one neighbour, it could be that the NN is actually quite far away in terms of propensity scores and hence a bad match. If this happens often, this could introduce bias into the estimation procedure. A solution to this could be to implement matching using several comparators in a caliper matching setting. However, this could decrease the number of available matches, which could increase the variance of the treatment estimate.

Kernel matching with appropriate trimming and enforcement of common support is a good compromise between these different approaches and was therefore selected as the main matching algorithm for baseline estimates.⁴ In order to find the optimal estimation model, this study used different kernel matching algorithms with different bandwidths and trimming levels. These different results were then compared with respect to the best balancing properties, with the best performing approach being selected as the optimal.

Following the first and second stages of the PSM analysis, within each of the six impact areas for the endline analysis, one optimal model was selected based on the estimation strategy for the key outcome indicator for that area. The selected model per impact area was then used for the estimation strategies of all other outcome indicators in that impact area. The balancing properties were then checked for each estimation strategy to ensure that the selected model per impact area performs well – in terms of balancing – for all outcome indicators. The results presented in Section E5 show that the selected model for each impact area performed well for all outcome indicators, and therefore, we do not use different models within an impact area.

⁴ See Caliendo and Kopeinig (2005, p. 10 f.) for a short summary of the pros and cons of different matching techniques.

Key PSM assumptions: common support and conditional independence

There are two key assumptions that need to hold for PSM to be a valid approach to estimating treatment effects: the common support assumption and the conditional independence assumption.

The **common support assumption** states that the estimated propensity score for all units in the treatment and control groups must lie within 0 and 1. Expressed differently, units in both groups must have a positive non-zero probability of belonging to either the treatment or control group and the distribution of those probabilities across the two groups must be such that comparable units across the groups can be found. This can easily be enforced by only comparing observations with appropriate propensity scores.

The second key assumption is the **conditional independence assumption**, which posits that, once observable characteristics have been accounted for, the outcome measure is not related to the treatment status anymore, other than via the effect of the programme. In essence, this assumption states that once observable characteristics are appropriately controlled for, treatment status can be treated as if it was assigned randomly. As described above, PSM deals with this problem by comparing outcome measures across treatment and control groups only for units that are similar, i.e. by controlling for the important characteristics that are related to both treatment status and the outcome measure. The conditional independence assumption simply states that all important characteristics have been taken care of. This means that any bias that arises due to participation in the programme has been dealt with. Note that this includes biases that arise due to unobservable factors – PSM cannot control for these and the assumption is that once observable characteristics have been dealt with no unobservable bias remains.

The validity of any PSM approach therefore crucially depends on how well the approach reduces any imbalance between treatment and control groups. Under conditional independence – i.e. independence of the treatment assignment from outcome measures when controlling for covariates – the propensity score is a valid balancing score. Conditioning on this score appropriately means that bias will be removed between control and treatment groups. Hence, treatment and control groups will be balanced, i.e. they will have similar covariate distributions. This means that, across a variety of different characteristics, the treatment and control groups will be similar to each other.

Assessing balance of covariates after matching is therefore a key step for any PSM analysis. The more balanced samples are after matching, the more plausible is it that the conditional independence assumption holds. As described above, however, balance also depends on the models and algorithms used to implement matching. The following paragraphs explain in detail how balance assessments were implemented and used in the current study.

Assessing balance

To select between different matching algorithms and to assess covariate balance after matching, this study compared matching models along a variety of dimensions. First, individual covariate balance was assessed across samples by looking at the standardised difference in means across treatment and control groups both before and after matching. This standardised difference is the difference in group averages over the square root of the average of the sample variances. If samples are balanced, this difference should be small and matching should reduce this standardised difference as compared to the unmatched samples.

In addition, this study performed t-tests to assess whether differences across treatment and control groups were statistically significant. If balance is achieved with PSM, differences between treatment and control groups should be negligible and therefore should not be significantly different from zero.

In this context, the variance ratios of covariates of treated over control measures was also assessed. If there is perfect balance across samples, then covariates should be distributed equally and hence this ratio should be equal to one.

All of these measures give an indication of whether specific individual covariates are balanced across treatment and control groups. To assess overall variance, this study used two statistics that summarise covariate balance in the sample at hand: Rubin's B and Rubin's R. Rubin's B reflects the absolute standardised difference of the means of the propensity score in the treated and control groups (unmatched and matched). Rubin's R is the ratio of the treated to control variances of the propensity scores. Rubin (2001) suggests that the value of B should lie below 25 and that R should lie between .5 and 2 for overall balance to be sufficient. Together, Rubin's B and Rubin's R provide an informative indication of the trade-off between bias and variance across the treatment and control groups, as it changes before and after the matching procedure. However, individual-level balance should always be assessed as the overall balance is only an approximation of goodness of fit.

Matching procedures were implemented using the psmatch2 package in Stata (16) and balancing tests were carried out using the pstest package, which provides the results for all of the statistics mentioned above.⁵

Finally, the distribution of propensity scores was also analysed graphically. Ideally, propensity scores should be distributed equally across treatment and control groups. Very skewed/diverging distributions could be an indication that balance has not been achieved successfully. The visual distribution of propensity scores was therefore taken into account in selecting the preferred estimation model for the impact analysis.

Results of balancing assessments are presented in Section E5 of this report.

E.3 Treatment effects measured by the impact strategy

The endline impact estimation for this study provides two estimates for each outcome indicator, as detailed below.

Intention to Treat: As discussed at baseline, the main impact estimation methodology provides a measure of an Intention-To-Treat (ITT) estimate. The ITT covers every household that is surveyed at endline in areas defined as treatment (according to the implementation plan) and ignores non-compliance or anything else that may prevent households from being treated. The ITT approach thus allows us to include in the estimation of impact all households that were originally included in the treatment group at baseline. Our endline data on exposure to treatment shows that 32% of eligible households surveyed at baseline did not end up being enrolled in the pilot and did not therefore receive the treatment (solar device). Therefore, in the ITT analysis the impact estimates provide a measure of the effect of being offered, rather than actually receiving the treatment and is generally more conservative compared to the analysis of impact on observations that are all equally treated.

⁵ See <http://fmwww.bc.edu/repec/bocode/p/pstest.html> for details.

Average Treatment Effect on the Treated: In addition to the ITT estimation, we also provide a measure of impact specifically focusing on households who were actually enrolled into the pilot project and therefore received the solar devices. This measure of impact represents the average effect of the pilot project on the group of households that received the treatment and is called the Average Treatment Effect on the Treated (ATT). The ATT is indicative of the expected causal effect of the pilot when its constituent parts (solar device and cash top-up, in this case) reach its intended beneficiaries. The ATT impact estimates are thus biased towards a sub-set of the target population that may have been better placed to receive the intervention (e.g. more eligible and registered households in Kilifi were enrolled into the pilot than in Garissa, which points towards local factors influencing the probability of enrolment as also suggested by our sensitivity analysis discussed in Annex D) and cannot be seen as representative of the overall impact of the pilot. They still represent interesting impact estimates from a research perspective, especially when compared to the ITT estimates as they show the difference between the effect of the pilot on its intended target population when also considering implementation issues and the potential effect that the pilot could have if households are actually exposed to the intervention as per the original design.

Furthermore, it is important to emphasise that the PSM approach used in this study works by looking for control units that can be compared to treatment units, and not the other way round. This means that it is assumed that treatment units are a given and control units need to be identified. Through finding matches for the treatment units (households in the treatment sub-counties in our case) in the pool of control units (households in the comparison sub-counties), the resulting estimates of the treatment effect are therefore the Average Treatment Effect on the Intended to be Treated (when looking at all households intended to be treated) and the Average Treatment Effect on the Treated (when looking at households that actually were treated). Extrapolating these estimates beyond the population for which the treatment sample is representative is not immediately possible.

The PSM approach described above was applied twice for each outcome indicator: first, on the sample of all households in the treatment sub-counties (ignoring non-compliance) to estimate the ITT; and second, on the subsample of households in the treatment sub-counties that were actually treated to estimate the ATT. As mentioned above, for each impact area, an optimal matching model was selected based on the key outcome indicator, which was then applied on all other outcome indicators in that impact area. The same selected model was applied to estimate both, the ITT and ATT, for each outcome indicator. The balancing properties were then checked for each estimation strategy to ensure that the selected model performs well. The results presented in Section E5 show that the selected model for each impact area performed well for all outcome indicators and for both ITT and ATT samples.

The main goal is to conduct inference on these treatment effects (the ITT and ATT estimates), i.e. to see whether they are significantly different from zero or not from a statistical point of view. Note that all standard errors for the impact estimates used are based on bootstrapping procedures for PSM estimates. See next section on why standard errors for PSM are bootstrapped.

E.4 Caveats - Addressing weaknesses in the analysis

Two key caveats related to the present estimation strategy need to be mentioned here. First, PSM only controls for observable characteristics that cause selection bias. This is a problem for any impact identification strategy that relies on controlling only for factors (variables) that can be observed in the data – not only PSM. PSM helps addressing this by allowing for extensive balancing checks after matching, which can provide substantial evidence for the

fact that balance is achieved across a large variety of characteristics and – by implication – is likely to also extend to unobservables. In this study, such extensive balancing checks were implemented. Results are presented in Section E5 below.

Second, calculating standard errors of estimated treatment effects using PSM methods is not straightforward. As Caliendo and Kopeinig (2005, p. 18) put it, 'The problem is that the estimated variance of the treatment effect should also include the variance due to the estimation of the propensity score, the imputation of the common support, and possibly also the order in which treated individuals are matched'. These estimations increase the variation of the treatment effect estimates over and above normal sampling variation. In the literature, there is no consensus on how to take this into account.

A popular approach to solve this problem is to bootstrap standard errors for the estimated treatment effect (see Lechner 2002). Each bootstrap draw re-estimates both the first and second stages of the estimation. This produces N bootstrap samples for which the ITT/ATT is estimated. The distribution of these means approximates the true sampling distribution, and therefore the standard errors of the population mean (Caliendo and Kopeinig 2005, p.18). This study followed this approach and implemented bootstrapping, using 200 repetitions, to estimate the standard errors of the estimated treatment effects. Note that, for the sake of completeness, this report shows both the bootstrapped and the non-bootstrapped standard errors below.

It is also important to note that there is no clear direction in which estimated standard errors should change due to bootstrapping. On the one hand, the additional variation taken into account should increase standard errors. On the other, bootstrapping generally makes estimates more precise, which tends to decrease standard errors. Overall, the direction of the change is not uniform. In fact, the results show that, with bootstrapping, standard errors in some instances are smaller and in some larger than without bootstrapping.

E.5 Results

This section presents the results obtained from applying PSM to the Mwangaza Mashinani baseline and endline data. For each outcome indicator, the balancing results and the impact estimates are presented for both, the ITT and ATT samples.

Presentation of results

In Volume I, the ITT estimates for all impact indicators are presented in a visual form, where each graph shows point estimates for treatment effects on outcome indicators and 95% confidence intervals for these effects. The confidence intervals indicate that the probability for the true treatment estimate to fall within the lower and upper bounds of the interval is 95%. When confidence intervals of such estimates do not overlap with zero, then this is an indication that this treatment effect is truly different from zero. This zero value is indicated using a red line in the graphs. Additionally, for the child time use and education impact indicators, we also showed the ATT estimates in Volume I in visual form. For all other impact indicators, we show the ATT estimates in visual form in Section E5 of this current volume.

Additionally, in Volume II, for each outcome variable, two sets of results are presented for each of the ITT and ATT samples: (a) the balancing results, and (b) the PSM estimates. The following paragraphs use the example of Figure 2 to explain the interpretation of results in detail.

The second stage results are presented, as illustrated in Figure 2 for the indicator on proportion of households who used kerosene or paraffin for lighting in the last month, for the ITT sample. The figure is divided into two panels; the top panel and the bottom panel, showing baseline and endline results respectively. The format for each panel is as follows:

- The graph on the left-hand side indicates how individual baseline variables balance before and after matching. The x-axis displays the standardised bias, which is the percentage difference of the sample means in the intended to be treated and not intended to be treated (or treated and non-treated) – unmatched or matched – subsamples as a percentage of the square root of the average of the sample variances in the intended to be treated and not intended to be treated groups (or treated and non-treated groups) (Rosenbaum and Rubin 1985). In Figure 2 below, for example, the unmatched samples display large imbalances with standardised bias being present across many of the covariates of interest. However, once matching takes place, the standardised imbalances are diminished.
- The second graph, on the right-hand side, shows the distribution of propensity scores across treatment and control groups. This graph visually confirms that, after dropping observations that are off common support, both treatment and control groups contain observations with propensity scores across the full range of the distribution, which is an indication for overall balance. Although the distributions of propensity scores across treatment and control groups would ideally be symmetric, the presence of some level of skewness does not put at risk the estimation procedure, as indicated by the balance achieved for each covariate and the overall values of Rubin's R and B after matching.
- The remaining rows on the right hand side display information related to the PSM model. The bandwidth and level of trimming for the optimal PSM model can be found in the first two rows. For example, the optimal model has a bandwidth of 2 and a trimming value of 3 for the baseline sample in Figure 2.
- This is then followed by the Rubin's R and Rubin's B values both before and after matching. Generally, a Rubin's B score under 25 after matching is desirable, whilst a Rubin's R score between 0.85 and 1.25 is the preferred range after matching (Rubin 2001). The unmatched samples are particularly unbalanced; for instance, the Rubin's B is 76.16. However, the Rubin's B score after matching, which is below 25, shows how matching removes the previous imbalances.
- Finally, the remaining rows on the left hand side under the endline panel indicate the impact estimate (ITT or ATT) for endline and the associated standard errors and number of observations on common support. Given that it is not definitively clear how to produce standard errors for PSM, both bootstrapped and non-bootstrapped standard errors are presented for robustness purposes (See Section E4 for more detail on this).

Note that the balancing was done on the full sample of households that were interviewed at baseline (1,186), while the impact estimation of the ITT and ATT effects was done on the sample of households that were interviewed at endline (1,114). Conducting the balancing on the full baseline sample rather than on the non-attrited sample that was reached at endline is acceptable in this case given that the level of attrition at endline was very low (6%). This then allows us to make use of the full range of observations at baseline for each evaluation group when assessing balance.

Proportion of households who used kerosene or paraffin for lighting in the last month

Figure 2: Use of kerosene: Second stage results (ITT)

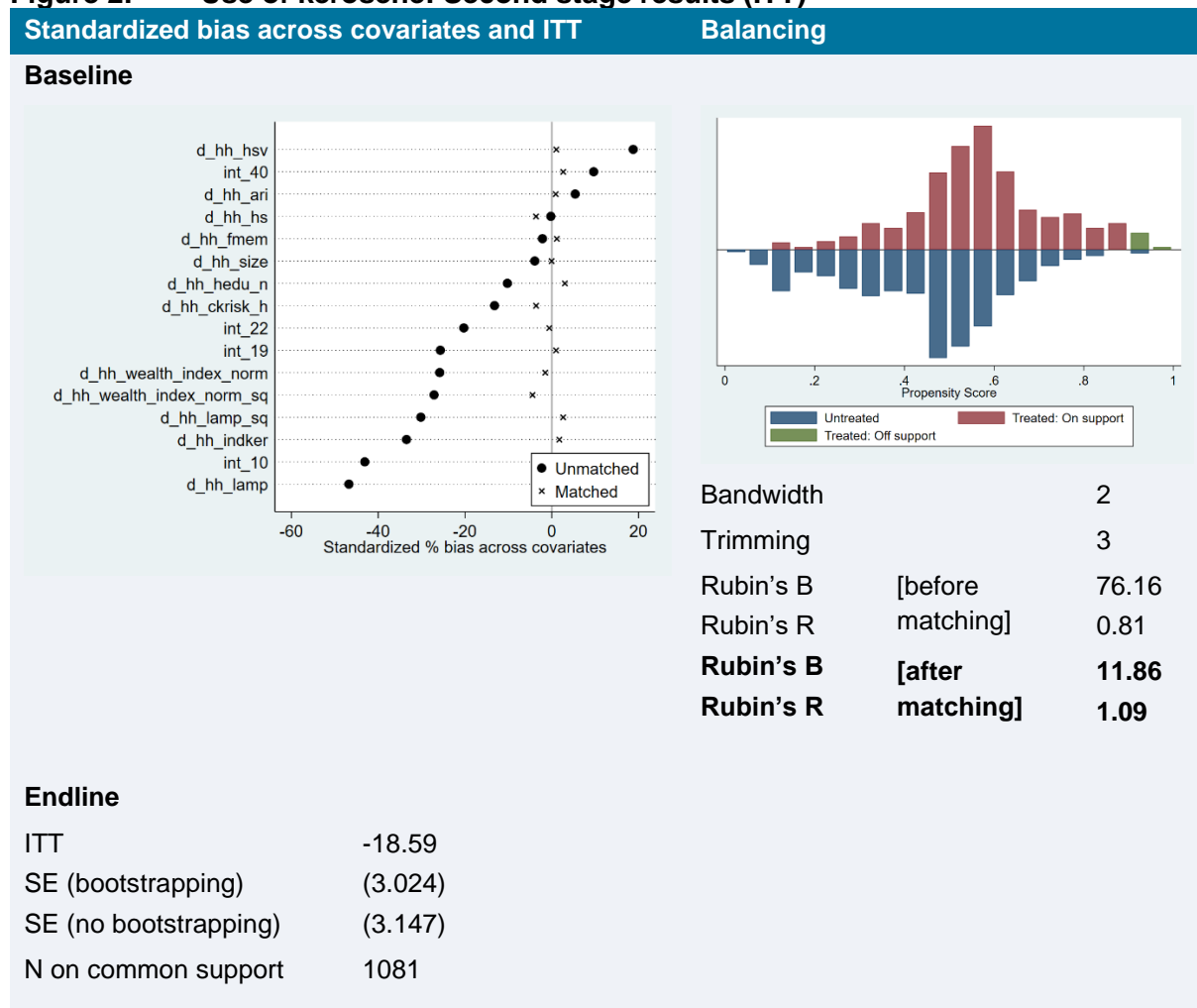
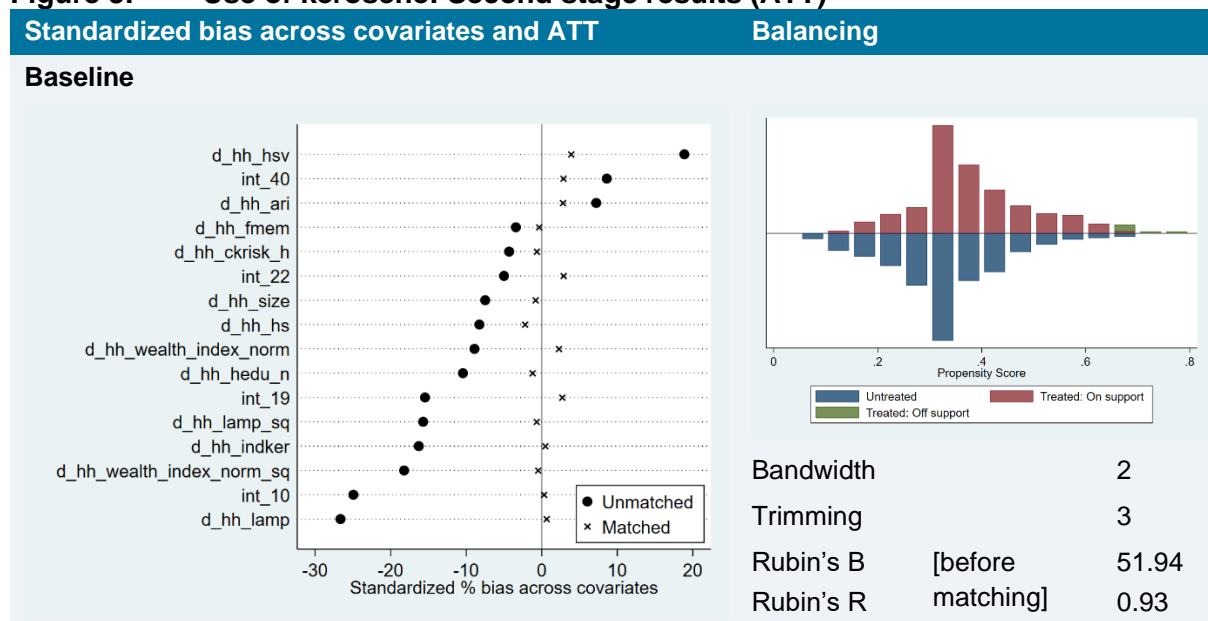


Figure 3: Use of kerosene: Second stage results (ATT)



		Rubin's B	[after	9.3
		Rubin's R	matching]	1.1
Endline				
ATT	-19.59			
SE (bootstrapping)	(2.585)			
SE (no bootstrapping)	(2.671)			
N on common support	1086			

Total household expenditure on all lighting sources in the last month (in KSH)

Figure 4: Expenditure on lighting: Second stage results (ITT)

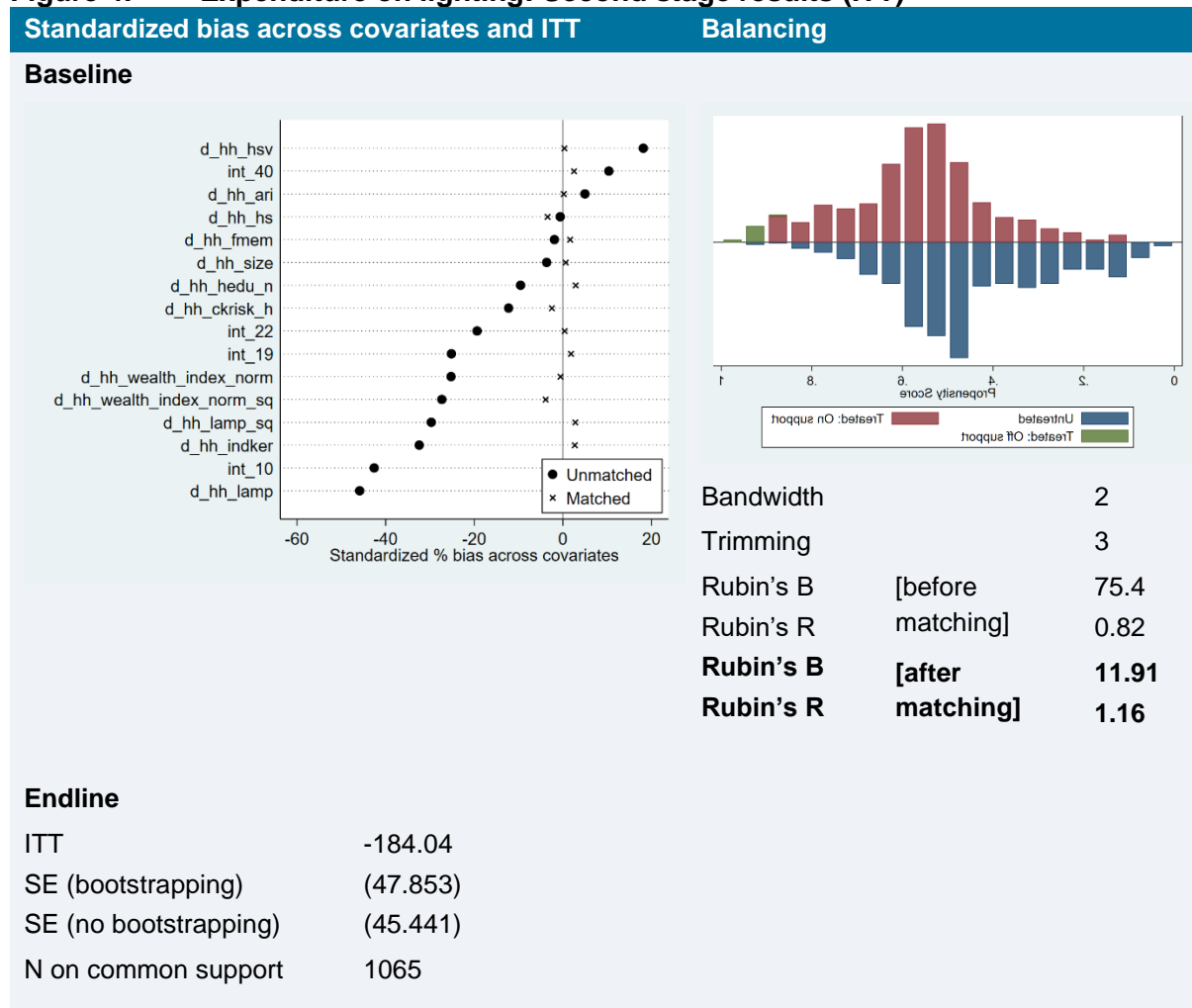
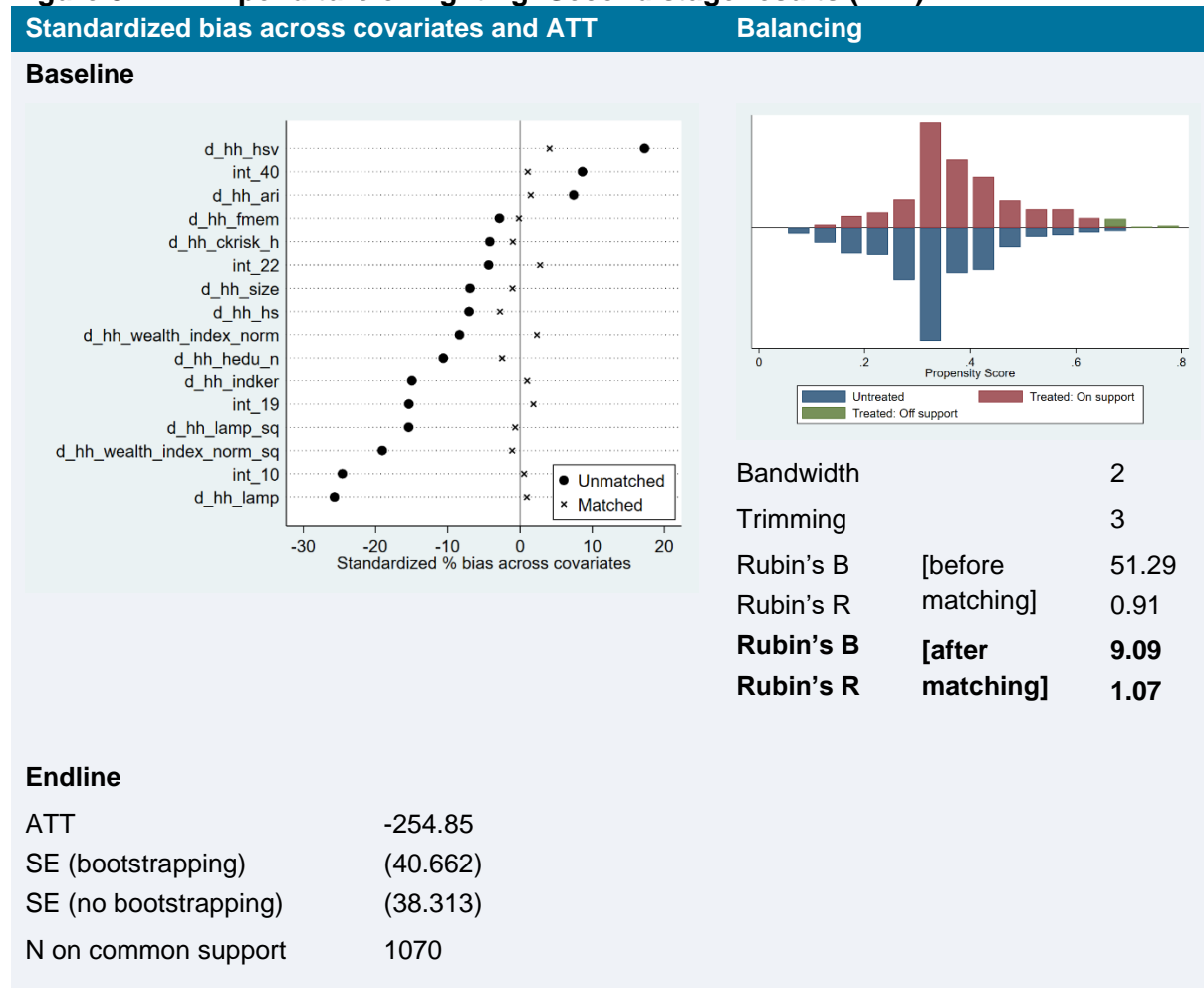
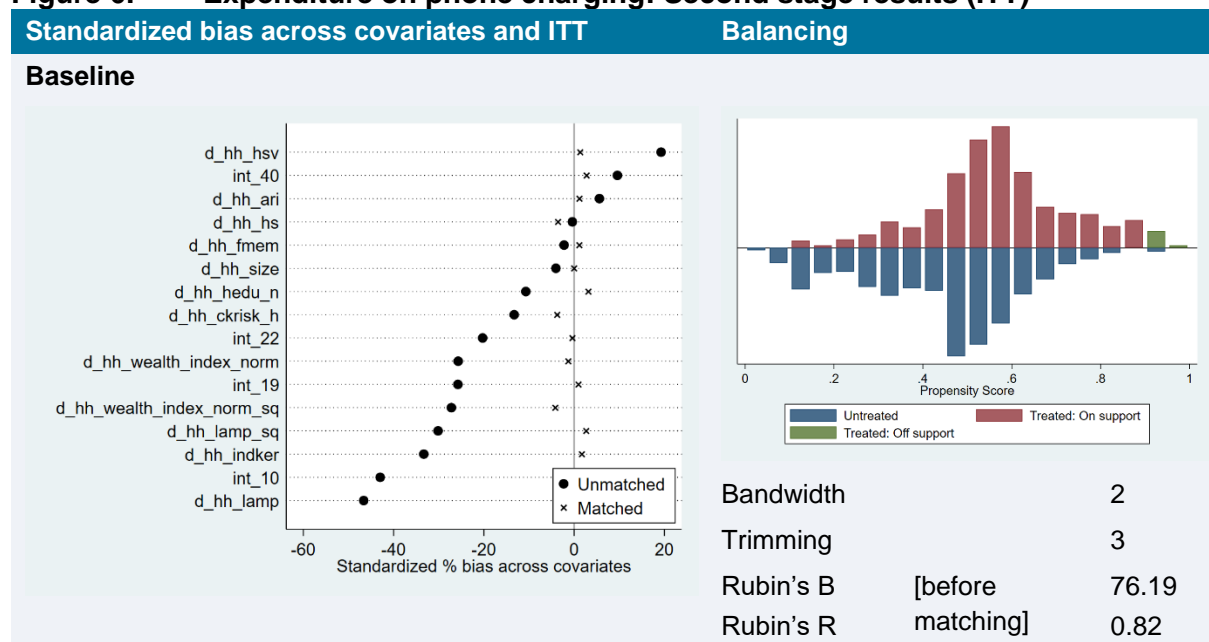


Figure 5: Expenditure on lighting: Second stage results (ATT)



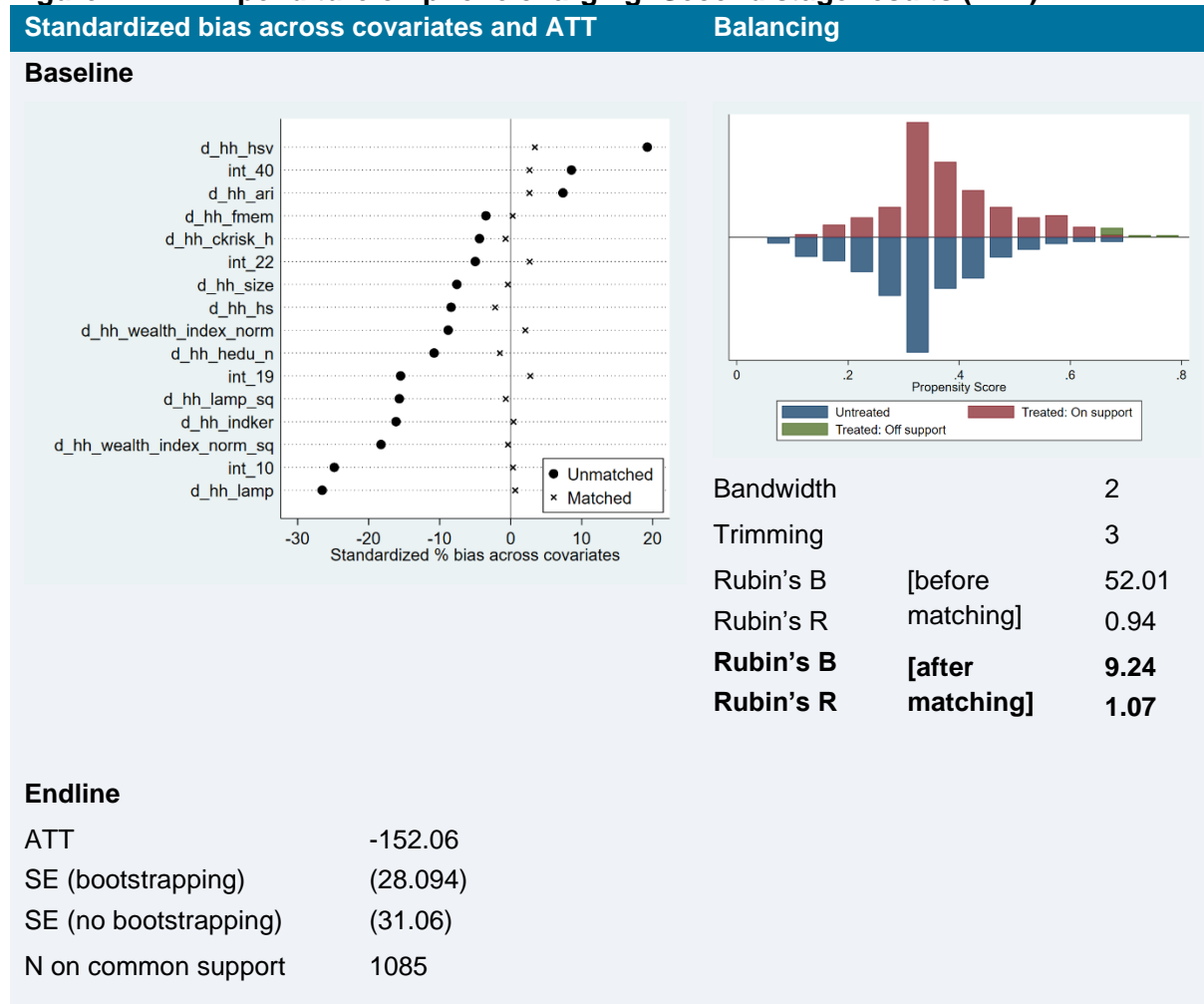
Total household expenditure on mobile phone charging in the last month (in KSH)

Figure 6: Expenditure on phone charging: Second stage results (ITT)



		Rubin's B	[after	11.76
		Rubin's R	matching]	1.12
Endline				
ITT	-196.02			
SE (bootstrapping)	(46.857)			
SE (no bootstrapping)	(47.147)			
N on common support	1080			

Figure 7: Expenditure on phone charging: Second stage results (ATT)



Proportion of households with access to tier 1 or above energy for lighting

Figure 8: Access to tier 1 or above energy for lighting: Second stage results (ITT)

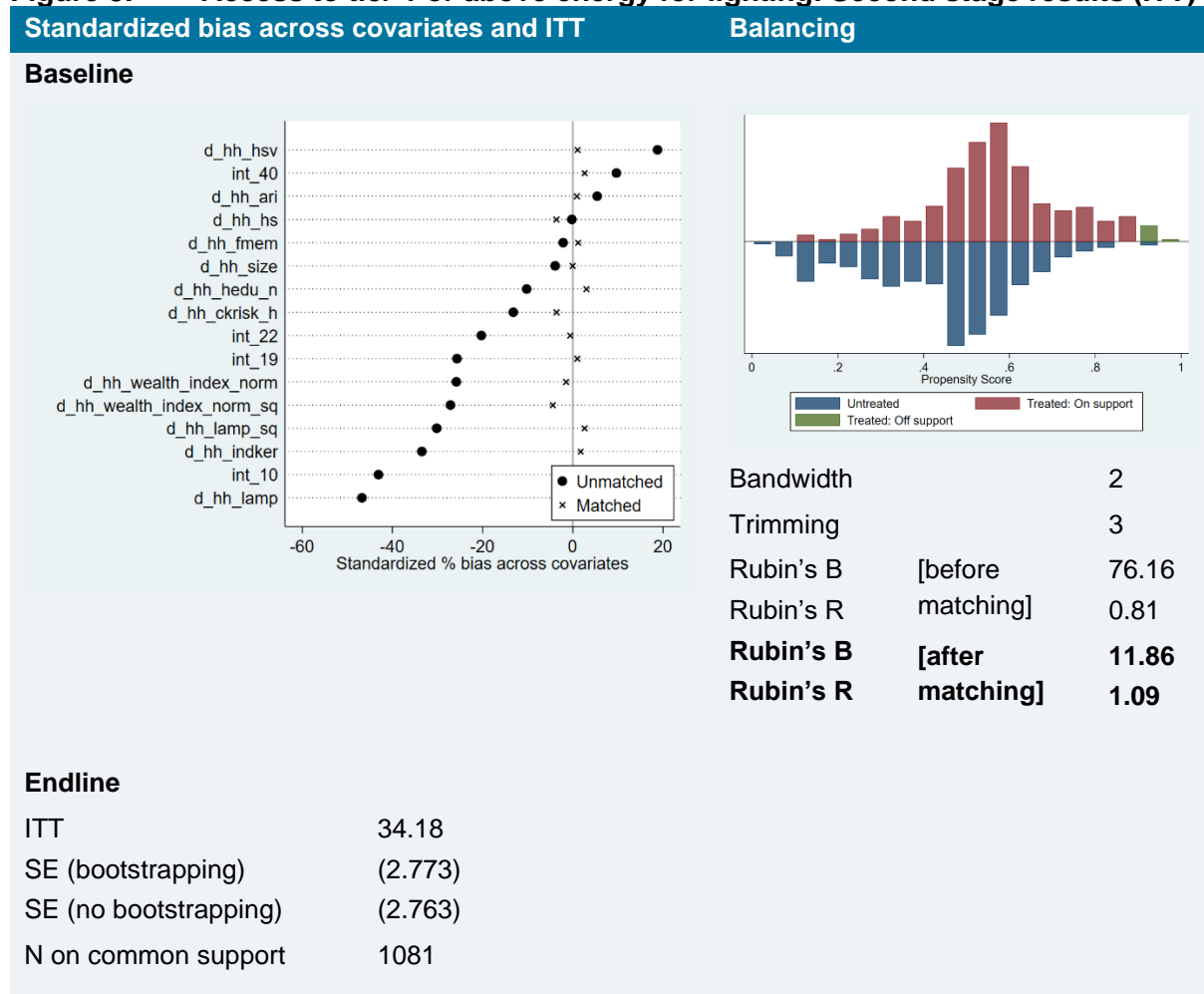
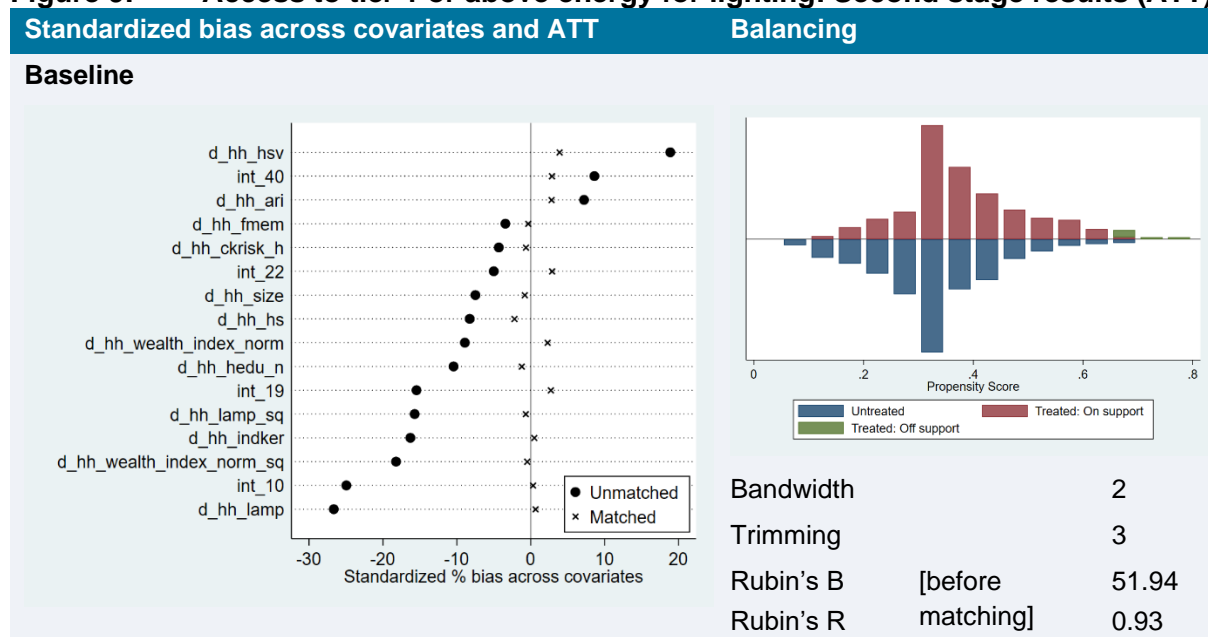


Figure 9: Access to tier 1 or above energy for lighting: Second stage results (ATT)



		Rubin's B	[after	9.30
		Rubin's R	matching]	1.10
Endline				
ATT	41.97			
SE (bootstrapping)	(3.036)			
SE (no bootstrapping)	(2.937)			
N on common support	1086			

Number of hours per day spent by children studying outside school

Figure 10: Hours spent studying outside school: Second stage results (ITT)

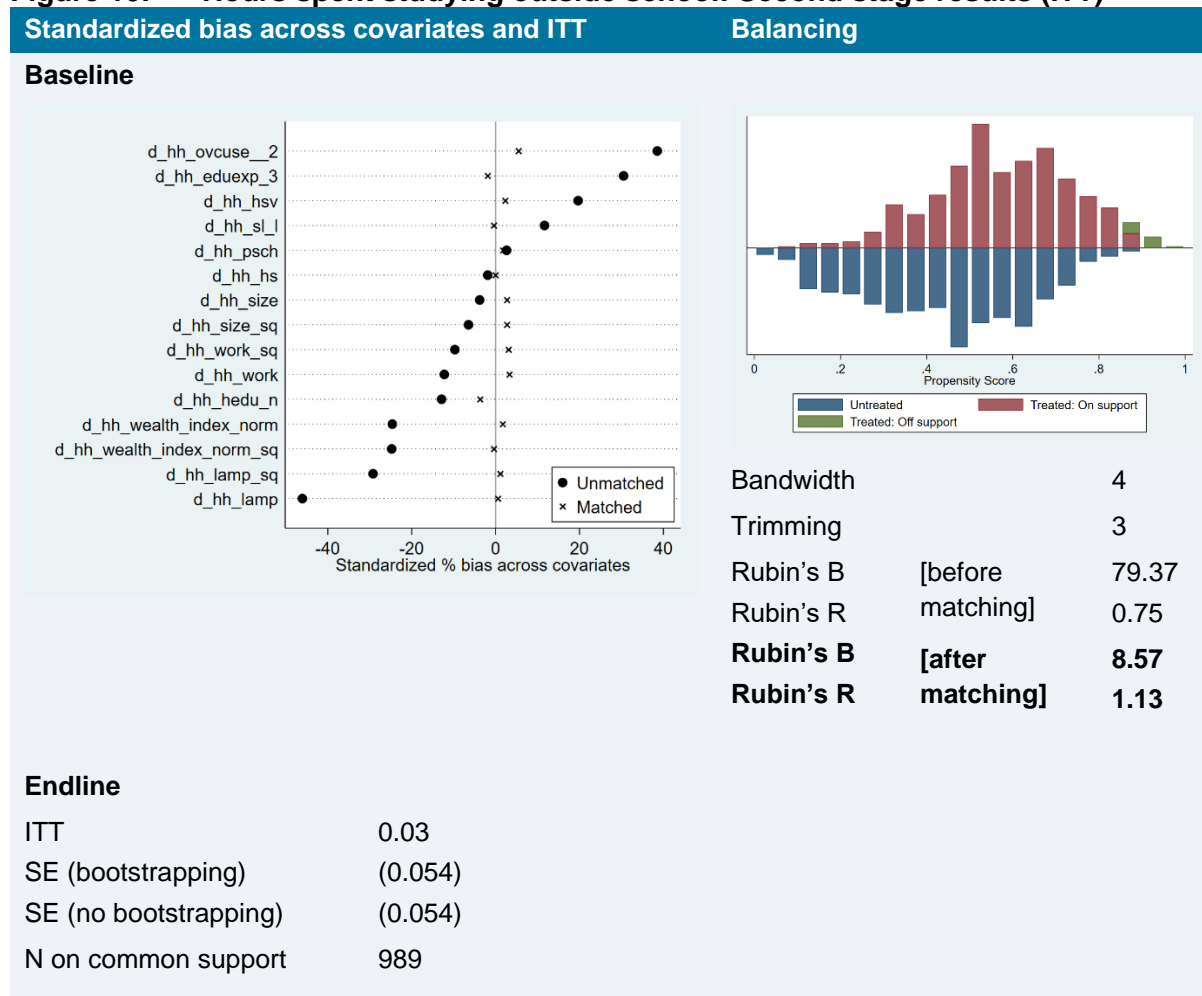
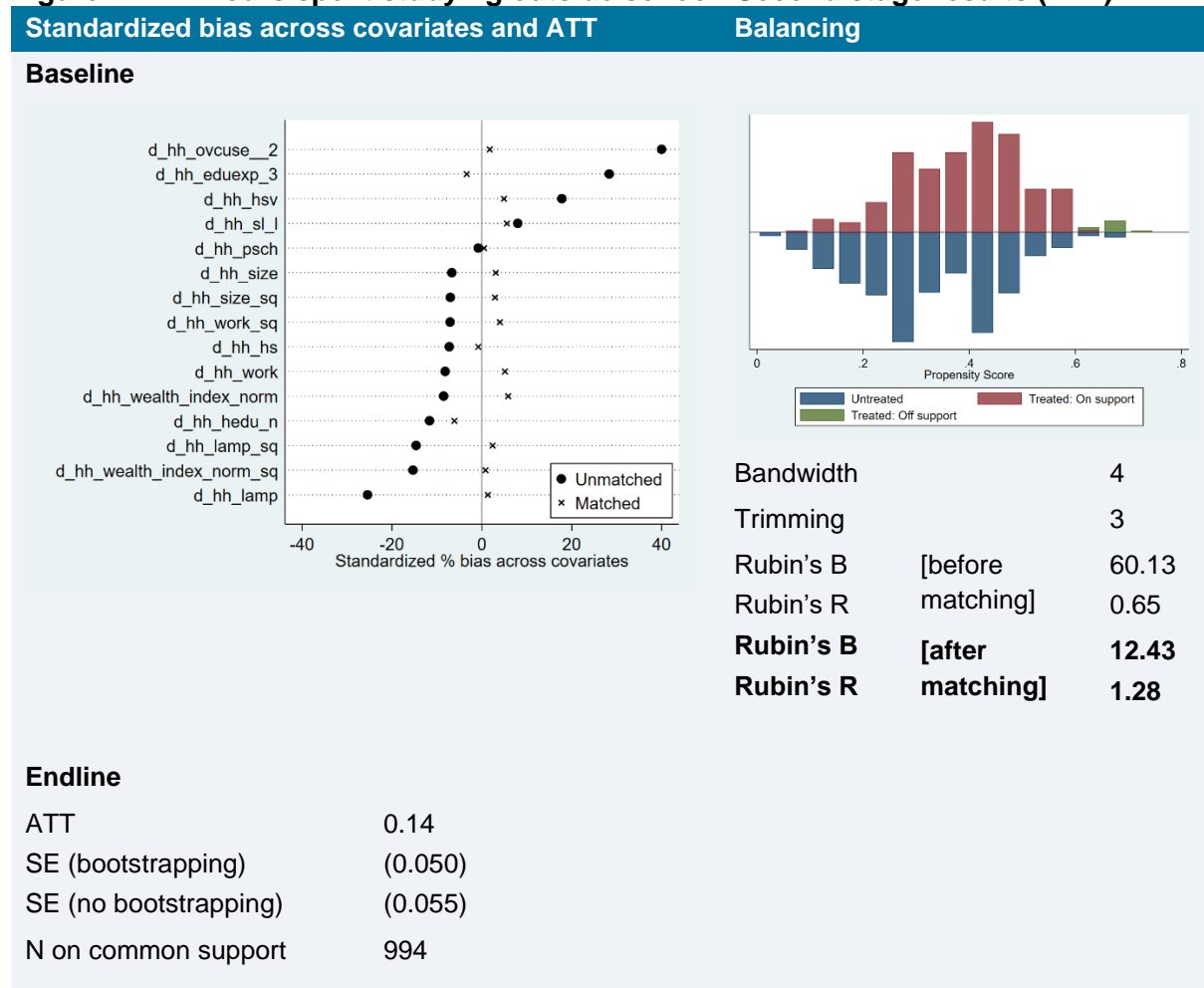
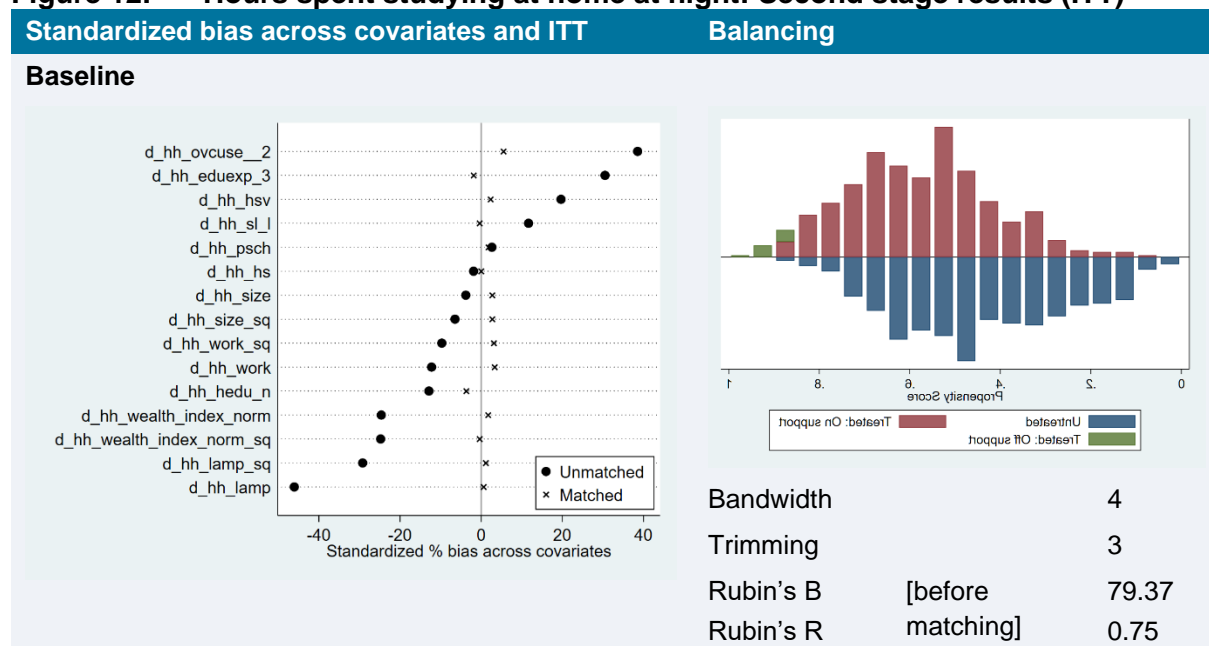


Figure 11: Hours spent studying outside school: Second stage results (ATT)



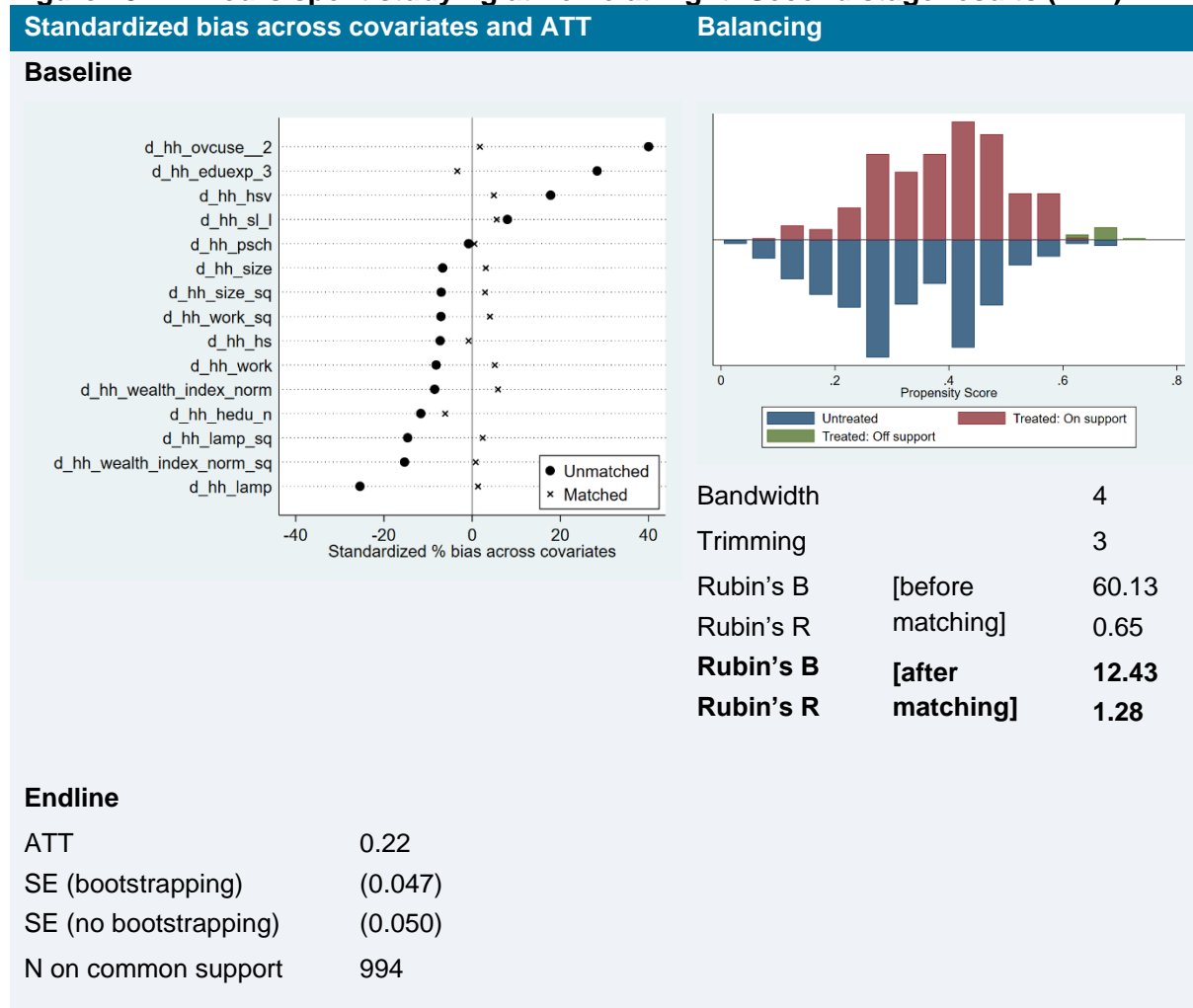
Number of hours per day spent by children studying at home at night

Figure 12: Hours spent studying at home at night: Second stage results (ITT)



		Rubin's B	[after	8.57
		Rubin's R	matching]	1.13
Endline				
ITT	0.11			
SE (bootstrapping)	(0.049)			
SE (no bootstrapping)	(0.049)			
N on common support	989			

Figure 13: Hours spent studying at home at night: Second stage results (ATT)



Mean proportion of children (aged 3-18) currently attending school

Figure 14: Currently attending school: Second stage results (ITT)

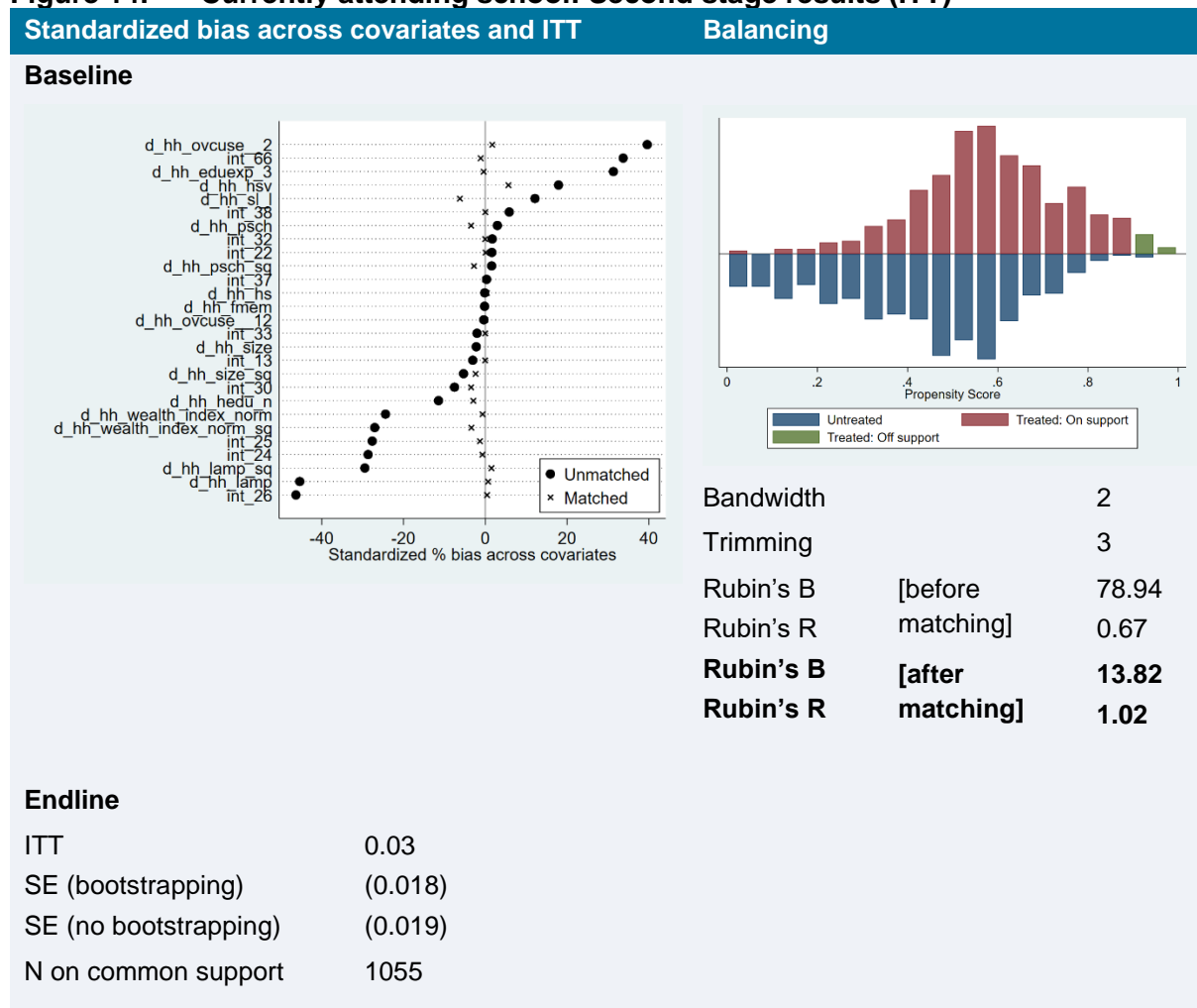
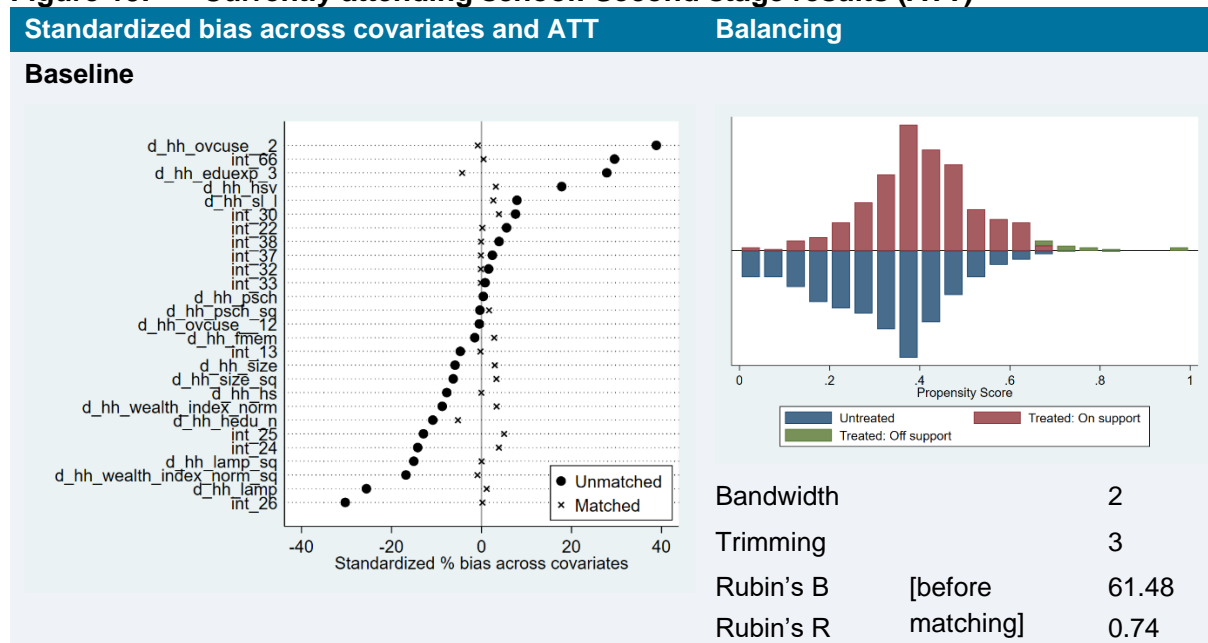


Figure 15: Currently attending school: Second stage results (ATT)



		Rubin's B	[after	11.58
		Rubin's R	matching]	1.23
Endline				
ATT	0.04			
SE (bootstrapping)	(0.016)			
SE (no bootstrapping)	(0.018)			
N on common support	1060			

Mean proportion of children (aged 3-18) regularly attending school

Figure 16: Regularly attending school: Second stage results (ITT)

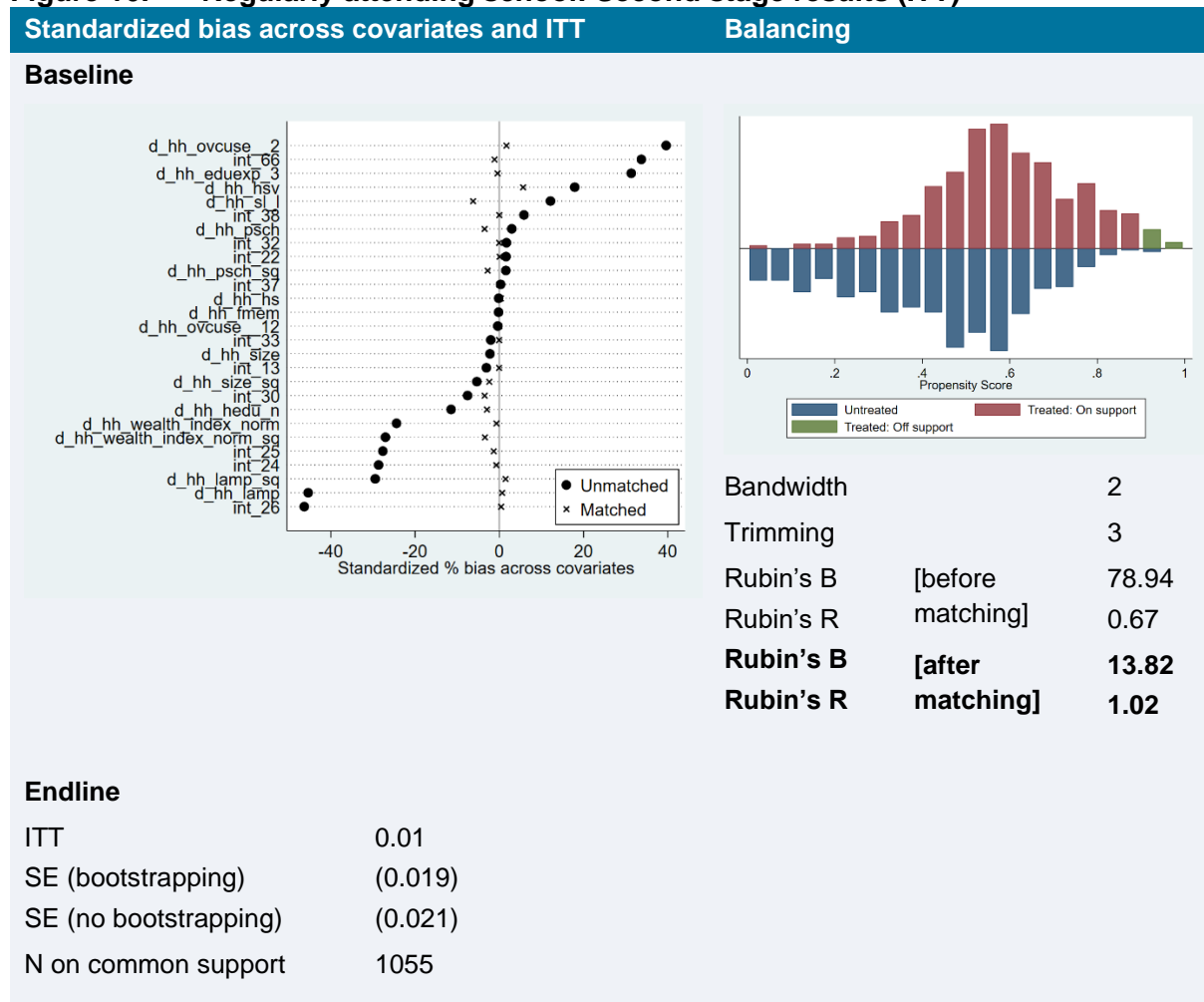
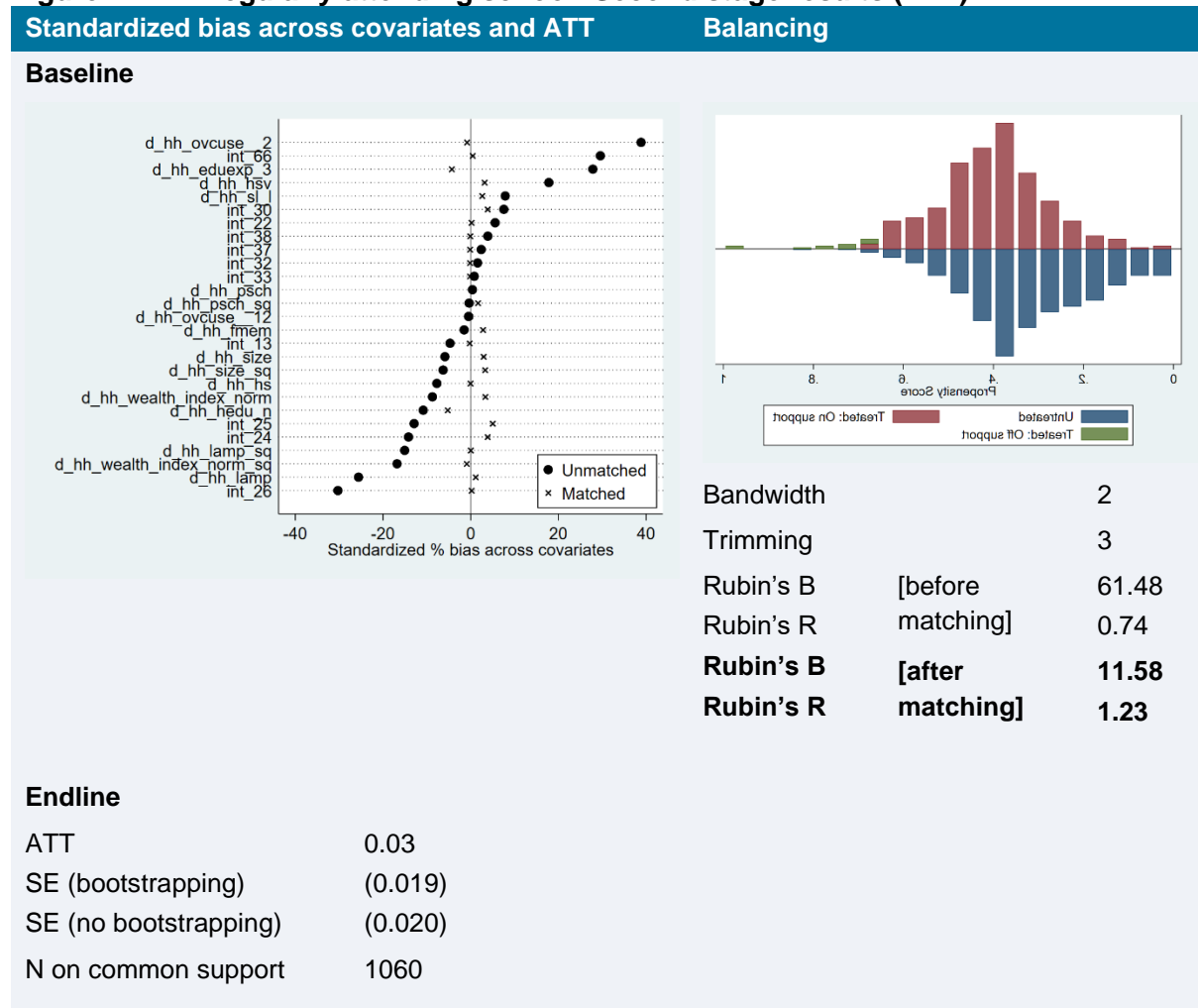
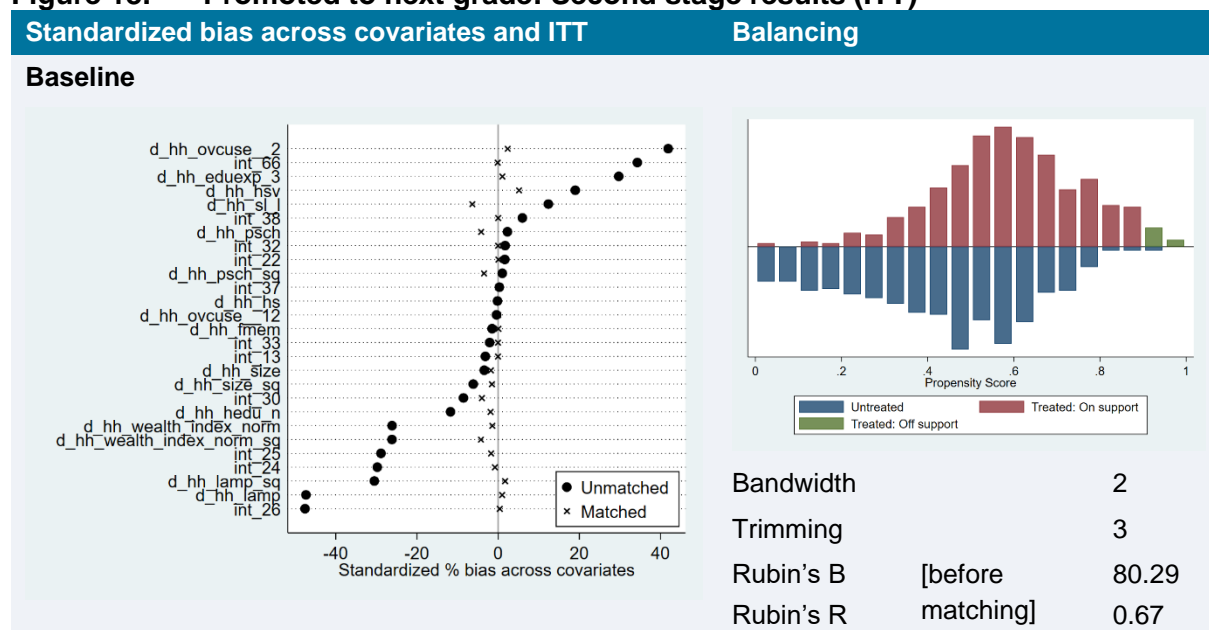


Figure 17: Regularly attending school: Second stage results (ATT)



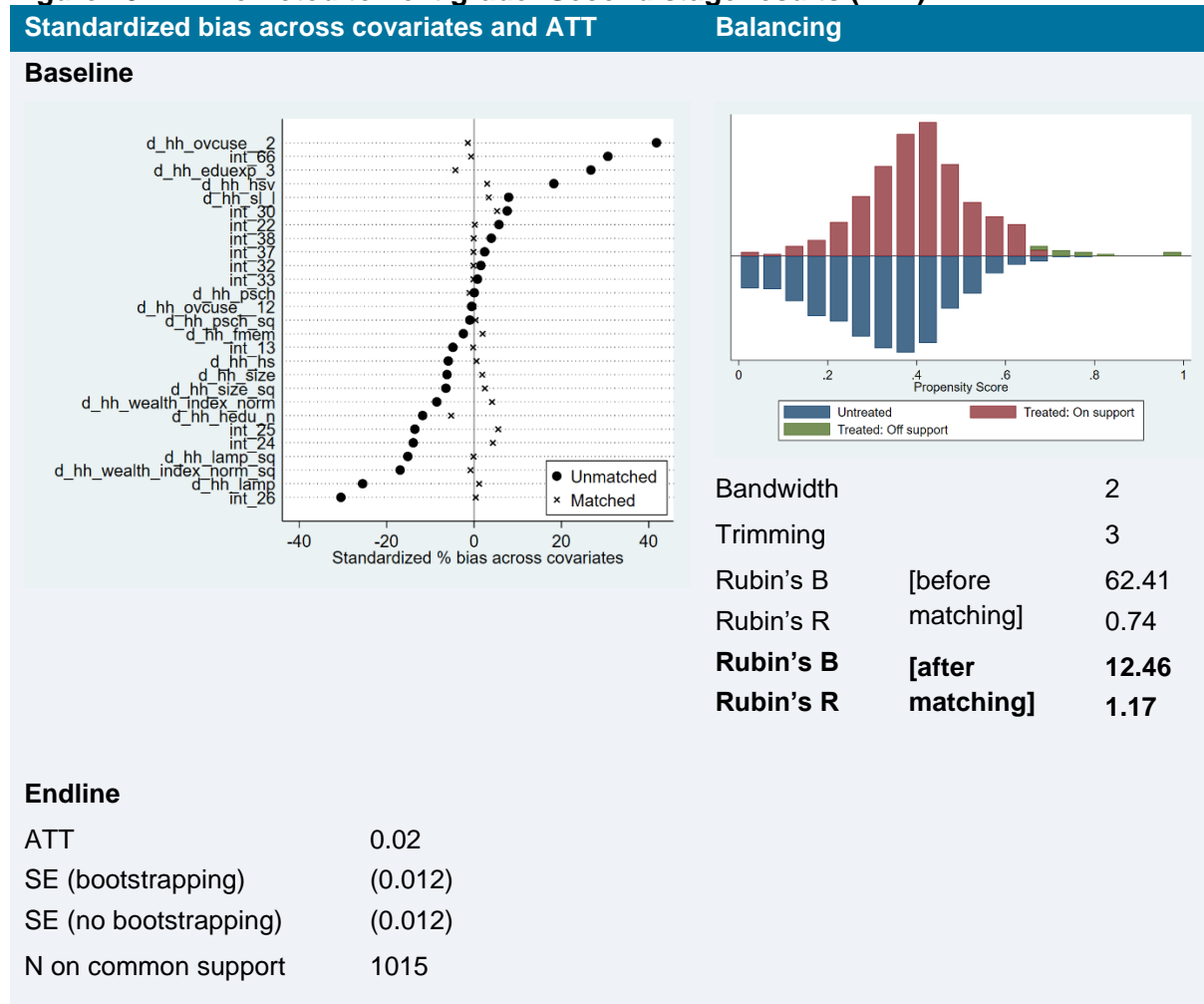
Mean proportion of children (aged 3-18) who got promoted to next academic grade

Figure 18: Promoted to next grade: Second stage results (ITT)



		Rubin's B	[after	13.10
		Rubin's R	matching]	1.00
Endline				
ITT	0.03			
SE (bootstrapping)	(0.015)			
SE (no bootstrapping)	(0.015)			
N on common support	1010			

Figure 19: Promoted to next grade: Second stage results (ATT)



Total household monthly income (in KSH)

Figure 20: Household income: Second stage results (ITT)

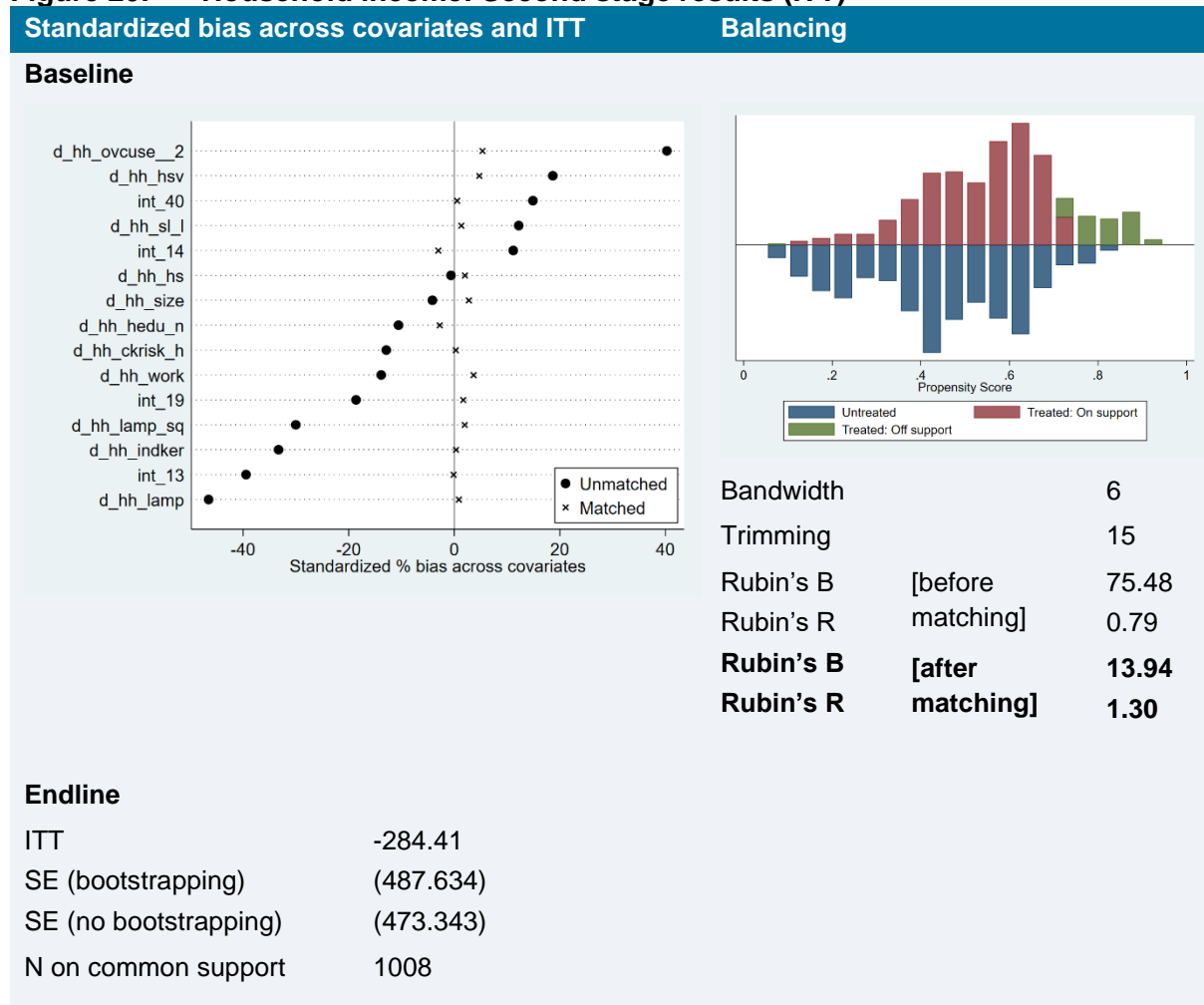
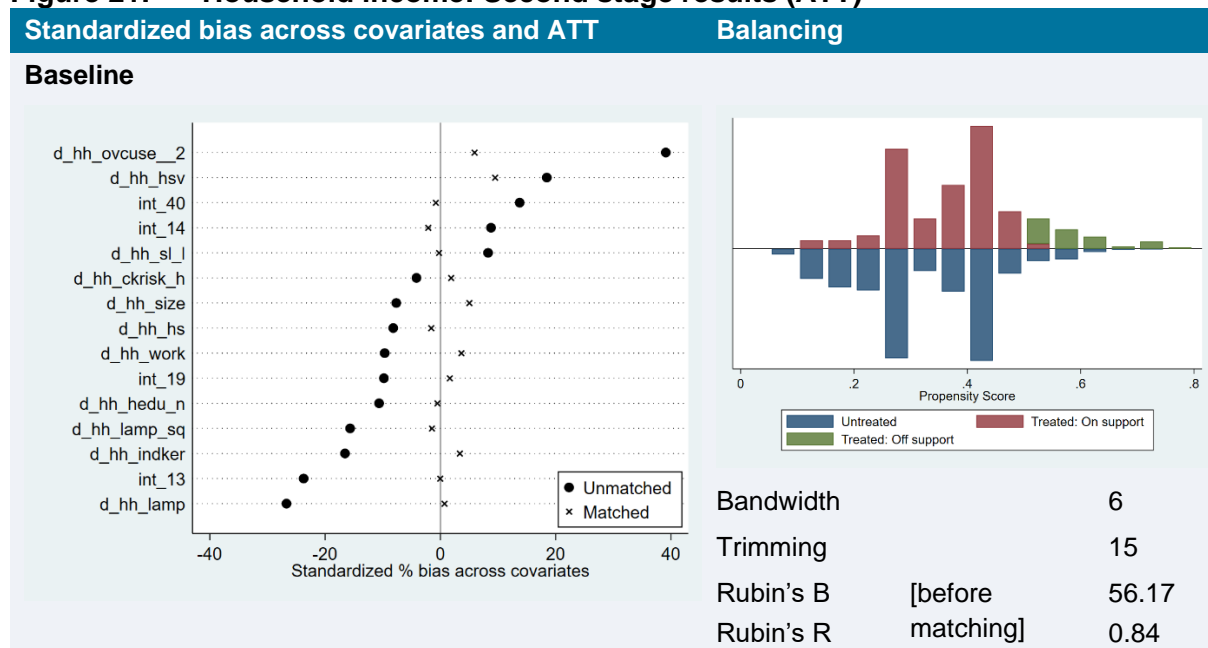


Figure 21: Household income: Second stage results (ATT)



		Rubin's B	[after	15.52
		Rubin's R	matching]	1.12
Endline				
ATT	-872.41			
SE (bootstrapping)	(450.057)			
SE (no bootstrapping)	(445.589)			
N on common support	1035			

Number of working household members per household

Figure 22: Working household members: Second stage results (ITT)

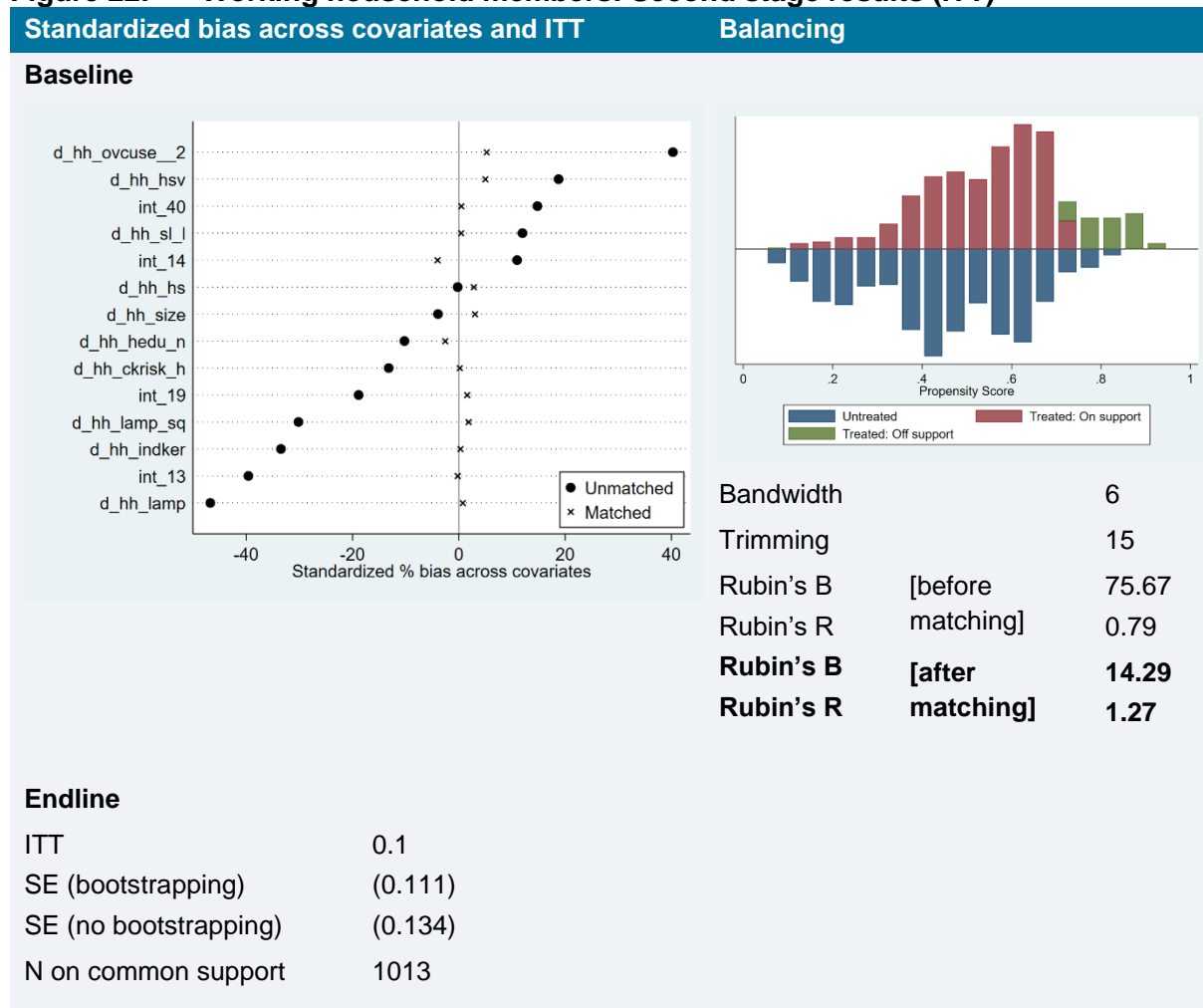
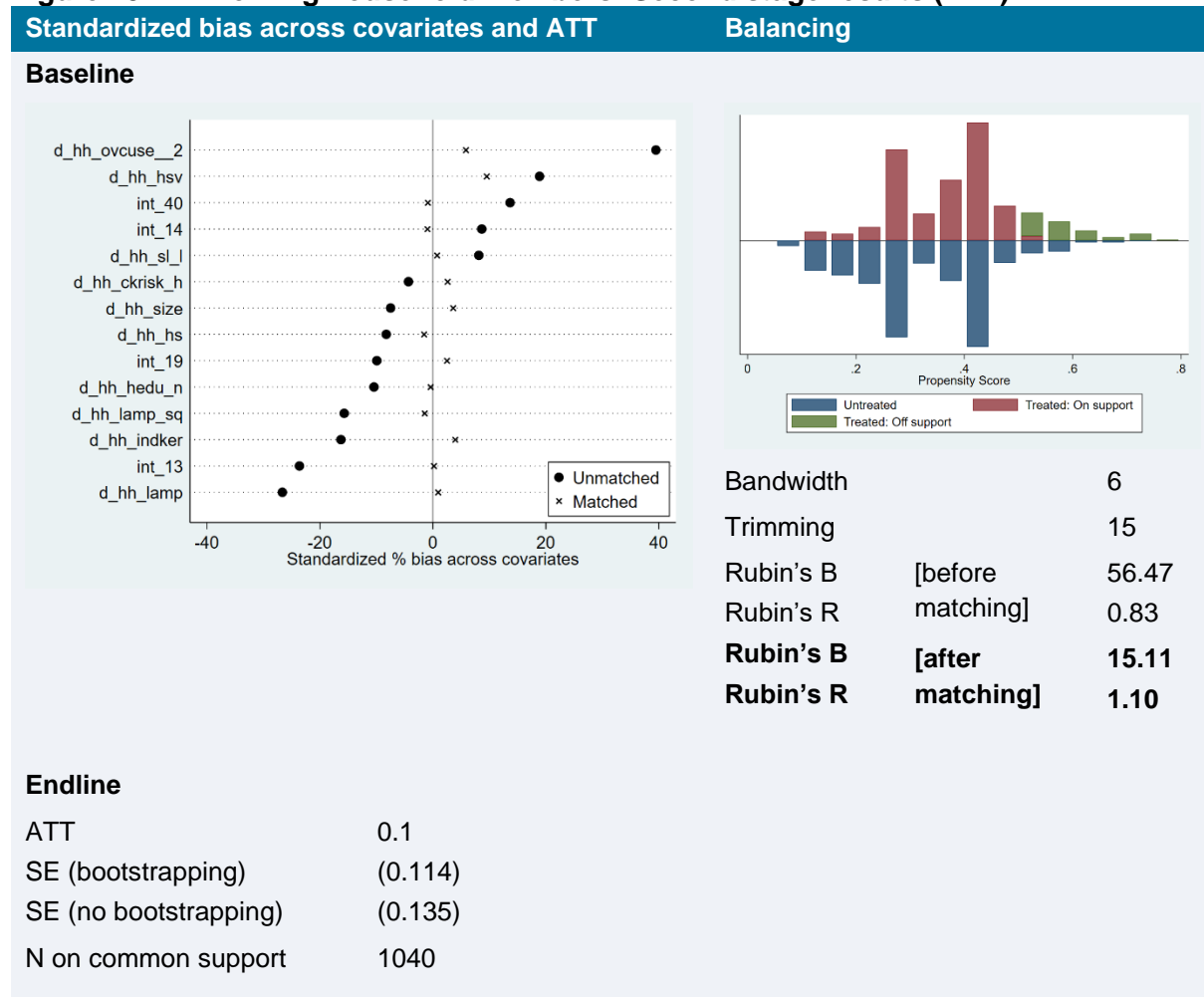
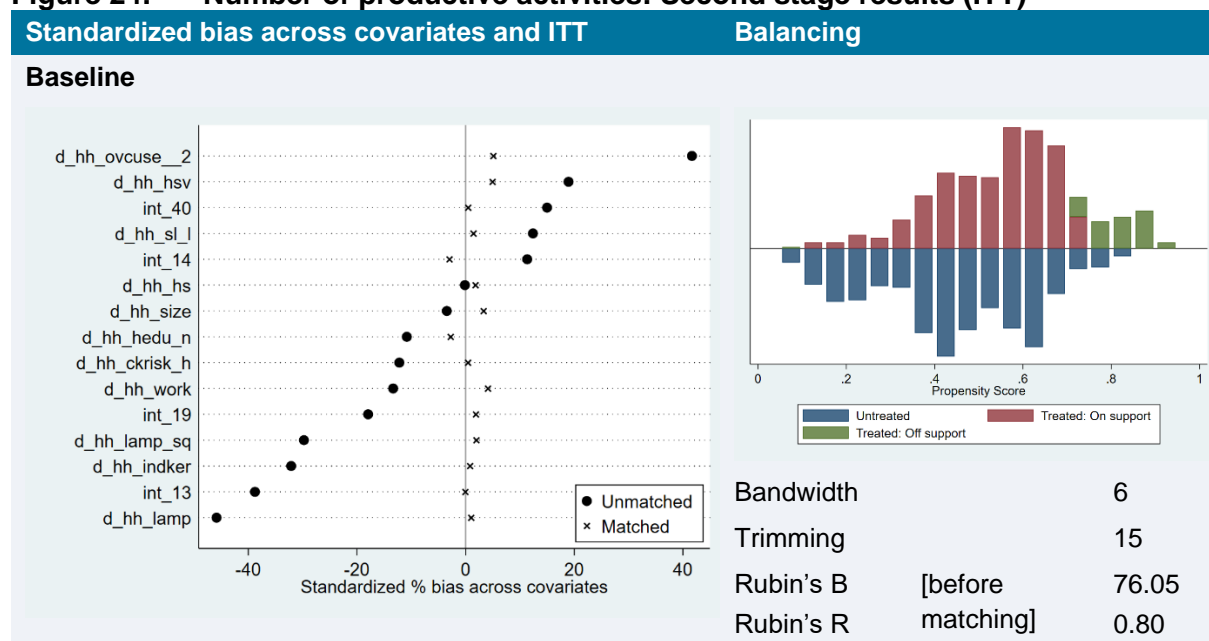


Figure 23: Working household members: Second stage results (ATT)



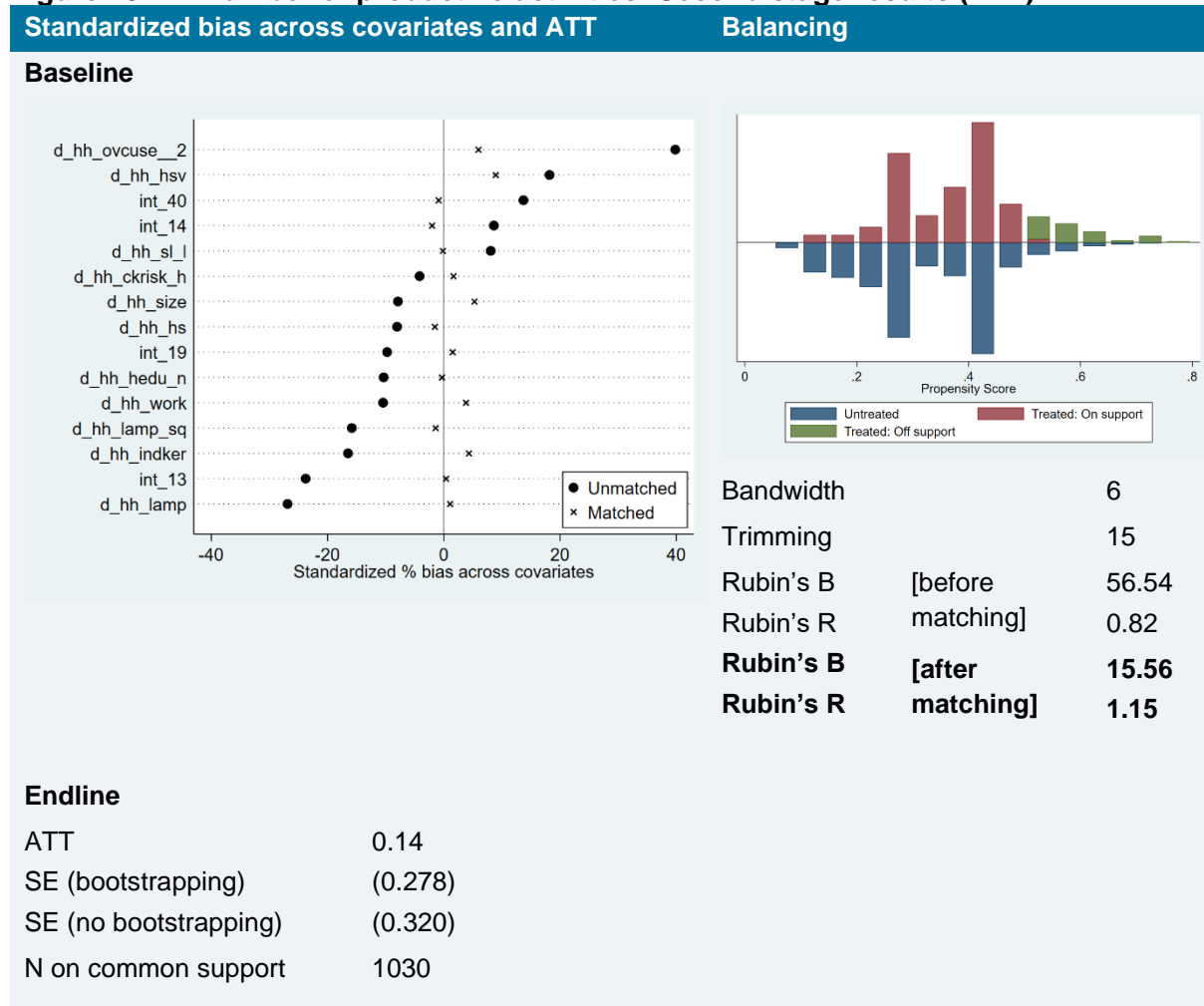
Number of productive activities per household

Figure 24: Number of productive activities: Second stage results (ITT)



		Rubin's B	[after	14.29
		Rubin's R	matching]	1.27
Endline				
ITT	0.26			
SE (bootstrapping)	(0.255)			
SE (no bootstrapping)	(0.324)			
N on common support	1004			

Figure 25: Number of productive activities: Second stage results (ATT)



Number of productive activities per household started in last 12 months

Figure 26: Number of activities started last year: Second stage results (ITT)

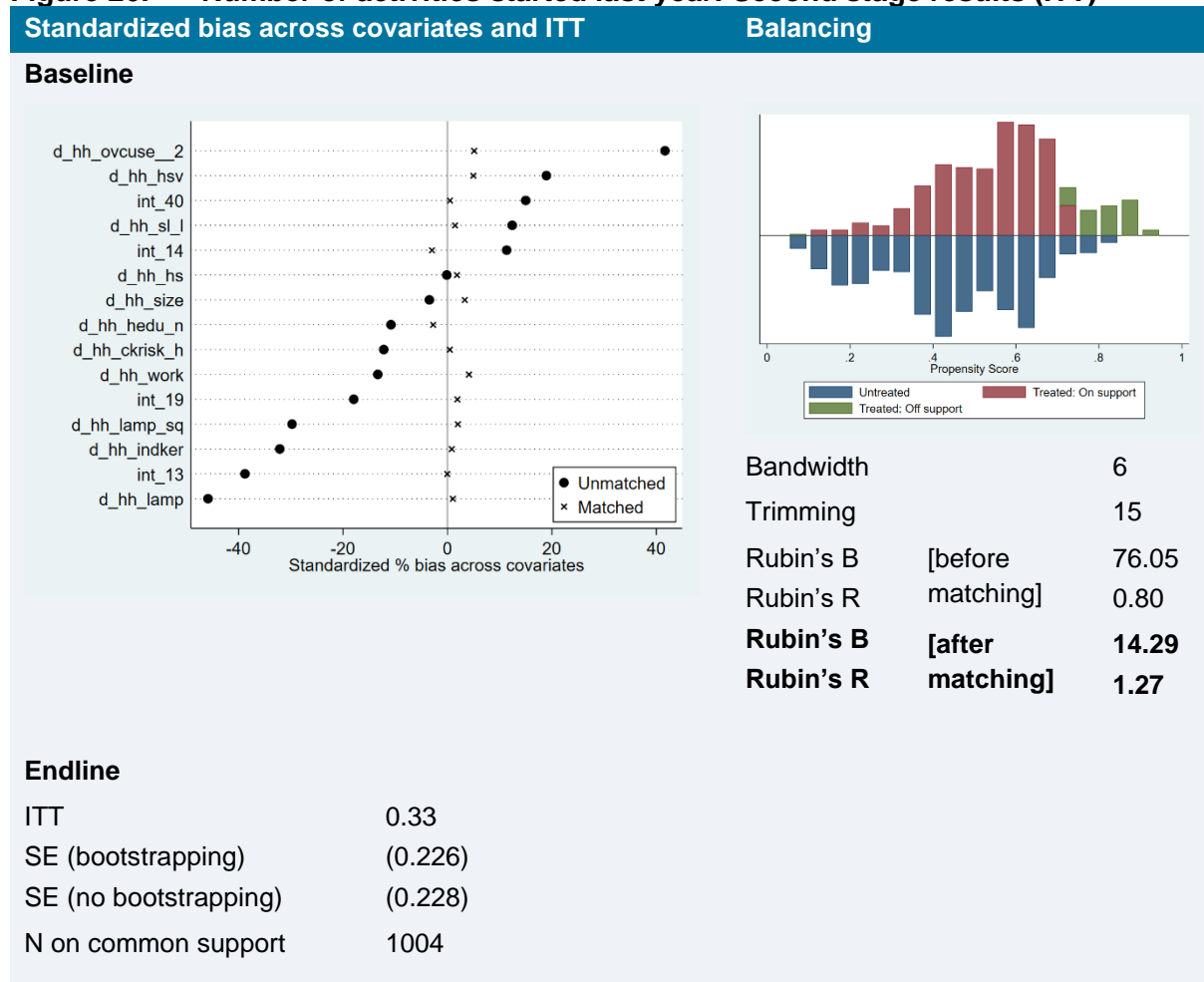
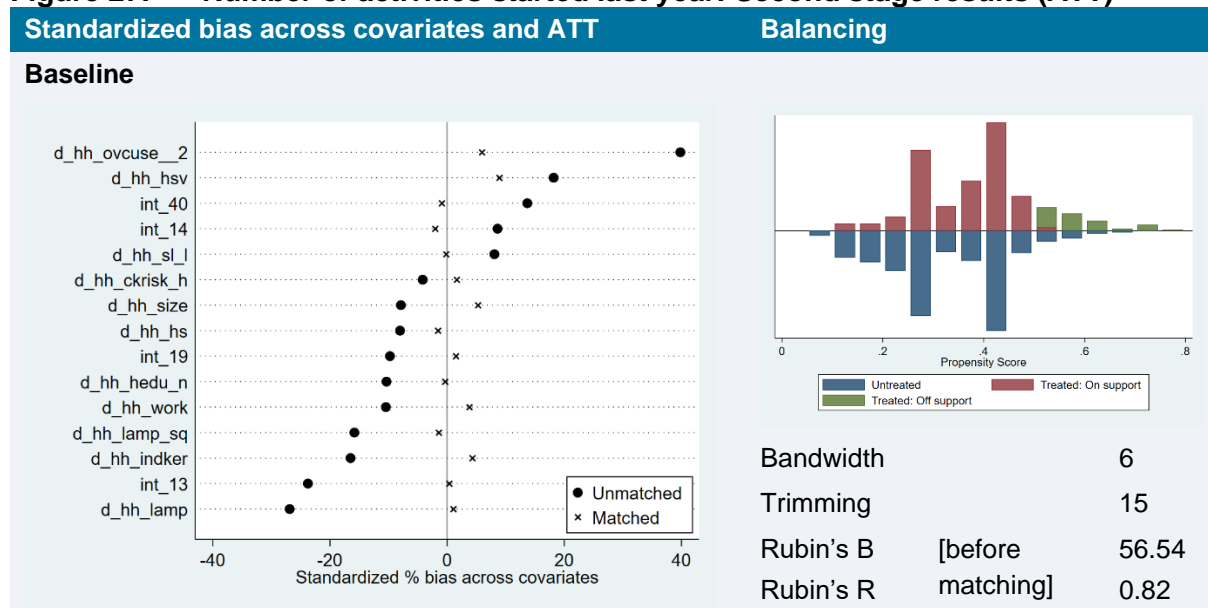


Figure 27: Number of activities started last year: Second stage results (ATT)



		Rubin's B	[after	15.56
		Rubin's R	matching]	1.15
Endline				
ATT	0.03			
SE (bootstrapping)	(0.216)			
SE (no bootstrapping)	(0.221)			
N on common support	1030			

Mean proportion of productive activities per household conducted at home

Figure 28: Activities conducted at home: Second stage results (ITT)

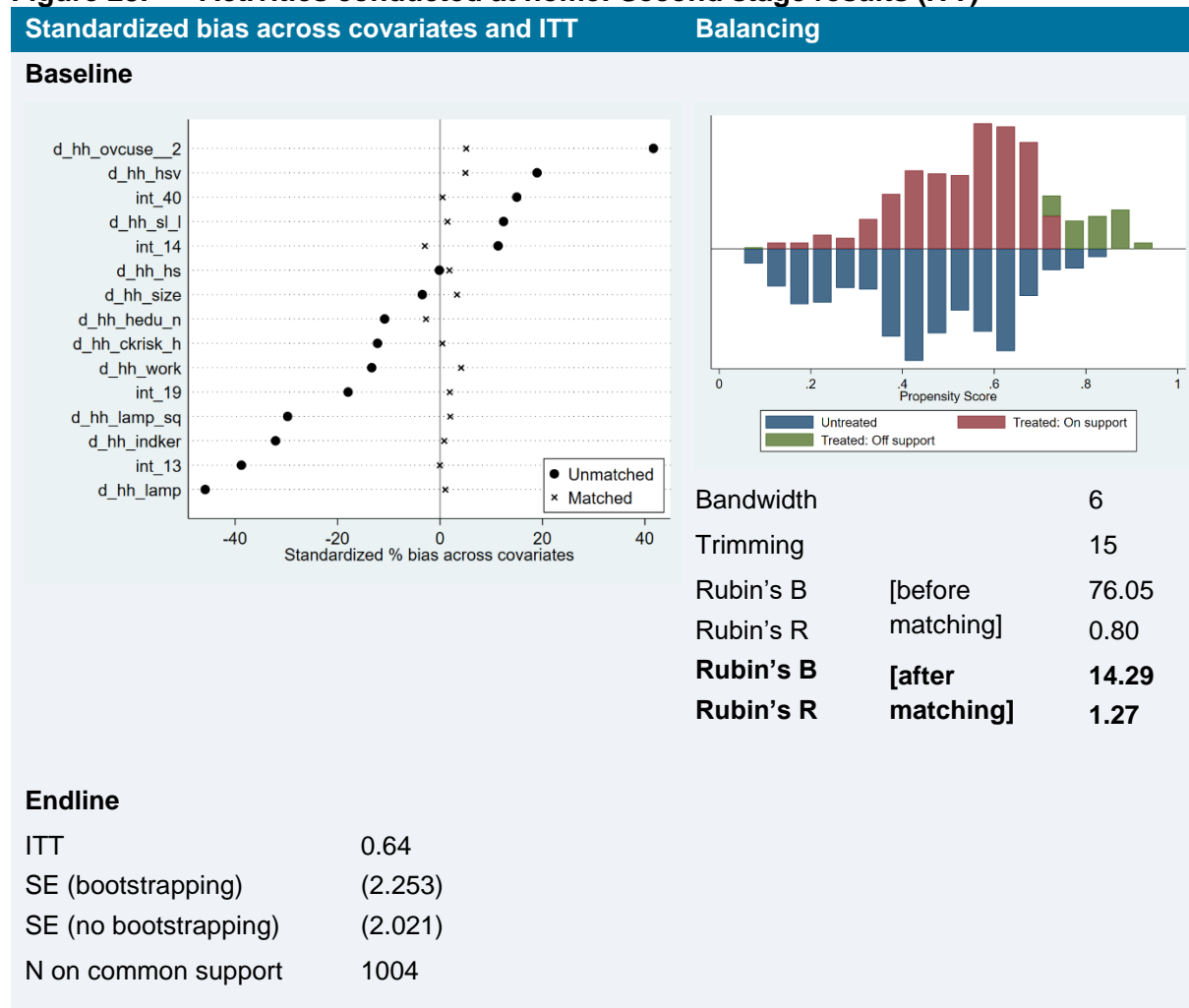
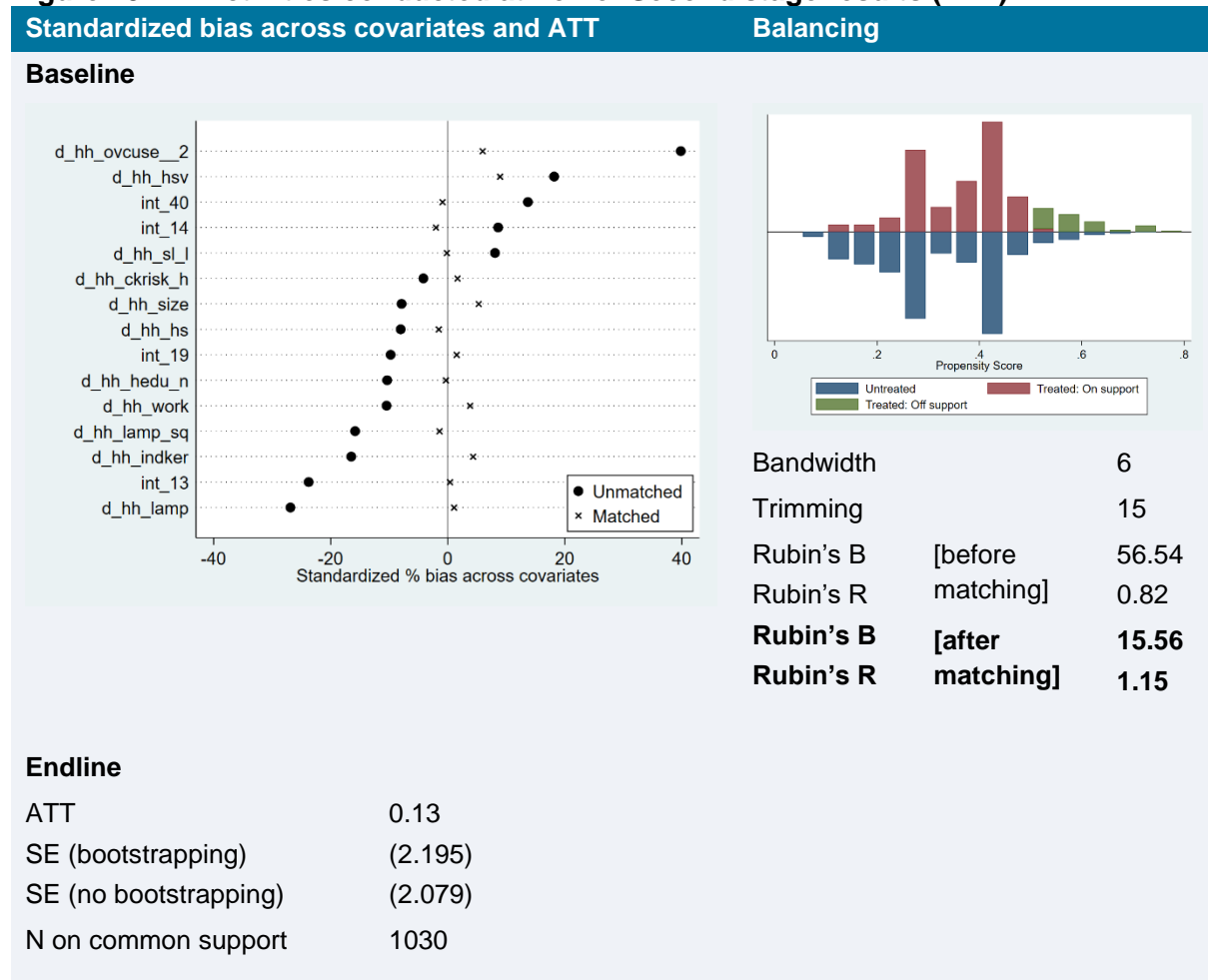
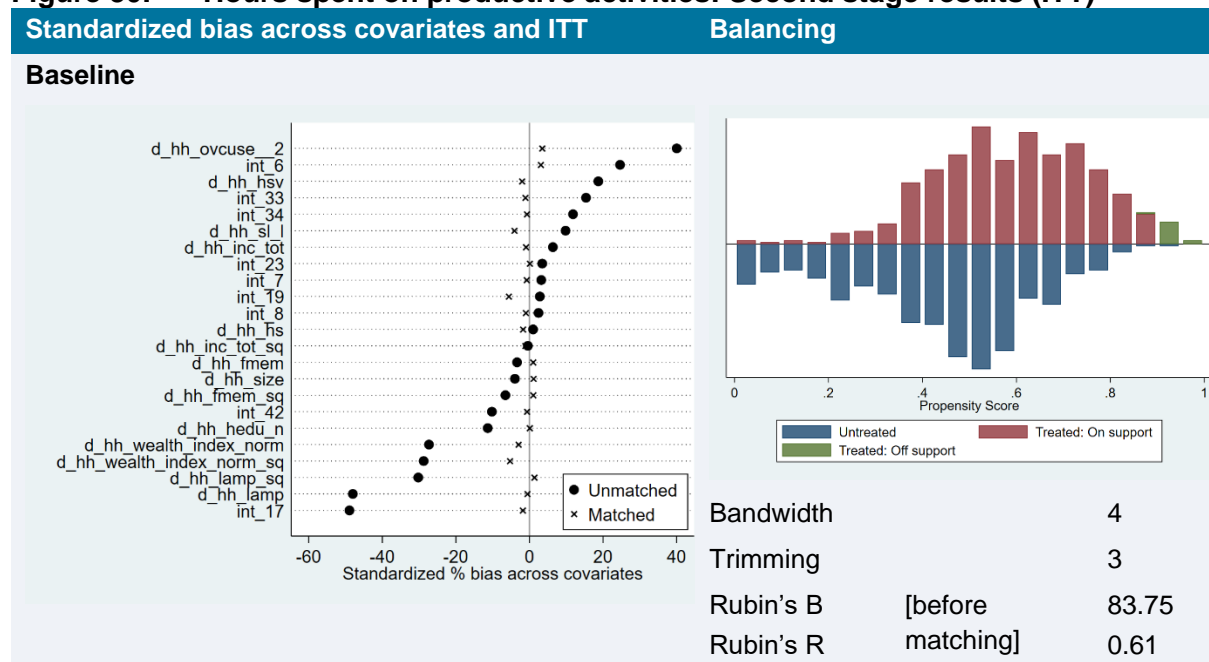


Figure 29: Activities conducted at home: Second stage results (ATT)



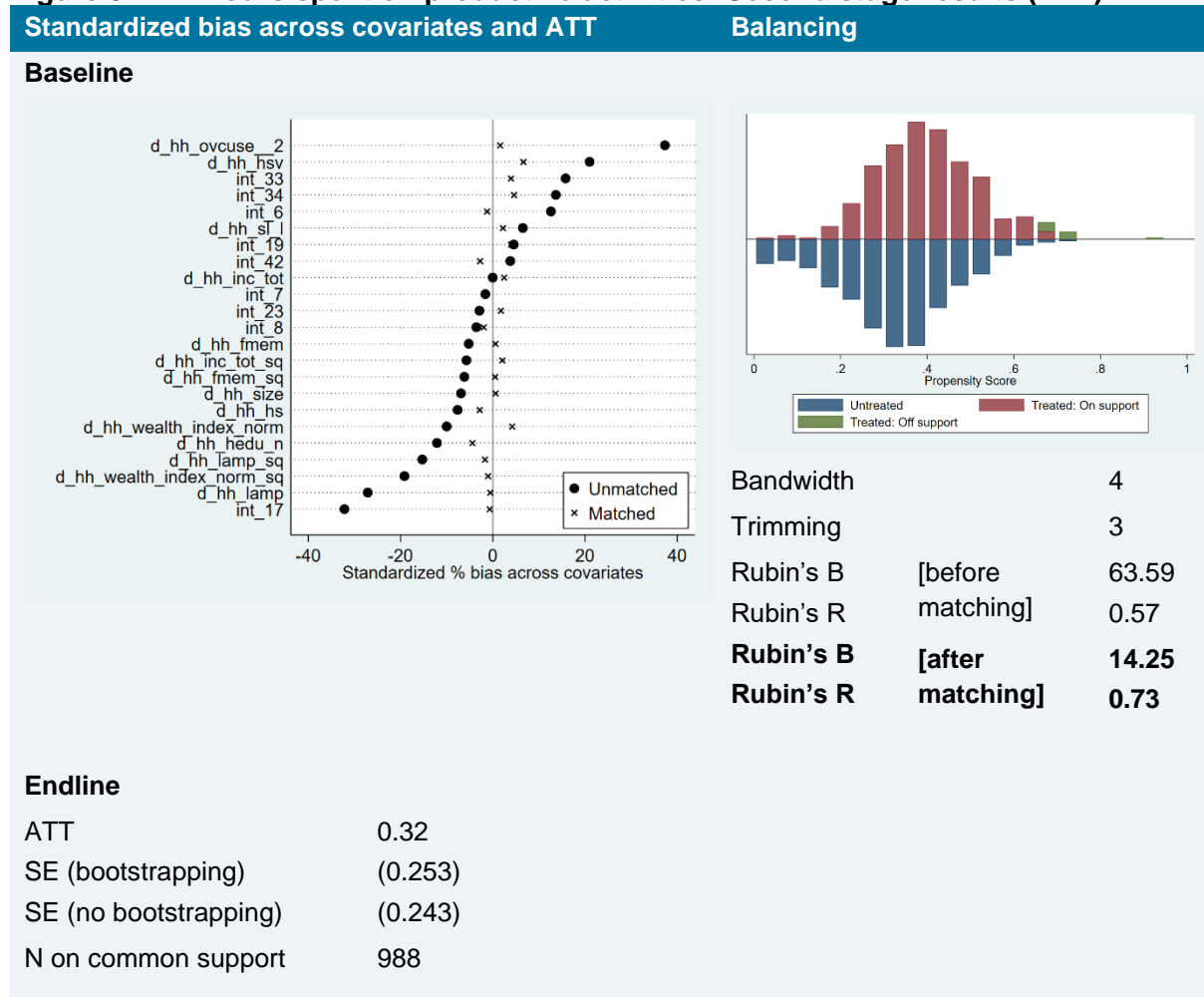
Number of hours per day spent by women on productive activities

Figure 30: Hours spent on productive activities: Second stage results (ITT)



		Rubin's B	[after	13.21
		Rubin's R	matching]	1.22
Endline				
ITT	-0.08			
SE (bootstrapping)	(0.247)			
SE (no bootstrapping)	(0.258)			
N on common support	983			

Figure 31: Hours spent on productive activities: Second stage results (ATT)



Number of hours per day spent by women on productive activities at home at night

Figure 32: Hours on productive activities at night: Second stage results (ITT)

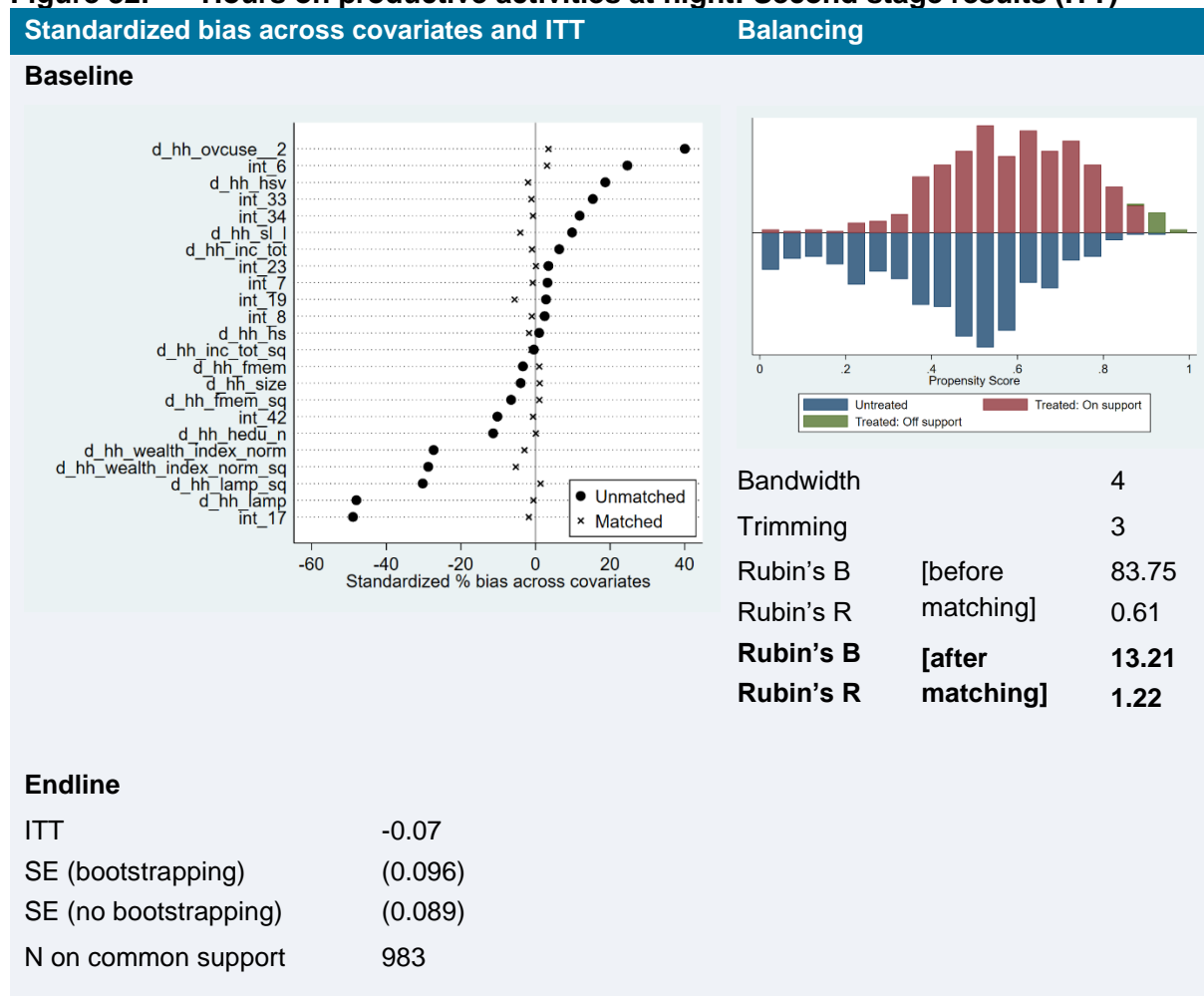
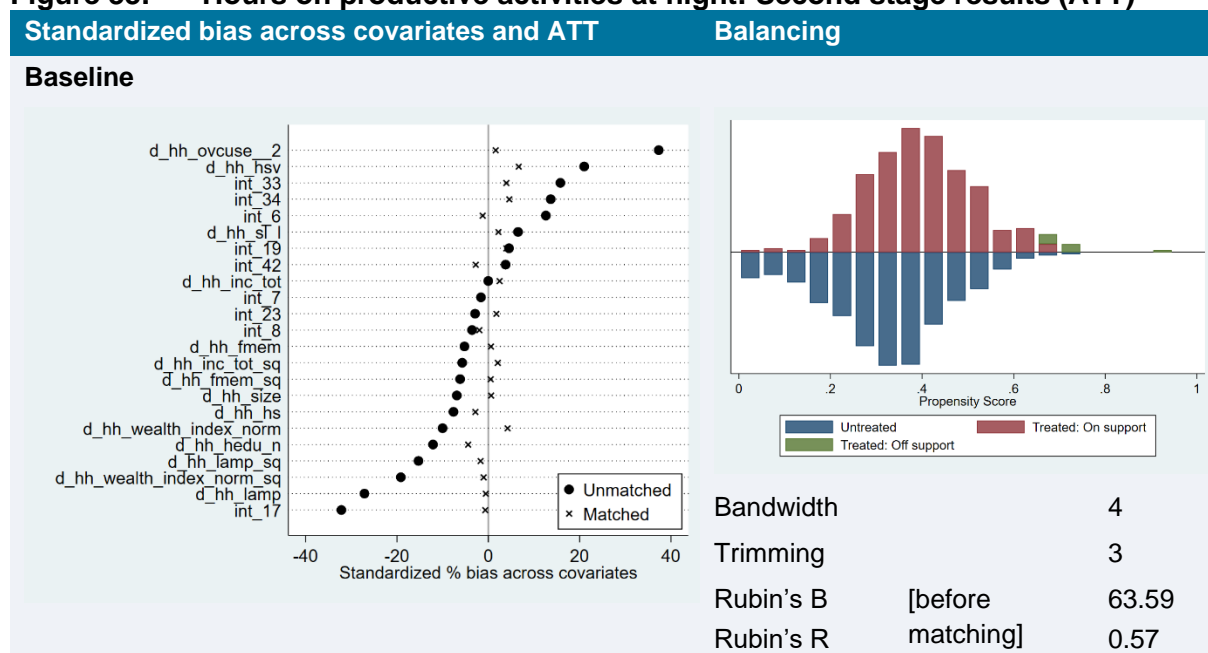


Figure 33: Hours on productive activities at night: Second stage results (ATT)



		Rubin's B	[after	14.25
		Rubin's R	matching]	0.73
Endline				
ATT	0.05			
SE (bootstrapping)	(0.087)			
SE (no bootstrapping)	(0.084)			
N on common support	988			

Number of hours per day spent by women on leisure activities

Figure 34: Hours spent on leisure activities: Second stage results (ITT)

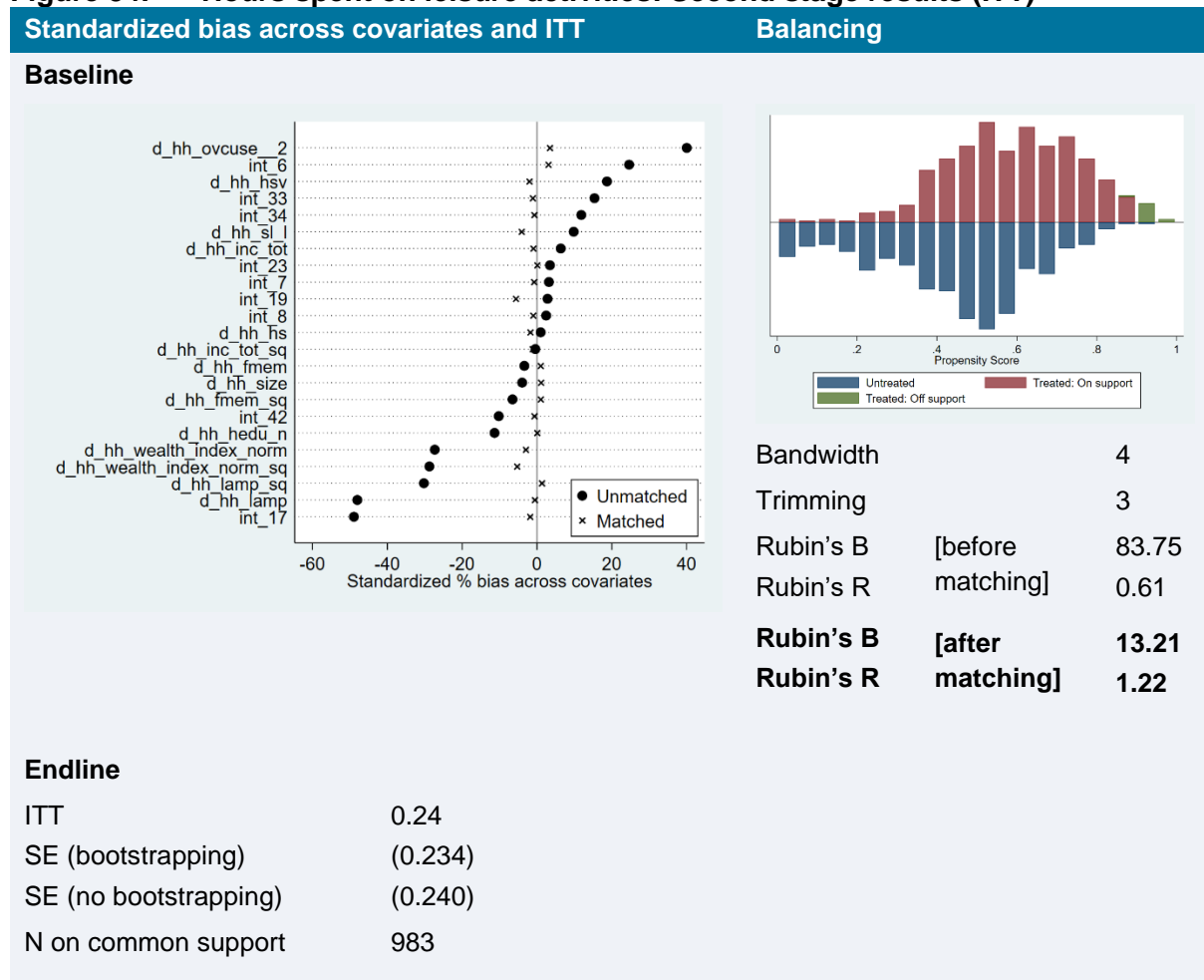
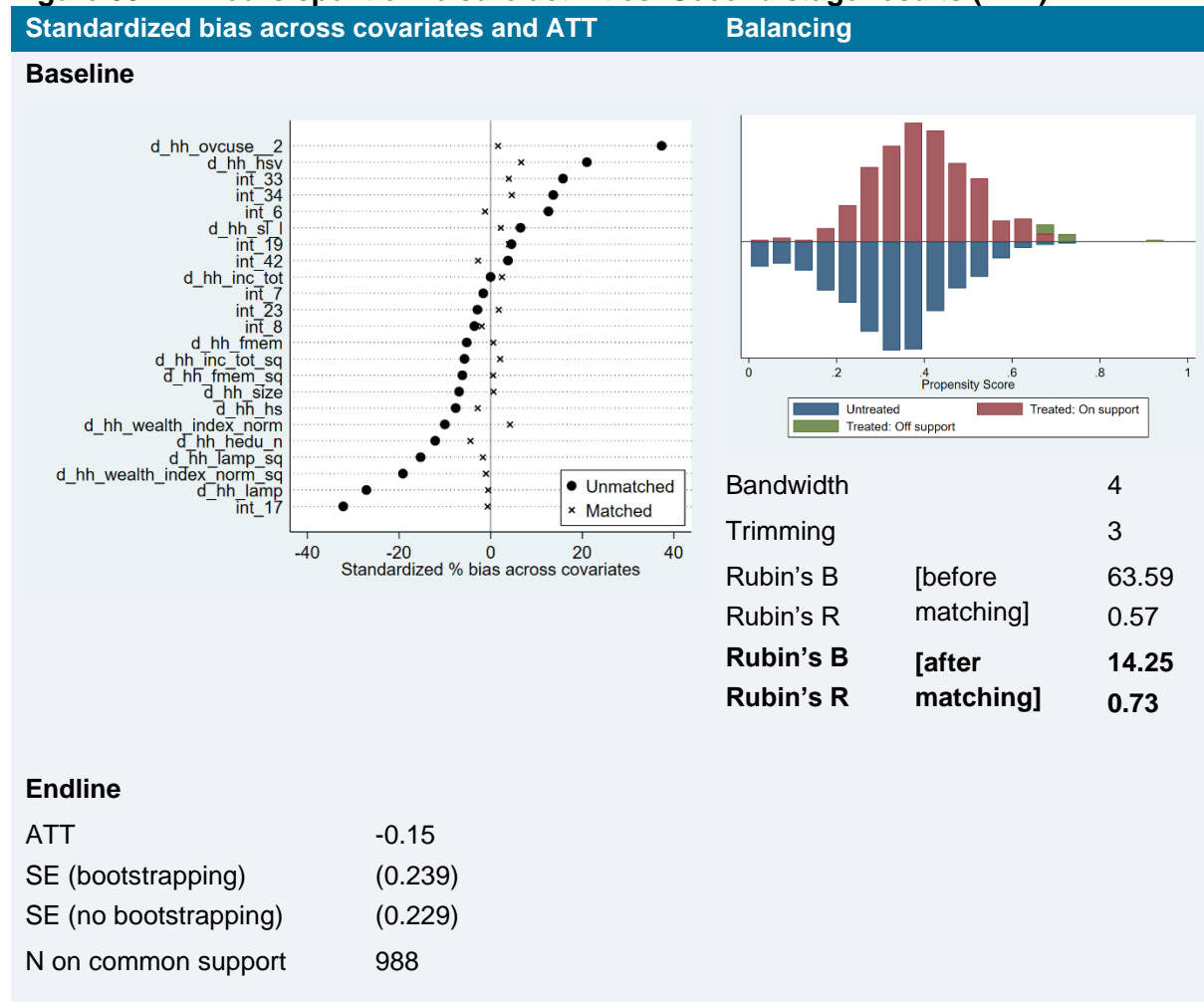
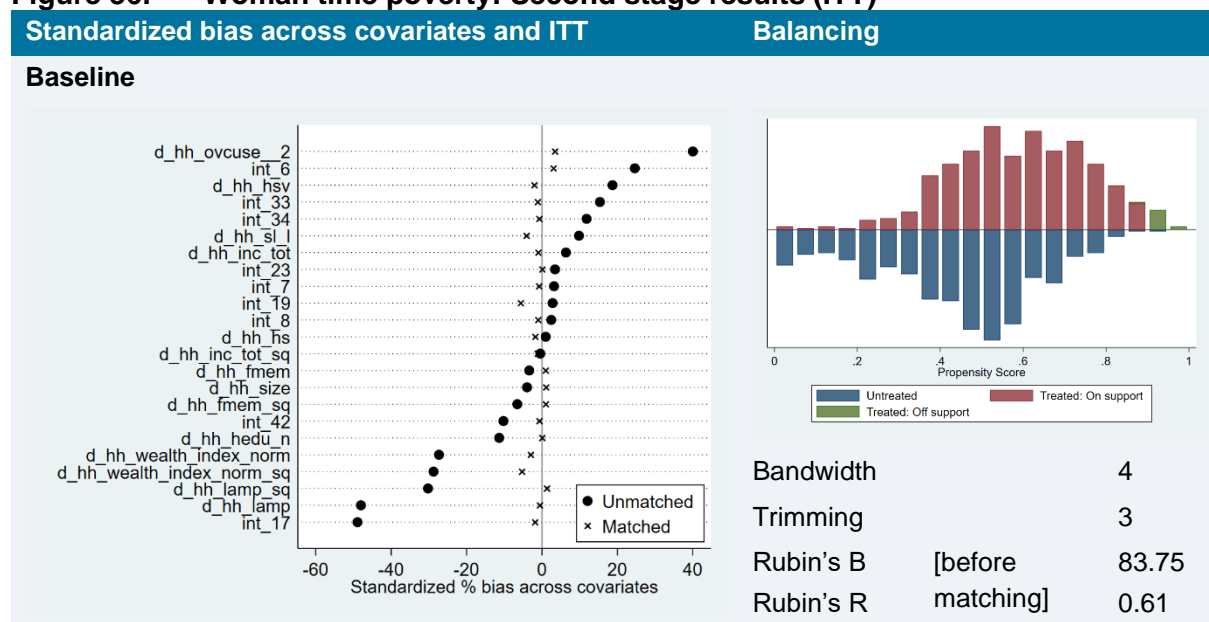


Figure 35: Hours spent on leisure activities: Second stage results (ATT)



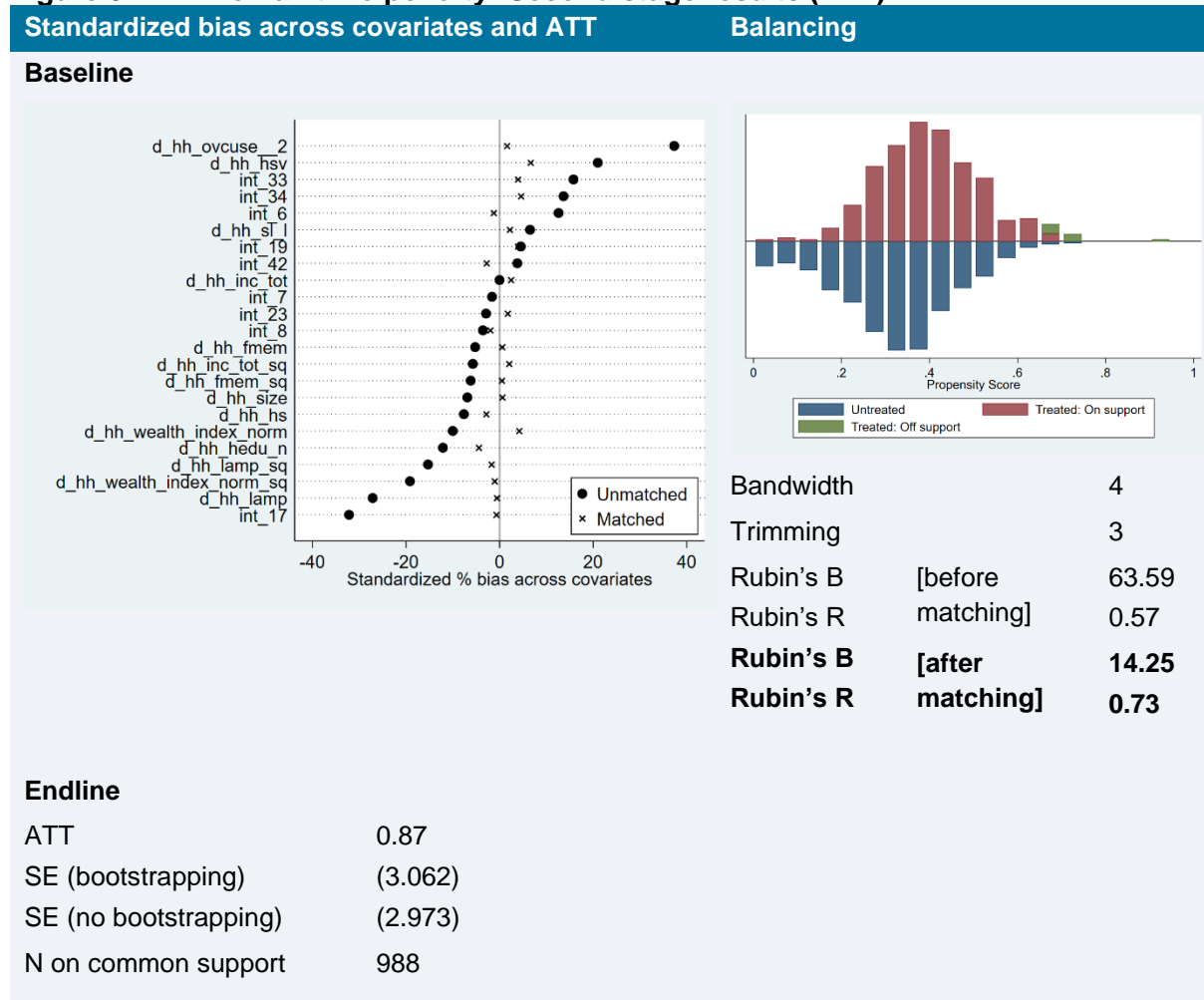
Proportion of women who are time poor

Figure 36: Woman time poverty: Second stage results (ITT)



		Rubin's B	[after	13.21
		Rubin's R	matching]	1.22
Endline				
ITT	3.36			
SE (bootstrapping)	(3.304)			
SE (no bootstrapping)	(3.149)			
N on common support	983			

Figure 37: Woman time poverty: Second stage results (ATT)



Mean proportion of household members with symptoms of eye irritation in last month

Figure 38: Eye irritation symptoms: Second stage results (ITT)

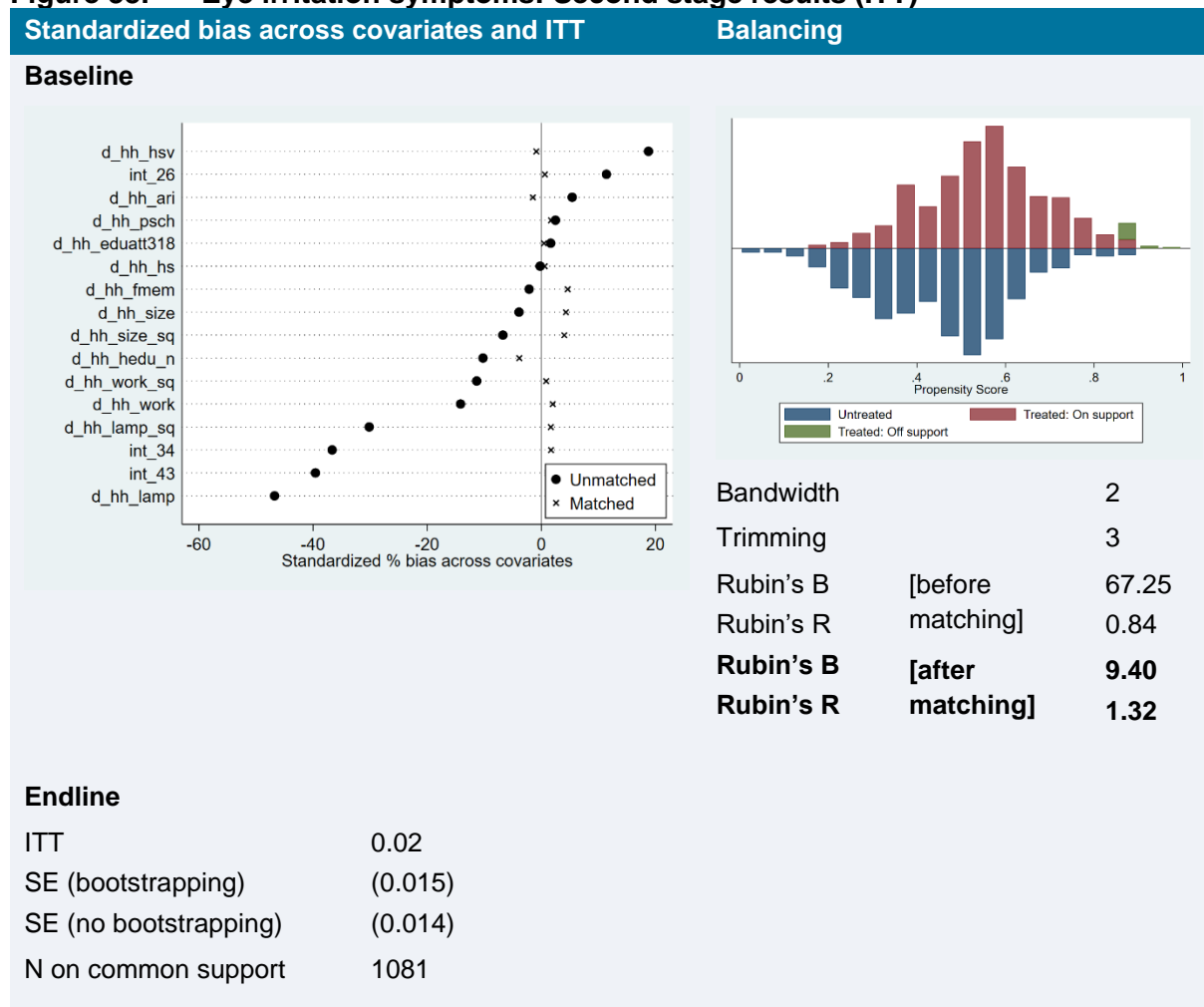
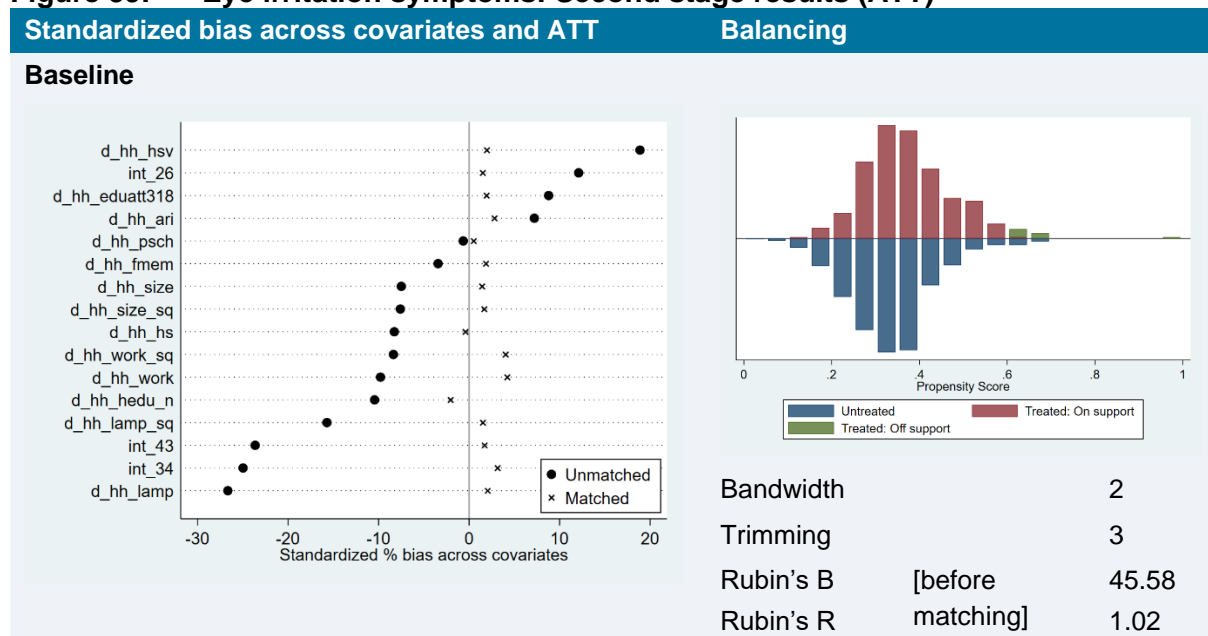


Figure 39: Eye irritation symptoms: Second stage results (ATT)



		Rubin's B	[after	7.39
		Rubin's R	matching]	1.46
Endline				
ATT	0.01			
SE (bootstrapping)	(0.015)			
SE (no bootstrapping)	(0.014)			
N on common support	1086			

Mean proportion of household members with burns related to lighting fuel in last 6 months

Figure 40: Burns related to lighting fuel: Second stage results (ITT)

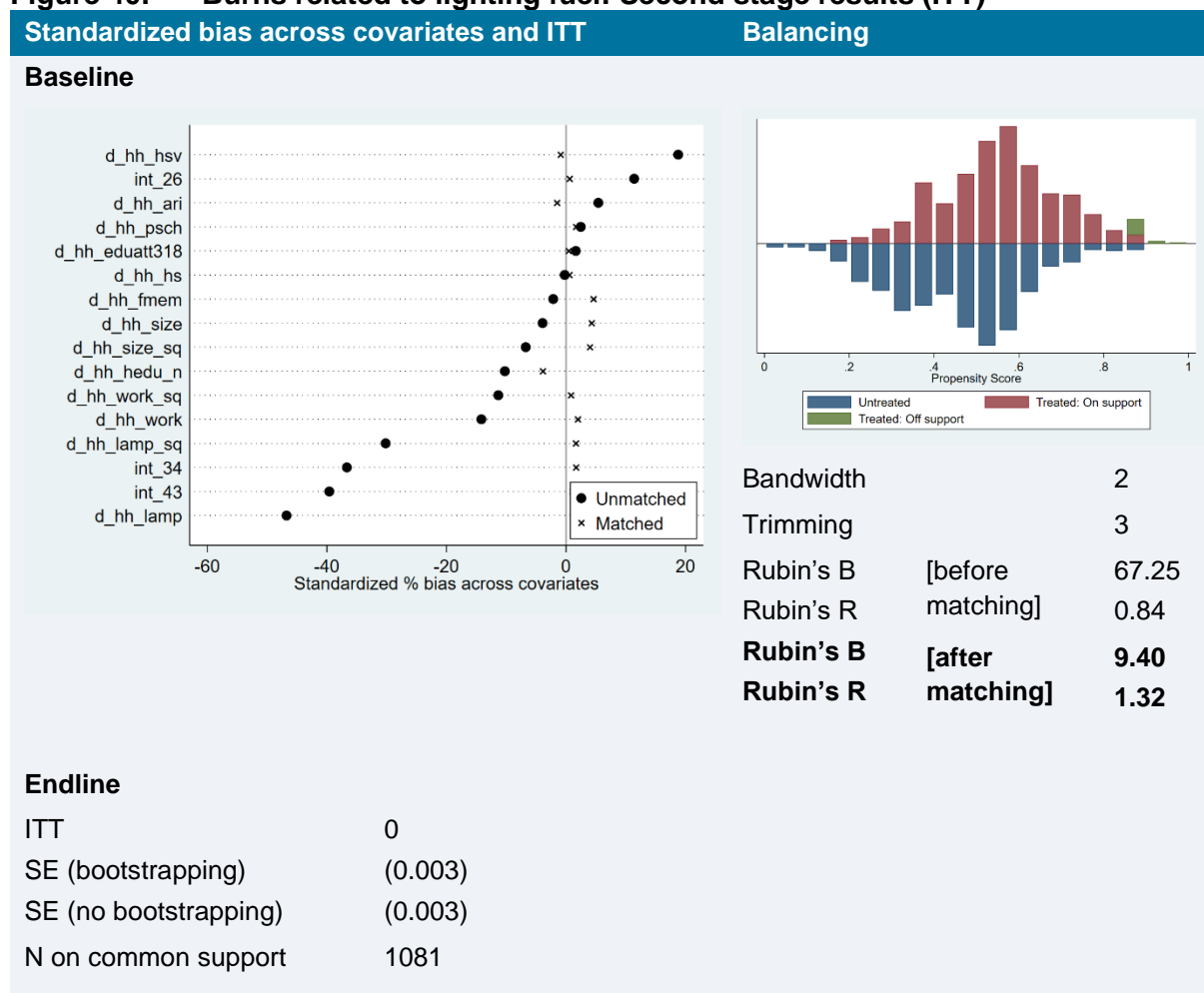


Figure 41: Burns related to lighting fuel: Second stage results (ATT)

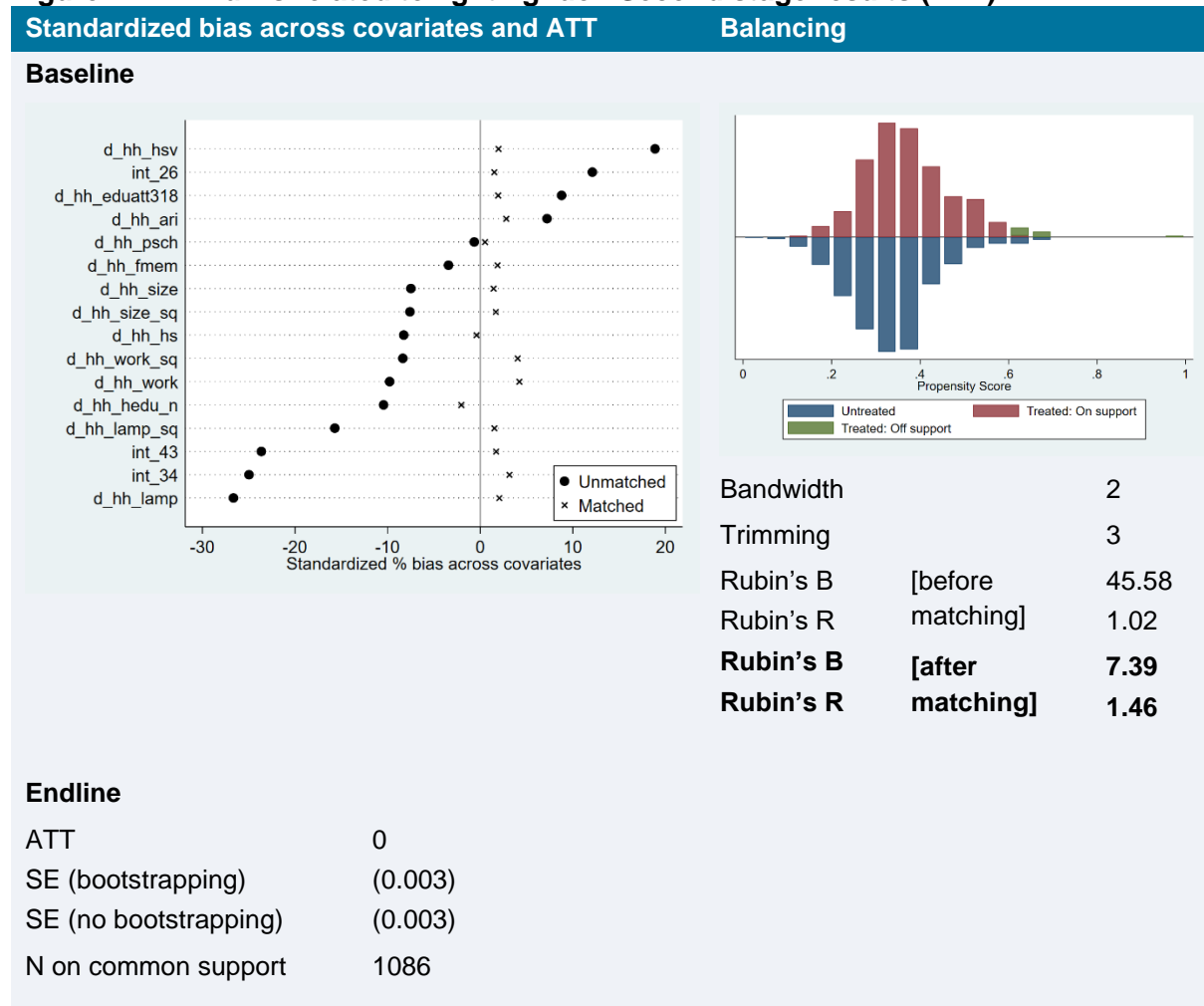


Figure 42: Impact of the pilot project on energy use and expenditure (ATT)

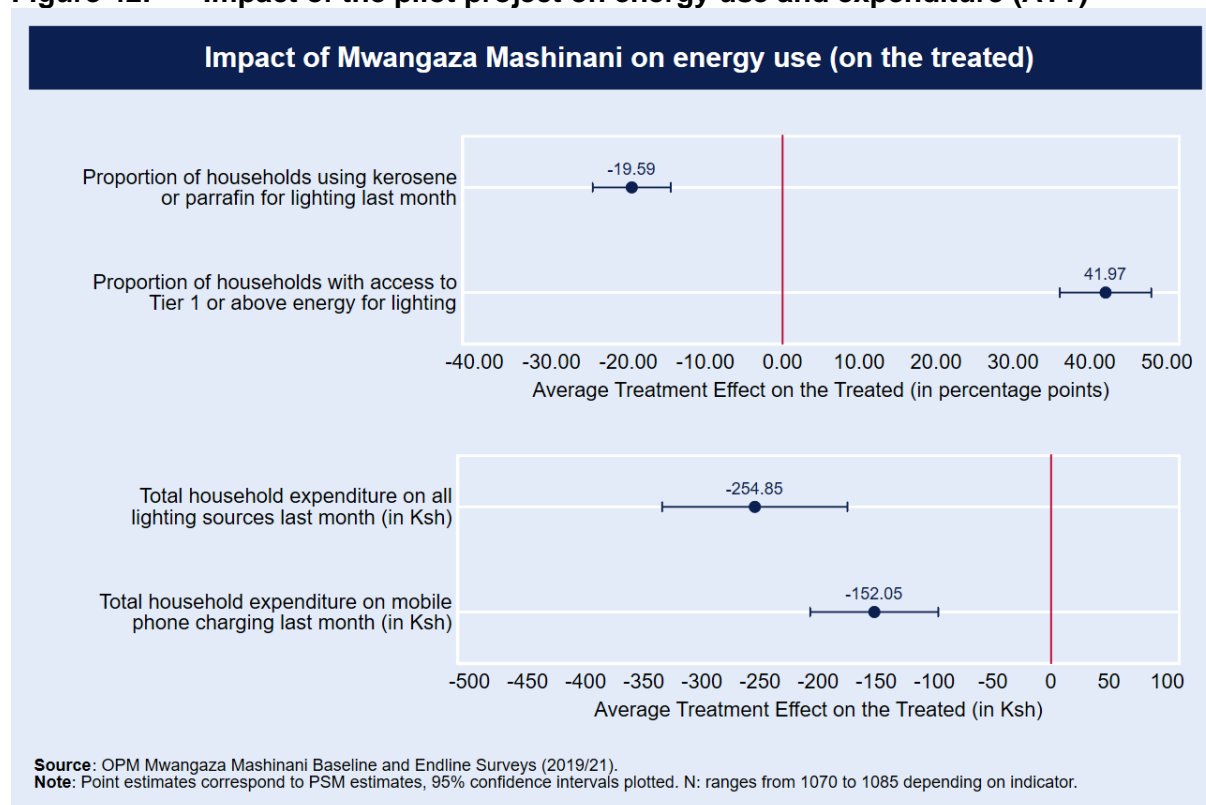


Figure 43: Impact of the pilot project on household livelihoods (ATT)

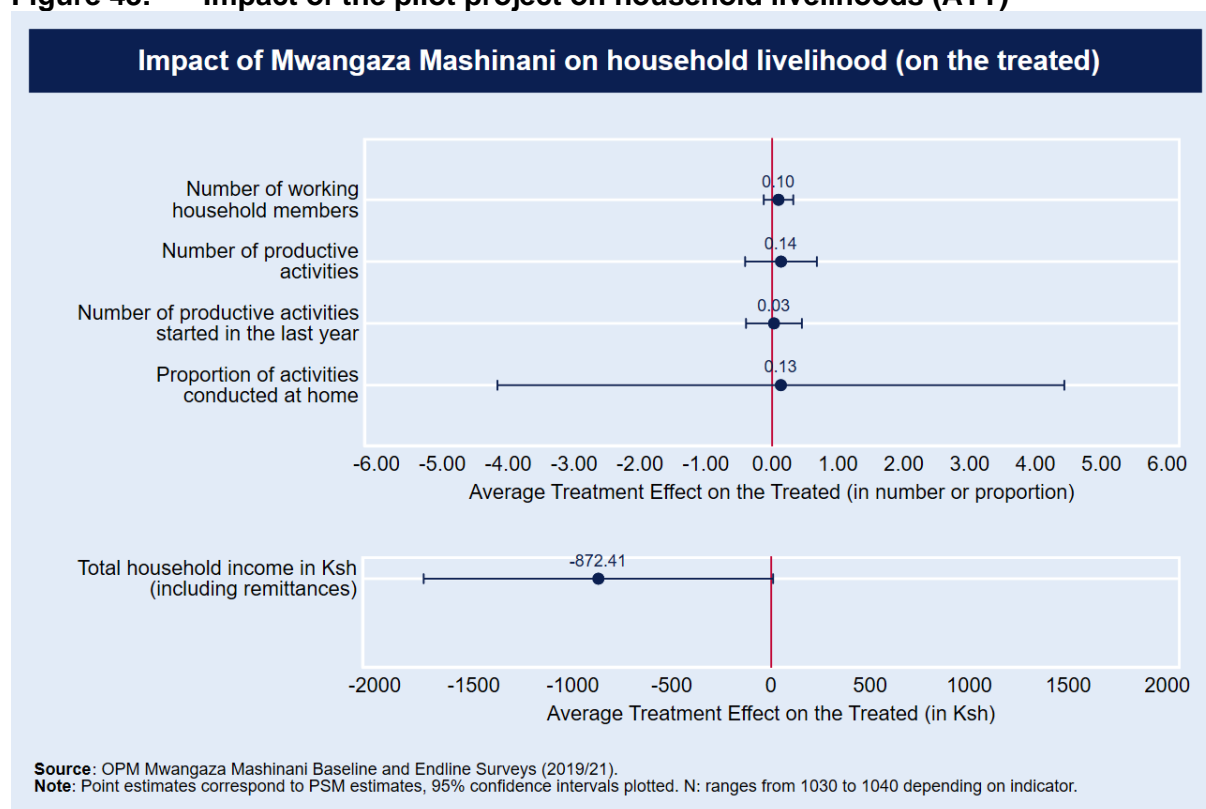


Figure 44: Impact of the pilot project on women's time use (ATT)

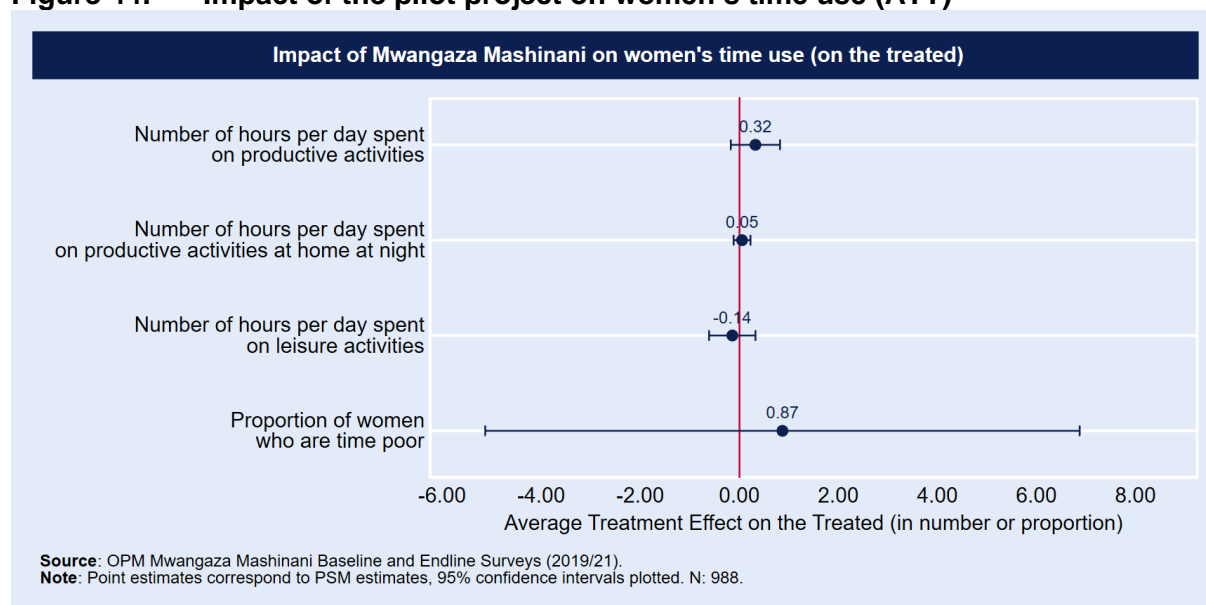
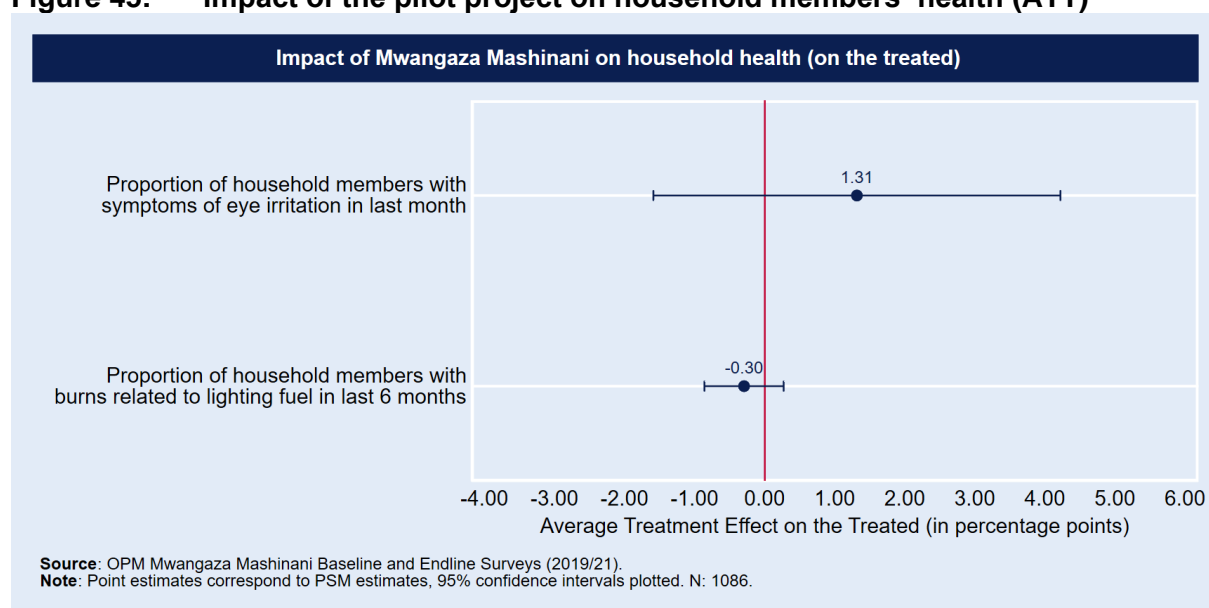


Figure 45: Impact of the pilot project on household members' health (ATT)



ANNEX F QUALITATIVE APPROACH

The qualitative component was originally designed as part of a mixed methods study. The research questions and framework were developed to respond to the endline evaluation report that would provide a summative assessment of the Mwangaza Mashinani pilot. Owing to changes in the design as a result of COVID-19, OPM had to make changes to the design and presentation of the evaluation. As qualitative data collection was completed in early 2020, these findings serve as a midline assessment for the programme.

F.1 Introduction and evaluation criteria

The key focus of the qualitative component is on the relevance, effectiveness and sustainability of the Mwangaza Mashinani pilot.⁶ We summarise below the main focus of the qualitative study with respect to each of these OECD-DAC⁷ criteria, as well as provide the specific Key Evaluation Questions (KEQ) which we aim to answer within each of the criteria.

Relevance

As part of the assessment of **relevance**, we assess the extent to which the objectives of the Mwangaza Mashinani pilot respond to the needs of the target population and the communities it is serving. Crucially, we focus on the population of interest which is ‘the most vulnerable segment’. Although it is beyond the remit of this evaluation to unpack the characteristics of the vulnerability and poverty and their manifestations with regard to the current programme, the objective for the qualitative component is to assume throughout the work that the needs of this particular population are greater than those of the ‘poor’ and that members of households and communities not only have varying needs but also power in accessing and using energy.⁸

In this context, we investigate whether the assumptions of the pilot project’s Theory of Change hold, particularly with respect to the pilot project’s objectives of:

1. Enhancing access to energy to the most vulnerable (i.e. whether the solar home systems (SHS) will be perceived relevant to the context of our sampled households in comparison to other sources of energy); and
2. Increasing market penetration in vulnerable communities (i.e. whether the targeting approach and awareness raising activities are focused on and involve the right people in the household and community who make decisions on access and use of energy; whether payment and repayment modalities make sense to the contexts of the sampled households and whether assumptions made about ownership are right).

The KEQs which the qualitative component answers include:

⁶ The main focus of the qualitative research was relevance and effectiveness. The qualitative design included preliminary indications on sustainability. However, data on this was limited as communities had only received the first cash top-up and still had to make several more repayments before fully owning their devices. While it was too early to determine if the programme would be sustained, data collected in relation to sustainability has provided an early indication about the challenges related to sustaining the use of the device.

⁷ These are definitions and principles for use as evaluation criteria. See <https://www.oecd.org/dac/evaluation/daccriteriaforevaluatingdevelopmentassistance.htm>

⁸ The qualitative study also considers aspects of the project and its assumptions that are not relevant to the target population, if any.

KEQ1. How well is the pilot project suited to the needs of the target population, their community and private sector SHS suppliers?

- DEQ1.1 Is the pilot project's objective of improving access to off-grid SHS relevant to the target population's energy and welfare (education, health and livelihood) needs?
- DEQ1.2. Is the intervention approach acceptable to the target population, their community and private SHS suppliers?

Effectiveness

The **effectiveness** assessment focuses on the way in which the project operations are functioning in order to identify ways in which implementation can be improved. In addition, this assessment considers whether or not the project is improving access to and use of energy amongst the most vulnerable population, and how women in different households as well as their communities are benefiting (or not) from the programme. In this regard, we explore how SHS is being used (or not), by whom, and in what ways. We also try to understand how and to what extent (if at all) the target population has improved their understanding of – and their ownership over – SHS.

The KEQs which we aim to answer through the qualitative study are:

KEQ3. To what extent have beneficiary households improved their awareness about and feel a sense of ownership towards their SHS?

- DEQ3.1. To what extent have beneficiary households improved their awareness about the use and benefits of SHS?
- DEQ3.2. To what extent do beneficiary households feel a sense of ownership towards their SHS?

KEQ4. How effectively have the operational modalities been taken up by the targeted beneficiaries and private sector suppliers? What are lessons for scale-up and replication in the NSNP?

- DEQ4.1. How well was the pilot project able to generate take up of the solar device among the target population?
- DEQ4.2. To what extent did beneficiary household take up the bi-monthly top-up and payment modality?

Sustainability

The **sustainability** assessment focuses on identifying factors that enable and hinder the likelihood that the targeted population will maintain their solar systems beyond the project cycle. Given that the target population is the most vulnerable, the qualitative research study collects information early on in the life of the project on affordability of the SHS and its maintenance and the extent to which the sampled households make an informed choice about whether to use SHS and maintain it in the longer run, taking into account other available sources of energy.

The KEQs which the qualitative component answers include:

KEQ10. How well are factors that are likely to affect the sustainability and scalability of the pilot project addressed?

- DEQ10.1. How strong is stakeholder commitment to sustain and scale-up the pilot project?
- DEQ10.2. How financially sustainable is the intervention approach?

F.2 Qualitative instrument design

The evaluation utilises a set of quantitative and qualitative tools to capture data on the key evaluation criteria. The main qualitative tools used to answer the KEQs are: 1) semi-structured key informant interviews and community mapping with village leaders, community champions and members of the Beneficiary Welfare Committee (BWC); and 2) in-depth interviews with households who are enrolled in the Mwangaza Mashinani project.

Key Informant Interviews

Key informants are people who have an informed perspective or have an experience relating to particular aspects of the intervention. Thus, key informant interviews were conducted with the village leader and a member of the BWC and/or community champions in each village. In this way, they complement and triangulate information collected from household studies.

Community Mapping

A community map is a participatory tool that draws on the support of community members (in this study, the village leader and community champion/BWC member) to identify the physical, social or economic landscape of the community. Maps are drawn by first identifying the geographical indicators of the village and sub-village and then map the inhabitants onto the geographic landscape. It is a useful way to understand vulnerability, access, sources of conflict or underlying challenges in the community. A community map was used to understand vulnerabilities in the community and locate especially vulnerable households that were part of the Mwangaza Mashinani.

In each sub-location, we drew one community map of the sub-location with the village leader to identify areas where vulnerable people in the sub-location/villages live. The village leader was first asked to map the boundary of the sub-location, and any major landmarks – the main road, schools, well, trees, water resources, chief's house etc. – before then mapping the villages in the community.

The village leader was then asked for their definition of vulnerability and, keeping this definition in mind, to locate the most vulnerable communities in the sub-location. Using the map and the list of project participants provided by the BWC/community champions, we then worked together with community champions/BWC members to locate Mwangaza Mashinani beneficiaries in these areas who had received a solar device.

In-depth Interviews

In-depth interviews (IDI) are intensive one-to-one discussions on a range of structured, semi-structured or unstructured questions. IDIs allow for probing and gaining insight from an individual's point of view. As in-depth interviews allow for additional privacy and anonymity, interviews can cover greater ground and explore more sensitive topics. IDIs were conducted with one male and one female member in each household. Differences in opinion based on gender and age were explored this way. We sampled three households per site and conducted one IDI with a man and one with a woman from the same household.

F.3 Qualitative Sampling Strategy

The qualitative sample draws from the quantitative household survey. Only households that have received the solar device under the Mwangaza Mashinani pilot were sampled.

Specifically, these are households residing in off-grid communities in Kilifi and Garissa and that have at least one child enrolled in and attending school, which are CT-OVC or OP-CT beneficiaries and have received the solar device. The sampling followed a purposive, two-step process. First, a list of sub-locations were drawn up for Kilifi and Garissa. These sub-locations were sorted from lowest average household income in a sub-location to the highest average household income. Any sub-location that had fewer than 10 sampled households in the quantitative baseline were removed from the list, to ensure that there would be a sufficient number of respondents available to select for qualitative research. In addition, any sub-locations that were deemed too insecure to travel to were removed from the list. Finally, the sub-locations with the lowest average household income were selected in Kilifi and Garissa. The purpose of selecting the poorest sub-locations was to visit those sub-counties with the most vulnerable solar device owners.

Definition of the eligible universe is constricted by the circumstances on the ground. In particular, areas of extreme security risk were excluded from the viable population where it would be unsafe for evaluation teams to work.

Each eligible registered beneficiary represents a single household and therefore, by drawing a list of registered beneficiaries, we selected households for our research sample.

Sampling households

A list of households for the sub-locations was drawn from the quantitative sample. With the help of the village leader (Chief/Assistant Chief) and the beneficiary lists provided by community champions/BWC members, the research teams shortlisted the households based on which households are considered most vulnerable in the community and are Mwangaza Mashinani beneficiaries.

Sampling community level representatives

OPM selected either a BWC or a community champion in each sub-county with the help of implementation teams. As the qualitative research relies on the community representative as a key informant of how the implementation has progressed in each community, the implementation teams interviewed both informants where both were present.

Selection of evaluation respondents

Village leaders include community elders, religious leaders, and any other authority figures in the community, who are sufficiently in tune with community needs and are able to speak about the context, challenges and opportunities where they live. Village leaders were mobilised in the field and are particularly powerful in affecting the moods, choices and dynamics within villages. They have certain control over village resources and therefore represent an important group of respondents interviewed separately and individually.

Community level implementers/representatives. We interviewed members of the BWC and/or community champions, who were able to speak specifically to targeted households experience with the intervention modalities and their use of solar device. These individuals are key to understanding the needs, challenges and opportunities of the supply chain at the level of the community. We used project data to identify and select these respondents.

Head of the household/female. We interviewed women/household heads who are women, on their access, use, ownership over and experience of the pilot. We interviewed women to gauge their understanding and acceptance of the SHS and related communications,

payment mechanisms, and SHS use, and issues related to affordability, maintenance, and sustainability. We explore differences in gender especially around ownership and access.

Head of the household/male. We interviewed men/household heads who are men on their access, use, ownership over and experience of the pilot. We interviewed men to gauge their understanding and acceptance of the SHS and related communications, payment mechanisms, and SHS use, and issues related to affordability, maintenance, and sustainability. We used interviews with men and women from the same household to explore differences in gender especially around ownership and access.

F.4 Fieldwork implementation

F.4.1 Piloting and training

Training in the use of the qualitative tools took place in Kilifi over four days followed by one day of piloting. The training was led and conducted by OPM staff responsible for the qualitative component of the study, with the support of senior staff from the local partner organisation, Research Guide Africa (RGA). Training was classroom-based and comprised presentations and interactive exercises. The training covered an introduction to the pilot project and evaluation, as well as how the pilot was implemented. Emphasis was placed on generating collective understanding of the project, research tools, sampling details and fieldwork protocols (personal conduct, general behaviour and other considerations). In particular, training was provided on formulating questions, how to interpret the research guide, recording using audio devices, note-taking, transcribing, labelling data, and the overall fieldwork plan. Finally, the OPM team explained key policies around safeguarding and ensuring confidentiality and consent. Researchers shared their qualitative research experience and participated in practical sessions involving role-play using the research guides, as well as mock community-mapping exercises, to help researchers gain familiarity with the tools.

Following the training, the entire field team piloted the qualitative instruments, as well as the sampling strategy and fieldwork protocols in one sub-location (Mwahera) in Kilifi. Researchers with knowledge of the local language facilitated and took notes while other researchers observed. Piloting of the tools was used to check the content and meaning of each tool, the length, and logistics in relation to implementing the tools in the communities. Together with RGA, we also assessed the research teams' work patterns as well as the personal strengths and weaknesses of the researchers.

F.4.2 Qualitative fieldwork

The qualitative research was conducted by RGA in January 2020. RGA also conducted the quantitative baseline survey and therefore had a strong understanding of the project context and our approach. Research Assistants (RAs) were recruited on a competitive basis and were chosen based on their experience of conducting qualitative studies, working with qualitative datasets, and knowledge of the local context and languages. The researchers were divided into two smaller research teams – one for each of Kilifi and Garissa counties – and each team was led by a lead researcher from either OPM or RGA (and by both in one Kilifi location). Each team was further divided into sub-teams, each consisting of one facilitator and one note-taker. Research activities were supervised by both OPM and RGA survey staff in Kilifi, and by RGA senior survey staff in Garissa to provide technical support.

Each interview and discussion had a lead facilitator and a note-taker. The researchers asked for each participant's consent to willingly participate in the interview as well as consent to be recorded using an audio device. Interviews and discussions were conducted mostly in local languages and translated into English. In both Kilifi and Garissa, there are some interviews, especially with some Chiefs and community champions, that were conducted in English or a mixture of English and Swahili. Most household interviews were conducted in the local language (Somali, Giriama or Swahili). The division of tasks among researchers, i.e. note-taking and facilitating/conducting interviews, was based on capacity to speak the local language as well as each researcher's skills and competencies. In Kilifi, interviews were conducted in either Swahili or Giriama. In Garissa, interviews were conducted in Somali. Field researchers were deployed in sub-locations where they could speak the languages.

Notes collated during the interviews and discussions were used to facilitate daily debrief sessions at the end of each day. These were led by RGA senior staff (and with OPM staff for Kilifi county) in order to discuss fieldwork and provide an initial synthesis of the findings. These sessions were a key stage of the analysis and were used to reveal research gaps; as well as to think about the team's performance, the effectiveness of the tools, and how each data collection tool helped to answer the key evaluation questions. The debrief sessions marked the start of building a narrative around findings, discussing emerging themes, and identifying additional areas to explore throughout the fieldwork. The completion of the qualitative data collection was followed by the transcription of data recorded during the interviews.

Table 5 summarises some of the challenges encountered during the qualitative fieldwork and the ways in which these were overcome.

Table 5: Qualitative Fieldwork Challenges

Fieldwork challenges	Resolution
High-level security situation throughout fieldwork duration	<p>Al-Shabab terrorist attacks occurring across Kenya preceding the fieldwork posed risks to the research team when carrying out fieldwork in both counties.</p> <p>OPM contracts Spearfish Security who provided daily security briefings and guidance on which areas were safe to travel to. In addition, the team benefited from intel on the ground through RGA. The team only travelled to the sub-locations when it was deemed safe to do so. This meant that there was a break between data collection in Kilifi and in Garissa.</p> <p>Furthermore, RGA carefully determined who from their Kenyan research team was safe to travel to Garissa given this county is high-risk even in normal times.</p>
Sampling: BWC's household lists not being updated	<p>The community mapping exercise highlighted that the project's beneficiary list was not always the most recently updated list, which posed challenges for sampling households.</p> <p>The research team worked with the list provided by the baseline quantitative data collection and compared this</p>

Fieldwork challenges	Resolution
	with the BWC member's list. The RGA team phoned sampled participants ahead of every fieldwork day to ensure that these households were enrolled in the project and had received a SHS through the project.
Revisiting households when heads were not there on the first visit	There were occasions where only one member of the sampled household was present for the interview. On these occasions, the research team interviewed the available household member and revisited the household to interview the second household member.
Reluctance of some interviewees (mainly female) to be interviewed without their husbands or another male household member being present	In cases where there was an initial reluctance for beneficiaries to be interviewed, the RGA team exercised patience and caution. RAs took time to reiterate the purpose of the visit and to emphasise the anonymity and confidentiality of the interview. When permitted to interview the participant, this would in some cases have been in the presence of other household members but not to the extent that it would have compromised findings.
Observation bias	<p>The presence of the research team (especially that of OPM staff who are non-Kenyan) will inevitably have affected participant responses.</p> <p>Research team members who were not directly involved in the interview physically distanced themselves from where the interview was taking place, especially where it was felt our presence was impacting the interview.</p> <p>Triangulating within-household and with community-level responses partially addressed the observation bias to some degree.</p>

F.5 Analysis process

We followed the stages of theme development in qualitative content and thematic analysis, as detailed by Vaismoradi et al (2016). The broad qualitative themes were based on the key evaluation criteria which were the focus of the qualitative study.

We developed sub-themes within each of these based on themes emerging from the baseline analysis; from our own observations and field notes having conducted the qualitative research in the field; and from daily debriefs with the RGA team following data collection in Kilifi and Garissa (initialisation). Using NVivo, we coded up the transcripts from all interviews using these themes and sub-themes, in particular making use of conceptual codes (e.g. payment systems), participant perspective codes (role of the BWC, role of community champions, etc.), and the setting code (e.g. context). In the construction phase, we classified, compared and labelled the translated transcripts. Any additional themes therefore arose from the OPM researchers reading through all translated transcripts and

adding codes where needed using the NVivo software; and related themes to our established knowledge of project implementation to date (rectification).

The storyline was already emerging from previous baseline data collection and our own first-hand observation during qualitative fieldwork, but we focused on developing the storyline more specifically following initialisation, construction and rectification (the finalisation stage). The qualitative analytical process is cyclical in nature and, as stated in Vaismoradi et al (2016), entailed the OPM team repeatedly returning to the data and refining sub-themes and the coding of transcripts.

ANNEX G IMPLEMENTATION REVIEW

TECHNICAL DETAILS

As part of the implementation review, we conducted qualitative interviews with stakeholders at the national level. The purpose of this data collection was to generate evidence to address evaluation questions related to the relevance, effectiveness, efficiency and sustainability of the pilot project.⁹ The interviews took place after 6 months of implementation and were timed such that the findings could be taken into account in time for the design of the second phase of the Mwangaza Mashinani pilot.

Data collection took the form of semi-structured, qualitative individual or group interviews with project stakeholders with most of the 15 interviews conducted face-to-face in Nairobi between 18 and 22 November 2019.¹⁰ The same topics were discussed with different stakeholders to allow for triangulation and different perspectives to inform the evidence base. However, not all topics were part of the interview with each stakeholder and interview topics varied depending on the stakeholder's potential knowledge of the topic. Because of the large number of evaluation questions and topics to cover, the interviews could not explore each topic in-depth.

Stakeholder selection was done in consultation with UNICEF and the implementing consortium. Table 6 indicates the stakeholders that were interviewed as part of the national-level implementation review.

Table 6: National-level stakeholders

Stakeholder Group	Stakeholders Interviewed
Funding agencies	SIDA, UNICEF
Development partners	The World Bank
Implementing consortium	Energy4Impact, The Busara Center for Behavioural Economics
Energy sector	Ministry of Energy, Kenya Off-Grid Solar Access Project (KOSAP), Power Africa, Kenya Private Sector Alliance (KEPSA), d.light, Bright Sky Solar Solution
Social Protection sector	Social Assistance Unit (DSA), Social Protection Secretariat (SPS)

The findings from the implementation review were shared in a Policy Note in January 2020. The results were shared with stakeholders through a workshop in Nairobi and at the technical working group in Kilifi in February 2020.

⁹ The evaluation matrix in Annex B indicates which evaluation questions draw on different stakeholder interviews.

¹⁰ Where stakeholders were not available or based outside of Nairobi, interviews were held via Skype between 25 November and 2 December 2019.

ANNEX H VALUE FOR MONEY ANALYSIS

H.1 Objectives and research questions

The objectives of the Value for Money analysis (VfM) are to review how much the Mwangaza Mashinani pilot project, as managed by UNICEF and implemented by a consortium led by Energy for Impact, has spent and assess whether the project provided VfM, being '*the optimal use of resources to achieve intended outcomes*' (DFID, 2011). Based on discussions with UNICEF, for the purpose of this midline analysis, we focused on two areas of VfM, namely economy and efficiency. By looking at these areas, we have attempted to answer the following research questions:

- **Economy:** Is the project buying inputs of the appropriate quality at the right price? Inputs include staff, contractual services from external providers, and other goods and services that are used to produce outputs.
- **Efficiency:** How well does the project convert inputs into outputs? Outputs are results delivered by the project, as measured by the project log frame. In this case, the cost efficiency analysis looks at the cost of delivering cash top-ups to beneficiaries and the cost incurred by the project per beneficiary household.
- **Cost-effectiveness:** How large were the impacts relative to the size of inputs and investment? The cost-effectiveness assessment will examine whether the project achieved its intended outcomes on the beneficiaries' sense of ownership, usage, health, and quality of life of children and their families.

Using the FCDO guidelines on VfM (DFID, 2011) and OPM's VfM approach (King and OPM, 2018), an assessment framework has been applied that sets out a transparent basis for making VfM evidence-based judgements. This clarity is achieved through the use of explicit criteria (aspects of performance) and standards (levels of performance) for each of the VfM dimensions. The criteria and standards are specific to the Mwangaza Mashinani pilot and aligned with the pilot's design and ToC. The VfM assessment is based on the comparison between identified standards and project level indicators for each criterion.

The core evidence base for this VfM assessment includes data that are routinely collected as part of the pilot monitoring and evaluation system, UNICEF annual reports to SIDA, E4I quarterly reports to UNICEF, the project implementation plan, contracts and MoUs with key input providers, and budget and expenditure data as recorded by UNICEF and E4I. The analysis also draws on a validation interview with UNICEF and E4I. This includes a mix of quantitative indicator-based measurement and qualitative contextual evidence.¹¹

There exist some limitations to the VfM assessment analysis.

- The reference point for the VfM assessment of a pilot programme is never obvious. As discussed in the introduction, the cost of a pilot programme is unlikely to be representative of the scaled-up programme by design. This is because a pilot programme is often innovative, requiring iteration in its design and implementation model. Pilot programmes will also often have disproportionately costly impact evaluation costs, where there is an objective to generate robust measures of programme impact in line with an

¹¹ In the following report, costs have been reported in USD and KES. For reference, at present, the exchange rate applied is 1 KES= USD 0.0092

explicit proof-of-concept objective. In our analysis, we have (wherever relevant) distinguished between the VfM performance of the pilot (where the 'value' relates principally to broader influencing objectives, operational experience and the evaluation evidence generated), from the likely VfM performance of a scaled-up version of the programme, assuming the core elements of the programme remain the same.

- A related limitation is that there are seldom other programmes against which the costs of a pilot programme can be compared. For this reason, the benchmarks for this analysis are set using project documents (i.e. proposals, budgets and contracts) rather than data from other programmes. However, throughout the narrative, where appropriate, we reference findings from other VFM studies to provide a comparator. For some indicators, due to the lack of appropriate benchmarks, assumptions have been made for comparisons. An example is the cost-effectiveness analysis for 'Child Time Study at home' where unsupervised home study time is assumed to be half as valuable when compared to an hour of tutor-led instruction.
- Budget data and actual spending are not reported based on a standardised coding approach. The budget is disaggregated by activity, while spending is coded according to the cost centre money was spent on (for example, personnel, travel, contractual services, etc.). This makes comparability of budget and spending data difficult and required the team to make a set of assumptions to analyse the efficiency of the project. This introduces some challenges to the robustness of the results.
- Lack of disaggregated data. The evaluation team was not able to access some data disaggregated at the appropriate level for the spending incurred by the consortium led by E4I, therefore limiting the extent to which certain aspects of the VfM assessment could be explored and expanded upon.
- Inconsistencies across the data sources further complicated the analysis. For example, the number of beneficiaries and default rates vary between the payroll data, the dashboard data, and the reconciliation reports provided as data sources. The main reasons shared for the inaccuracies were that, first, the dashboard was not always updated regularly since it pulls its data from banks and solar suppliers. Sometimes this data never came through or came late, causing some discrepancies. Second, it was challenging to get data on beneficiaries from the Cooperative bank.

H.2 Approach

H.2.1 Economy assessment

The assessment of the project performance against the economy criterion assesses whether the project uses resources economically, buying inputs of the appropriate quality at the right price, and following good project management practices. When evaluating the pilot's performance against the economy criterion, the following sub-criteria are used:

1. Whether the project is meeting agreed benchmarks for TA and management costs, and costs of key inputs: cost of contractual services for implementation and evaluation of project activities, prices of M-Pesa and bank charges, prices of the solar products;
2. Whether the project shows sound procurement practices and effective negotiation in respect of solar suppliers' services.

Performance standards for the economy area have been adapted to the design of the project and data received from UNICEF and E4I. The performance standards are as follows:

Performance	Criteria
A: Very Good	Evaluation deems that costs have been minimised, without compromising the integrity of expected results, and may even exceed expected results.
B: Good	TA and management costs, cost of key inputs meet benchmarks. Project comprehensively follows sound procurement practices for solar products and meets expectations for quality and price.
C: Average	Any of the Economy measurements do not consistently reach benchmarks, or any significant departures from benchmarks can be justified in terms of context and evolving circumstances. Project generally follows sound procurement practices for solar devices and meets expectations for quality and price.
D: Low	Any one of the Economy measurements consistently under-perform benchmarks. Project does not follow sound procurement practices.

Note: Benchmarks are based on design documents and/or comparable figures for other similar projects.

H.2.2 Efficiency assessment

Drawing on FCDO's VfM framework, efficiency is concerned with the relationship between inputs and outputs, which are the goods and services the project delivers. The efficiency analysis will focus on the way in which the resources were managed for the project's delivery of outputs. We focus on three metrics within the efficiency area: allocative efficiency, technical efficiency and dynamic efficiency. Performance standards for the efficiency area have been adapted to the design of the project and data received from UNICEF and E4I. The performance standards are as follows:

Performance	Criteria
A: Very Good	Evaluation deems that the organisations have a capacity (HR and IT/financial) and system in place for determining cost efficiency (including outsourcing choices, appraisal, due diligence of partners etc.), regularly evaluate allocative efficiency and practice sound financial management techniques, and demonstrate the ability for the programme resources to adapt to changes in delivery costs or unforeseen events.
B: Good	Evaluation deems that the organisations have an adequate capacity (HR and IT/financial) and system in place for determining cost efficiency (including outsourcing choices, appraisal, due diligence of partners etc.), have good evaluate allocative efficiency practices, and have a system in place for the programme resources to adapt to changes in delivery costs or unforeseen events. Management of key drivers for efficiency is adequate.
C: Average	Any of the Efficiency measurements do not consistently reach benchmarks, or any significant departures from benchmarks can be justified in terms of context and evolving circumstances. The system in place for determining cost-efficiency is only partially effective.
D: Low	Any one of the efficiency measurements consistently underperforms benchmarks. System in place for determining cost efficiency is not effective.

Note: Benchmarks are based on design documents and /or comparable figures for other similar projects.

H.2.3 Cost-effectiveness assessment

According to FCOD's VfM framework, cost-effectiveness measures how much impact the inputs or investments had on the project results. In this assessment, we measure cost-effectiveness against the following impact areas: education, child/women time use, livelihoods, and energy use. A benefit-cost ratio indicator is also included, in an attempt to summarise the overall value for money of the project.

Performance standards for the effectiveness area have been defined as follows:

Performance	Criteria
A: Very Good	There is sufficient evidence that the programme exceeded expectations for impacts based on the independent impact evaluation and progress achieved through the cost-effectiveness indicators. Cost-effectiveness is significantly lower than relevant benchmarks. The benefit-cost ratio is significantly higher than 1.
B: Good	The programme is judged to have met expectations for impacts based on the independent impact evaluation and progress achieved through the cost-effectiveness indicators. Cost-effectiveness is somewhat lower than relevant benchmarks. The benefit-cost ratio is somewhat higher than 1.
C: Average	Any of the effectiveness measurements do not consistently exceed benchmarks, but do not fall below average. The benefit-cost ratio equals 1.
D: Low	Any one of the effectiveness sub-indicators scores below average. The benefit-cost ratio is lower than 1.

Note: Benchmarks are based on other projects and data sources. In cases where a benchmark was not available results have been compared to the projected use of current energy sources.

H.3 VfM assessment framework

Table 7: VfM assessment framework

Indicator	Indicator	Type of data	How is the indicator measured	Benchmark	Source
1 Economy criterion: the pilot uses resources economically, buying inputs of the appropriate quality at the right price, and following good programme management practices					
Sub-criterion: the project is meeting agreed benchmarks for TA and management costs, and costs of key inputs: cost of contractual services for implementation and evaluation of project activities, prices of M-Pesa and bank charges, prices of the solar products					
1.1	Difference between average monthly UNICEF staff cost and benchmark as a percentage of the benchmark	Quantitative (monetary)	Total UNICEF staff costs divided on months till Sept 2020. Staff costs are derived from data on annual salary, number of months working on the project and percentage of FTE worked on the project	Budget estimation for TA and QA activities over planned project duration;	Actual: UNICEF staff costs as provided by Social Protection Specialist. Benchmark: UNICEF budget as presented UNICEF KCO Energy and Cash Plus (draft concept note) 31 August 2017
1.2	Difference between average monthly UNICEF operational cost and benchmark as a percentage of the benchmark	Quantitative (monetary)	Total non-staff costs excluding transfers to beneficiaries divided on months till Sept 2020	UNICEF budget for inception activities and fieldwork monitoring over planned project duration	Actual: UNICEF spending accounts. Benchmark: UNICEF budget as presented in UNICEF KCO Energy and Cash Plus (draft concept note) 31 August 2017
1.3	Difference between actual cost for E4I contractual services and benchmark as a percentage of the benchmark	Quantitative (monetary)	Final contract(s) value vs original contract value	UNICEF -E4I original contract (July 2018- February 2020)	Actual: Contracts and contract extensions between UNICEF and E4I. Benchmark: UNICEF-E4I institutional contract. Contract number 43253093 July 2018-February 2020

Indicator	Indicator	Type of data	How is the indicator measured	Benchmark	Source
1.4	Difference between actual cost for OPM contractual services and benchmark as a percentage of the benchmark	Quantitative (monetary)	Final contract(s) value vs original contract value	UNICEF -OPM original contract	Actual: Contracts and contract extensions between UNICEF (November 2018 to December 2020) and OPM. Benchmark: UNICEF-OPM original contract value (November 2018 to 31 March 2020)
1.5	Difference between actual transaction costs as percentage of total transfer value and benchmark as a percentage of the benchmark	Quantitative (monetary)	Total value of M-Pesa charge, EFT charges and zoning charges as a percentage of total cash transfer to beneficiaries	UNICEF budget for transaction costs	Actual: E4I payroll data and interviews with implementers. Benchmark: UNICEF budget as presented in UNICEF KCO Energy and Cash Plus (draft concept note) 31 August 2017
1.6	Difference between actual unit cost of solar product and benchmark as a percentage of the benchmark	Quantitative (monetary)	Actual costs paid vs budgeted amount	Expected amount as presented in UNICEF KCO SIDA Project Proposal Clean 5th September 2017 (003)	Actual: MoU with solar suppliers. Benchmark: UNICEF KCO Energy and Cash Plus (draft concept note) 31 August 2017
Sub-criterion: the project shows sound procurement practices and effective negotiation in respect of solar suppliers' services.					
1.7	Existence of operational evidence of procurement policies and	Qualitative – document review	Evidence of competitive tendering and multiple quotes for solar device suppliers	UNICEF procurement policy	Actual: UNICEF KCO SIDA Project Proposal, UNICEF SIDA Annual Report June 2020, Project MoU with Solar suppliers, Project Operational Manual. Benchmark: UNICEF procurement policy

Indicator	Indicator	Type of data	How is the indicator measured	Benchmark	Source
	procedures being documented and followed				
2 Efficiency criterion: the project has the capacity (HR and IT/financial) and systems in place for determining cost efficiency (including outsourcing choices, appraisal, due diligence of partners etc.), regularly evaluate allocative efficiency and practice sound financial management techniques, and demonstrate the ability for the project resources to adapt to changes in delivery costs or unforeseen events.					
Sub criterion: Allocative efficiency. Allocation of resources across intervention pathways in appropriate proportion; that is, reflecting the relative priority given and associated costs.					
2.1	Difference between actual expenditure on cost centre and budgeted amount as a percentage of the budgeted amount	Quantitative (monetary)	For each cost centre: (total budget- total spent) for this cost centre as a % of total budgeted for this cost centre by the time of the evaluation and by the end of the project	Difference within 20% above/below budget is considered to be adequate	Actual: UNICEF spending accounts and additional staff costs provided by Social Protection Specialist. Benchmark: UNICEF budget as presented in UNICEF KCO Energy and Cash Plus (draft concept note) 31 August 2017; UNICEF Concept Note To Swedish International Development Cooperation Agency (SIDA) Additional Financing – Mwangaza Mashinani Maisha Bora Project (Energy Plus Cash Pilot). Kenya 2018 and UNICEF KCO and ESARO funds allocated to the project
2.2	Time series of expenses by cost item	Quantitative (monetary)	Disaggregation of expenses by cost item across payment cycles	Trend - assumption that expenses on cash transfers to beneficiaries reflect planned payment schedule; UNICEF TA and QA costs are high initially and decreasing over time. Expenses on contractual services meet agreed payment schedule and delivery of services. Operational costs	Actual: UNICEF spending accounts, Benchmark: Implementation plan, Contracts with service providers (E4I and OPM); payment cycle schedule

Indicator	Indicator	Type of data	How is the indicator measured	Benchmark	Source
				increasing in line with fieldwork activities	
2.3	Cost to transfer ratio	Quantitative (monetary)	Ratio of the project costs (excluding cash transfers to beneficiaries) to the total value transferred to a recipient	CTRs from other cash transfer projects in Kenya	Actual: UNICEF spending accounts. Benchmark: Bahri, O'Brien (2018), O'Brien, Hove (2015)
Sub criterion: Technical efficiency. Delivery according to the project implementation plan					
2.4	Adherence to implementation timeline	Qualitative – document review	Whether there has been any changes to the implementation timeline, whether those were agreed in advance, whether those were justified	Implementation timeline as agreed with project stakeholders during the set up phase	Actual: E4I Quarterly reports to UNICEF, UNICEF KCO Energy for the poor – Mwangaza Mashinani Progress Report prepared for SIDA Sweden November 2018-June 2020. June, 2020, E4I contract addendum. Benchmark: Implementation timeline at project set up
2.5	Key logframe achievements are on track to meet targets	Quantitative	Achievement against logframe targets of key outputs	Project Logframe June 2020	Actual: Logframe indicators in UNICEF KCO Energy for the poor – Mwangaza Mashinani Progress Report prepared for SIDA Sweden November 2018-June 2020. June, 2020 Benchmark: Logframe targets in UNICEF KCO Energy for the poor – Mwangaza Mashinani Progress Report prepared for SIDA Sweden November 2018-June 2020. June, 2020

Indicator	Indicator	Type of data	How is the indicator measured	Benchmark	Source
2.6	Actual spend per household per device	Quantitative (monetary)	Ratio of the project costs (excluding cash transfers to beneficiaries) to total number of households purchasing the solar device	Actual cost of solar devices	Actual: UNICEF spending accounts and logframe indicators. Benchmark: MoU with Solar suppliers
Sub criterion: Dynamic efficiency. Appropriate use of M&E findings to support adaptive management and appropriate reallocation of resources to reflect evolving circumstances and opportunities in the context of the project's implementation.					
2.7	Narrative evidence of use of M&E to support adaptive management and learning and changes to implementation activities reflecting evolving circumstances	Qualitative – document review and KIs	Whether project is showing proof of adaptive management	Systems are in place to allow for adaptive management. Some project-generated evidence is being used	Actual: Vulnerability assessment, outputs of the external independent evaluation, implementer's quarterly reports, UNICEF annual progress reports to SIDA, beneficiary survey data, qualitative feedback from fieldwork activities, the project grievance process, project dashboard, TWGs' minutes

Table 8: VfM assessment for each indicator

Indicator	Indicator	Actual	Benchmark	Difference between benchmark and actual value	% Difference between benchmark and actual value	VfM assessment
1 Economy criterion: the pilot uses resources economically, buying inputs of the appropriate quality at the right price, and following good programme management practices						
Sub-criterion: the project is meeting agreed benchmarks for TA and management costs, and costs of key inputs: cost of contractual services for implementation and evaluation of project activities, prices of M-Pesa and bank charges, prices of the solar products (within 25% above/below benchmark is considered to be acceptable)						

Indicator	Indicator	Actual	Benchmark	Difference between benchmark and actual value	% Difference between benchmark and actual value	VfM assessment
1.1	Monthly average staff cost (\$)	2,986	6,667	3681	55%	Good (potentially lower capacity to provide necessary QA and TA)
1.2	Monthly average operational cost (\$)	1,532	3,750	2,218	59%	Very good
1.3	Contractual services - E4I (\$)	530,126	449,933	- 80,193	-18%	Average
1.3.1	E4I Staff costs (\$)	261,689	183,719	-77,970	-42%	Low
1.3.2	E4I Non staff costs (4)	396,608	346,407	-50,201	-14%	Good
1.4	Contractual services – OPM (\$)	605,989	544,939	- 61,050	-11%	Good
1.5	% of transaction charges over total amount to beneficiaries	5%	10%	50%		Very good
1.6.1	Cost of Biolite Home 620 (\$)	125	100	- 25	-25%	Average
1.6.2	Cost of D-31 cost (\$)	127	100	- 27	-27%	Low
Sub-criterion: the project shows sound procurement practices and effective negotiation in respect of solar suppliers' services.						
1.7	Existence of operational evidence of procurement policies and procedures being documented and followed	--				Very good - There is evidence of competitive tendering and multiple quotes for solar device suppliers
2 Efficiency criterion: the project has the capacity (HR and IT/financial) and systems in place for determining cost efficiency (including outsourcing choices, appraisal, due diligence of partners etc.), regularly evaluate allocative efficiency and practice sound financial management techniques, and demonstrate the ability for the project resources to adapt to changes in delivery costs or unforeseen events.						
Sub criterion: Allocative efficiency. Allocation of resources across intervention pathways in appropriate proportion; that is, reflecting the relative priority given and associated costs. (within 15% above/below benchmark is considered to be acceptable)						

Indicator	Indicator	Actual	Benchmark	Difference between benchmark and actual value	% Difference between benchmark and actual value	VfM assessment
2.1.1	Cash transfer to beneficiaries (\$)	254,995	318,840	63,845	20%	Low. We would expect full amount to be disbursed to beneficiaries
2.1.2	Inception phase: Sensitisation, enrollment, targeting and identification/recruitment of potential beneficiaries including service providers (\$)	77,735	70,000	- 7,735	-11%	Acceptable (average), although some risks could have been foreseen
2.1.3	Community level activities and cost of implementing partner: BWC training and incentives, community education before and after payments, development of communication materials, community livelihood development support (\$)	404,219	337,500	- 66,719	-20%	Not acceptable (low)
2.1.4	UNICEF technical assistance and QA (\$)	107,491	160,000	52,509	33%	Acceptable (good).
2.1.5	Field monitoring (\$)	19,108	23,492	4,384	19%	Acceptable (average)
2.1.6	Procurement of a certified research institution including baseline, midline and endline surveys (\$)	333,520	761,050	427,531	56%	Acceptable (average). This is in line with project timeline
2.2	Time series of expenses by cost item	Trend - assumption that expenses on cash transfers to beneficiaries reflect planned payment schedule; set up and inception follow original timeline; UNICEF TA and QA costs are high initially and decreasing over time. Expenses on contractual services meet agreed				Low at set up/ inception. Good during implementation, reflecting changes in timeline due to Government's delays

Indicator	Indicator	Actual	Benchmark	Difference between benchmark and actual value	% Difference between benchmark and actual value	VfM assessment
		payment schedule and delivery of services. Operational costs increasing in line with fieldwork activities				
2.3	Cost to transfer ratio	3.69	0.502	-3.19	-636%	Low, although primarily driven by pilot related costs and deliver of additional activities on top of cash
Sub criterion: Technical efficiency. Delivery according to the project implementation plan (within 15% above/below benchmark is considered to be acceptable)						
2.4	Adherence to implementation timeline	Implementation timeline as agreed with project stakeholders during the set up phase				Low – we observed severe delays during the procurement process and at the inception phase.
2.5.1	Number of households purchasing an SHS or SL	1500	1692	-192	-13%	Acceptable (Good)
2.5.2	Number of beneficiaries using a SL or SHS regularly	1500	1669	-169	-11%	Acceptable (Good)
2.5.3	% of households regularly repaying	100%	70%	30%	30%	Not acceptable (Low)
2.5.4	Percent of beneficiaries that complete repayment	100%	70%	30%	30%	Not acceptable (Low)
2.5.5	% of payments delayed	--	33%			--
2.5.6	The average length of payment delays (days)	10	66	-56	560%	Not acceptable (Low)
2.5.7	Beneficiaries understanding of utilisation of SHS and SL	1500	1692	-192	13%	Acceptable (Good)

Indicator	Indicator	Actual	Benchmark	Difference between benchmark and actual value	% Difference between benchmark and actual value	VfM assessment
2.5.8	Number of the beneficiaries engaged in livelihood activities (capacity building activities)	1500	1692	-192	13%	Acceptable (Good)
2.5.9	BWC or local entrepreneurs trained to support beneficiaries	All	65		--	--
2.5.10	Number of beneficiaries with working SL or SHS	100%	99%	1%	1%	Acceptable (Very Good)
2.6	Actual spend per household per device (\$)	1) 557 2) 296 (excluding evaluation and TA and QA costs)	1) 151 2) 151	1) -406 2) -145	1) -269% 2) -96%	Low, although mostly driven by pilot related costs.
Sub criterion: Dynamic efficiency. Appropriate use of M&E findings to support adaptive management and appropriate reallocation of resources to reflect evolving circumstances and opportunities in the context of the project's implementation.						
2.7	Narrative evidence of use of M&E to support adaptive management and learning and changes to implementation activities reflecting evolving circumstances	Systems are in place to allow for adaptive management. Some project-generated evidence is being used				Average. Some project-generated evidence is being used, although the project lacks a solid MIS.

Table 9: Pilot team composition

Staff Role	Salary (annual \$)	Recruited	Number of months worked on the pilot (till Sept 2020)	Revised % work time for the pilot*	Original % work time for the pilot shared by UNICEF	Note
Chief of Social Policy	283,642	At project start	26	3%	10%	Position was vacant for 10 months from November 2019 to September 2020
Social Protection Specialist	187,460	At project start	33	10%	30%	Position was vacant for 3 months (July-October 2019)
Evaluation Specialist	187,460	At project start	36	1%	5%	Only involved in the impact evaluation and not in other programme aspects
Social Protection Specialist	106,162	At project start	36	5%	15%	
Social Policy Consultant	60,060	January 2020	8	10%	30%	
Social policy programme associate	45,888	At project start	36	3%	10%	
Social Policy UNV based in Nairobi	14,986	May 2019	16	10%	30%	
Social protection UNV based in Kilifi	17,743	March 2020	6	30%	75%	
Social Protection UNV based in Garissa	21,073	March 2020	6	30%	75%	
Note: * revised estimates of percent of time work on the pilot have been shared after submission of the first draft of this note. Indicators presented in the current version of the note are constructed using these revised estimates.						

Table 10: Project budget and actual spending

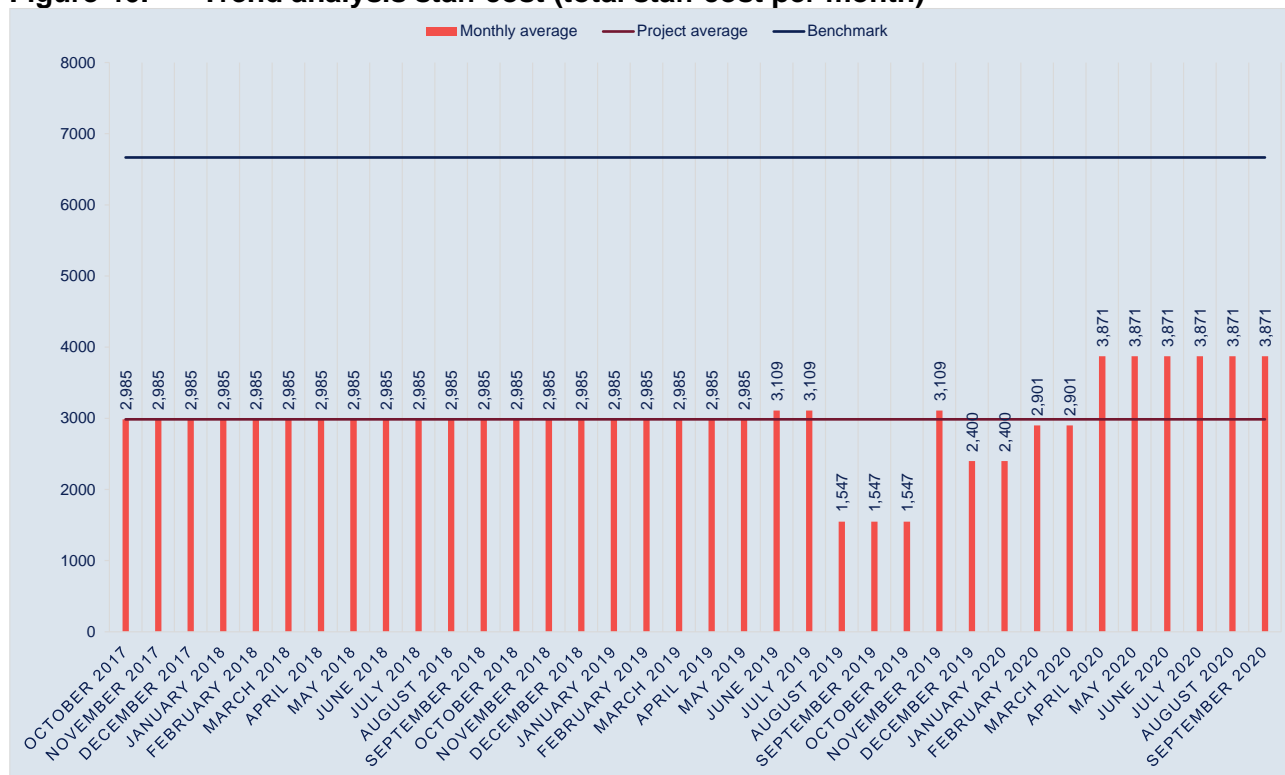
	Budget (by source of funds)				Spending (by September 2020)		
	SIDA 1 (Aug 2017-Nov 2019)	SIDA 2 (Nov 2019 onward)	Other grants	TOTAL	Spending till Sept 2020	Known commitment	TOTAL

	Budget (by source of funds)				Spending (by September 2020)		
Cash transfer to beneficiaries	\$ 155,040	\$ 163,800		\$ 318,840	\$ 254,995		\$ 254,995
Inception phase: Sensitization, enrollment, targeting and identification/recruitment of potential beneficiaries including service providers	\$ 70,000			\$ 70,000	\$ 77,735		\$ 77,735
Community level activities and Cost of implementing partner: BWC training and incentives, Community education before and after payments, Development of Communication materials, Community livelihood development support	\$ 337,500			\$ 337,500	\$ 404,219	\$ 125,907	\$ 530,126
UNICEF TA and QA	\$ 160,000			\$ 160,000	\$ 107,491		\$ 107,491
Field monitoring	\$ 20,000		\$ 3,492	\$ 23,492	\$ 19,108		\$ 19,108
Procurement of a certified research institution including baseline, midlines and endline surveys	\$ 340,000		\$ 421,050	\$ 761,050	\$ 333,520	\$ 272,470	\$ 605,989
TOTAL	\$ 1,082,540	\$ 163,800	\$ 424,542	\$ 1,670,882	\$ 1,197,067	\$ 398,377	\$1,595,443

Note: Budget excludes UNICEF indirect costs (8%). Spending and budget lines. The comparison maps expenditures incurred by the project until September 2020 against the original budget lines. We use the budget proposal presented in UNICEF KCO Energy and Cash Plus (draft concept note) 31 August 2017 and UNICEF Concept Note To Swedish International Development Cooperation Agency (SIDA) Additional Financing – Mwangaza Mashinani Maisha Bora Project (Energy Plus Cash Pilot). Kenya 2018 to estimate the project budget and DFAM Expenditure Listing Summary Report till September 2020 and additional information on staff costs shared by UNICEF's team to estimate the project expenditures by activity. Estimates of spending by activity relies on assumptions because the DFAM Expenditure Listing Summary Report reports costs by cost item rather than activity. Assumptions follow:

- Spend on Cash transfer to beneficiaries: total value of transfers to beneficiaries, including Bank charges and Mpesa charges.
- Inception phase: total cost incurred before June 2019, excluding evaluation activities; transfers to beneficiaries (pilot cycle in April 2019), E4I's contractual services, UNICEF staff costs;
- Community level activities and Cost of implementing partner: total value of contractual services provided by the consortium partner.
- Field monitoring: costs incurred after May 2019, excluding UNICEF staff costs, transfers to beneficiaries and contractual services provided by E4I and OPM;
- Procurement of a Certified research institution including baseline, midlines and endline surveys: total value of contractual services provided by OPM;
- UNICEF technical assistance and QA: total UNICEF staff and other personnel costs derived from information on staff costs shared by UNICEF Social Protection Specialist.

Figure 46: Trend analysis staff cost (total staff cost per month)



Staff costs are generally below the expected benchmark, derived by UNICEF budget allocation for TA, QA and support to project implementation. Staff costs are lower in August-October 2019 because one social protection specialist left and his role was vacant for three months. The position of chief of social policy was also vacant for 10 months from November 2019 to September 2020. The increase in costs in February 2020 is attributable to the expansion of the project team. In fact, the project team hired a new staff member in January 2020. Staff costs increase again in April 2020 because the project hired new personnel to coordinate the last two payment cycles and facilitate transition to the second phase of the pilot in both counties

ANNEX I STATISTICAL TABLES

Results presented in this Annex are for the group of treatment households that were intended to be treated and successfully interviewed at endline, except for the indicators on condition and maintenance of the solar device that are reported on the sub-sample of households that were actually treated.

I.1 Population Characteristics

Table 11: Household characteristics at endline (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	
Resides in Kilifi (%)	567	66.7	66.3	67.1	.	.	.	.	.	.	.	.	.
Resides in Garissa (%)	567	33.3	32.9	33.7	.	.	.	.	.	.	.	.	.
Receives CT-OVC (%)	566	47.9	45.1	50.6	378	47.9	44.7	51.1	188	47.9	42.5	53.2	0
Receives OP-CT (%)	566	47.7	44.9	50.5	378	48.7	45.4	52	188	45.7	40.5	51	2.9
Receives PWSD-CT (%)	566	1.9	0.8	3.1	378	2.1	0.7	3.5	188	1.6	-0.2	3.4	0.5
Does not receive regular cash transfer (%)	566	2.8	1.5	4.2	378	1.9	0.5	3.2	188	4.8	1.7	7.8	-2.9*
Household head is male (%)	567	42.7	39.3	46.1	378	40.5	36.6	44.4	189	47.1	40.6	53.6	-6.6*
Number of household members (mean)	567	7	6.7	7.3	378	7.5	7.2	7.9	189	5.9	5.6	6.2	1.6***
Dependency Ratio (mean)	552	1.6	1.5	1.7	371	1.4	1.3	1.6	181	1.9	1.7	2.1	-0.5***
Number of female household members (mean)	567	3.8	3.6	4	378	4.2	3.9	4.4	189	3.1	2.9	3.3	1.1***

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 12: Household characteristics at endline (Household level indicators) – continued

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI		N	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	
Resides in Kilifi (%)	242	63.2	59.3	67.2	325	69.2	66.3	72.2	-6.0*	272	66.5	63.8	69.3	268	67.9	65.2	70.6	-1.4
Resides in Garissa (%)	242	36.8	32.8	40.7	325	30.8	27.8	33.7	6.0*	272	33.5	30.7	36.2	268	32.1	29.4	34.8	1.4
Receives CT-OVC (%)	241	30.3	25.6	35	325	60.9	56.6	65.2	-30.6***	.	.	.	.	.	.	.	.	.
Receives OP-CT (%)	241	65.1	60.2	70.1	325	34.8	30.6	38.9	30.4***	.	.	.	.	.	.	.	.	.
Receives PWSD-CT (%)	241	2.1	0.3	3.8	325	1.8	0.4	3.3	0.2	.	.	.	.	.	.	.	.	.
Does not receive regular cash transfer (%)	241	2.5	0.5	4.4	325	3.1	1.2	4.9	-0.6	.	.	.	.	.	.	.	.	.
Household head is male (%)	.	.	.	.	.	.	.	.	.	272	27.2	22.6	31.8	268	58.6	53.4	63.7	-31.4***

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Number of household members (mean)	242	7.7	7.3	8.2	325	6.5	6.1	6.8	1.3***	272	6.4	6.1	6.7	268	7.6	7.1	8	-1.2***
Dependency Ratio (mean)	238	1.7	1.5	1.9	314	1.5	1.4	1.7	0.2	270	1.4	1.2	1.5	256	1.8	1.6	2	-0.4***
Number of female household members (mean)	242	3.8	3.6	4.1	325	3.8	3.6	4	0	272	3.6	3.3	3.8	268	4.1	3.8	4.3	-0.5***

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

I.2 Exposure to project operations

Table 13: Solar device condition, maintenance, and use at endline (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Type of solar device-D.light	383	50.9	45.9	55.9	271	54.2	48.3	60.2	112	42.9	33.6	52.1	11.4**
Type of solar device-Biolite	383	48.6	43.5	53.6	271	45.4	39.5	51.3	112	56.3	46.8	65.7	-10.9*
Type of solar device-Sun King	383	0.5	-0.2	1.2	271	0.4	-0.3	1.1	112	0.9	-0.9	2.6	-0.5
Household still has a solar device	383	98.2	96.8	99.5	271	98.5	97.1	100	112	97.3	94.3	100.3	1.2
Reason for no solar device- Sold device for cash	7	0			4	0			3	0			0
Reason for no solar device- Gave away the device	7	14.3	-149.7	178.2	4	0			3	33.3	-312.4	379	-33.3
Reason for no solar device- Lent the device for cash	7	0			4	0			3	0			0
Reason for no solar device- Device was stolen	7	57.1	-153.5	267.7	4	100			3	0			100
Reason for no solar device- Device was broken and I threw it away	7	28.6	-175.5	232.7	4	0			3	66.7	-279	412.4	-66.7
Reason for no solar device- Device was repossessed for lack of payment	7	0			4	0			3	0			0
Reason for no solar device- Device was used as collateral and taken	7	0			4	0			3	0			0
Reason for no solar device- Other	7	0			4	0			3	0			0
Device is fully working	376	57.4	52.6	62.3	267	59.9	54.2	65.7	109	51.4	42.2	60.5	8.5
Device is partially working	376	17.3	13.5	21	267	21	16.1	25.8	109	8.3	3.3	13.2	12.7***
Device is not working at all	376	25.3	21	29.5	267	19.1	14.5	23.7	109	40.4	31.2	49.6	-21.3***
Days since device has been completely not working	160	205.3	185.3	225.3	107	183.2	159.7	206.8	53	249.7	212.3	287.1	-66.5***
Parts of the device not working: Battery	160	15.6	10	21.2	107	22.4	14.2	30.6	53	1.9	-1.8	5.6	20.5***
Parts of the device not working: Wires	160	23.1	16.6	29.7	107	29.9	20.9	38.9	53	9.4	1.6	17.2	20.5***
Parts of the device not working: Lamp/Bulb	160	20	14	26	107	28	19.4	36.7	53	3.8	-1.5	9	24.3***

Parts of the device not working: Solar panels	160	1.3	-0.5	3	107	0.9	-0.9	2.8	53	1.9	-1.8	5.6	-1
Parts of the device not working: Switches	160	3.1	0.4	5.8	107	4.7	0.6	8.7	53	0			4.7**
Parts of the device not working: Charge controller	160	5	1.7	8.3	107	6.5	2	11.1	53	1.9	-1.8	5.6	4.7
Parts of the device not working: USB charging	160	5.6	2	9.3	107	4.7	0.6	8.7	53	7.5	0.1	15	-2.9
Parts of the device not working: Radio	160	6.9	3	10.8	107	10.3	4.5	16.1	53	0			10.3***
Parts of the device not working: Phone charging cables	160	1.9	-0.3	4	107	1.9	-0.7	4.5	53	1.9	-1.8	5.6	0
Parts of the device not working: Base unit	160	5.6	2.1	9.2	107	8.4	3.1	13.7	53	0			8.4***
Parts of the device not working: switched off for lack of payment	160	23.1	17.3	28.9	107	9.3	3.8	14.9	53	50.9	37.3	64.6	-41.6***
Parts of the device not working: Others	160	3.1	0.4	5.8	107	1.9	-0.6	4.4	53	5.7	-0.8	12.1	-3.8
Parts of the device not working: Don't know	160	11.9	6.9	16.9	107	6.5	1.8	11.3	53	22.6	11.1	34.2	-16.1**
Device will require repair to fully function again	95	24.2	15.9	32.5	51	33.3	20.9	45.8	44	13.6	3	24.3	19.7**
Device will require replacement to fully function again	95	20	12.4	27.6	51	33.3	20.3	46.3	44	4.5	-1.9	10.9	28.8***
Dont know if device needs to be replaced or repaired to fully function again	95	55.8	46.8	64.8	51	33.3	20	46.7	44	81.8	70	93.6	-48.5***
Household intends to repair their faulty solar device (requiring repair)	141	53.2	45.7	60.6	90	67.8	58.1	77.4	51	27.5	15.8	39.1	40.3***
Reason for not repairing: I cannot afford the repair costs	51	39.2	25.5	52.9	21	57.1	32.3	82	30	26.7	11.7	41.6	30.5**
Reason for not repairing: I don't have the time to take my device for repair	51	0			21	0			30	0			0
Reason for not repairing: no convenient or close place to take device for repair	51	3.9	-1.6	9.4	21	9.5	-3.6	22.6	30	0			9.5
Reason for not repairing: Don't know where to go for repair	51	7.8	-0.1	15.8	21	9.5	-4.2	23.2	30	6.7	-2.9	16.2	2.9
Reason for not repairing: Don't value having device given its low light quality	51	2	-2	5.9	21	4.8	-4.9	14.4	30	0			4.8
Reason for not repairing: Don't value having device given its difficulty to maintain	51	0			21	0			30	0			0
Reason for not repairing: Device was switched off for lack of payment	51	45.1	32.1	58.1	21	14.3	-1.8	30.3	30	66.7	48.8	84.5	-52.4***
Reason for not repairing: Other	51	2	-2	5.9	21	4.8	-4.9	14.4	30	0			4.8
Repair person: I or other household members will do it ourselves	90	1.1	-1.1	3.3	69	1.4	-1.4	4.3	21	0			1.4
Repair person: Friends/family/neighbour	90	2.2	-0.8	5.2	69	2.9	-1	6.8	21	0			2.9
Repair person: Solar provider I got the device from	90	28.9	19.1	38.7	69	27.5	16.5	38.6	21	33.3	12	54.7	-5.8
Repair person: BWC	90	0			69	0			21	0			0
Repair person: Chief	90	0			69	0			21	0			0
Repair person: Community Champion	90	24.4	15.4	33.5	69	30.4	19.1	41.7	21	4.8	-4.8	14.3	25.7***

Repair person: Local technician/shop	90	22.2	13.5	31	69	23.2	13.2	33.2	21	19	1	37.1	4.1
Repair person: Other	90	2.2	-0.9	5.3	69	0			21	9.5	-3.4	22.4	-9.5
Repair person: Don't know	90	18.9	10.8	27	69	14.5	6.1	22.9	21	33.3	12.8	53.9	-18.8*
Household don't know repair cost of solar device (intend to repair)	90	76.7	68.1	85.3	69	69.6	58.4	80.7	21	100			-30.4***
Household intends to replace faulty solar device (requiring replacement)	19	26.3	1	51.6	17	29.4	1.5	57.3	2	0			29.4**
Households do not know how much the replacement would cost (intend to replace)	8	87.5	38.6	136.4	6	83.3	21.2	145.4	2	100			-16.7
Households have needed to repair the device at some point since getting it	382	43.2	38.4	48	271	50.2	44.3	56.1	111	26.1	18.2	34.1	24.1***
# times households have needed to repair the device since getting it	382	0.6	0.5	0.7	271	0.7	0.6	0.9	111	0.3	0.2	0.4	0.5***
Households have needed to repair the device since getting it: 0 times	382	56.8	52	61.6	271	49.8	43.9	55.7	111	73.9	65.9	81.8	-24.1***
Households have needed to repair the device since getting it: 1 time	382	32.5	27.8	37.1	271	35.4	29.8	41.1	111	25.2	17.3	33.1	10.2**
Households have needed to repair the device since getting it: 2+ times	382	10.7	7.7	13.7	271	14.8	10.6	18.9	111	0.9	-0.9	2.7	13.9***
Source for repair of solar device: Friends/family/neighbour	47	31.9	17.7	46.1	42	35.7	19.9	51.5	5	0			35.7***
Source for repair of solar device: Solar provider	47	19.1	7.3	31	42	19	6.8	31.3	5	20	-21.3	61.3	-1
Source for repair of solar device: BWC	47	2.1	-2.2	6.4	42	2.4	-2.4	7.2	5	0			2.4
Source for repair of solar device: Chief	47	0			42	0			5	0			0
Source for repair of solar device: Community Champion	47	23.4	10.8	36	42	23.8	10.6	37	5	20	-21.3	61.3	3.8
Source for repair of solar device: Local technician/shop	47	23.4	9.9	36.9	42	19	6.1	32	5	60	0.4	119.6	-41
Source for repair of solar device: Other	47	0			42	0			5	0			0
Components most commonly faulty: Battery	70	12.9	4.8	20.9	65	12.3	4.2	20.4	5	20	-20.8	60.8	-7.7
Components most commonly faulty: Wires	70	55.7	44.1	67.4	65	58.5	46.4	70.5	5	20	-20.8	60.8	38.5*
Components most commonly faulty: Lamp/bulb	70	20	10.3	29.7	65	20	10.1	29.9	5	20	-20.8	60.8	0
Components most commonly faulty: Solar panel	70	0			65	0			5	0			0
Components most commonly faulty: Switches	70	1.4	-1.4	4.3	65	1.5	-1.5	4.6	5	0			1.5
Components most commonly faulty: Charge controller	70	0			65	0			5	0			0
Components most commonly faulty: USB charging	70	5.7	0	11.4	65	4.6	-0.7	9.9	5	20	-20.8	60.8	-15.4
Components most commonly faulty: Radio	70	5.7	0.4	11.1	65	4.6	-0.2	9.5	5	20	-20.8	60.8	-15.4
Components most commonly faulty: Phone charging	70	4.3	-0.7	9.2	65	3.1	-1.3	7.4	5	20	-20.8	60.8	-16.9

Components most commonly faulty: Base unit/token unit	70	4.3	-0.7	9.2	65	3.1	-1.3	7.4	5	20	-20.8	60.8	-16.9
Components most commonly faulty: Other	70	1.4	-1.4	4.3	65	1.5	-1.5	4.6	5	0			1.5
Spent 0 on repairs to date (for those who had to repair)	59	66.1	54.5	77.7	55	70.9	58.9	82.9	4	0			70.9***
Households incurred additional costs related to device beside repayment&repair	382	12.3	9.1	15.5	271	11.1	7.5	14.7	111	15.3	8.7	21.9	-4.2
Additional expense- Transport costs to top up the device	45	84.4	76.9	92	28	82.1	72.6	91.6	17	88.2	76	100.5	-6.1
Additional expense- Transport costs to repair the device	44	9.1	-0.2	18.4	27	7.4	-3.3	18.1	17	11.8	-5.4	28.9	-4.4
Additional expense- Installation costs (e.g. roof work and wiring)	46	21.7	9.4	34.1	29	27.6	11	44.2	17	11.8	-5.3	28.8	15.8
Additional expense- Extra fees paid to top up the device	47	34	21.8	46.3	30	46.7	30.5	62.8	17	11.8	-5.3	28.8	34.9***
Additional expense- Other	45	0			28	0			17	0			0
Total amount spent on installation costs	382	7.6	1.5	13.7	271	10	1.5	18.4	111	1.8	-1.7	5.3	8.2*
Total amount spent on extra fee to top up the device	382	89.5	30.9	148.1	271	98.3	29.1	167.6	111	68	-42	178	30.3
Total amount spent on transport cost to top up the device	382	605.5	359.2	851.8	271	747.4	404.6	1090.3	111	259	125.7	392.3	488.4***
Total amount spent on transport cost to repair the device	382	6	-0.4	12.4	271	5.2	-2.6	12.9	111	8.1	-3.2	19.4	-2.9
Households willing to repair device if it requires a substantial repair	214	50.5	43.6	57.3	160	50.6	42.9	58.3	54	50	35.5	64.5	0.6
Reason for not repairing device-I cannot afford the repair costs	106	97.2	93.9	100.4	79	96.2	91.9	100.5	27	100			-3.8*
Reason for not repairing device-I don't have time to take device for repair	106	3.8	0.1	7.4	79	3.8	-0.4	8	27	3.7	-3.7	11.1	0.1
Reason for not repairing device- No convenient place to take device for repair	106	0.9	-0.9	2.8	79	0			27	3.7	-3.7	11.1	-3.7
Reason for not repairing device-Don't know where to go for repair	106	0.9	-0.9	2.8	79	1.3	-1.2	3.8	27	0			1.3
Reason for not repairing device-Don't value device given low light quality	106	0			79	0			27	0			0
Reason for not repairing device-Don't value device given difficulty to operate	106	0			79	0			27	0			0
Reason for not repairing device- Other	106	1.9	-0.7	4.4	79	2.5	-0.9	5.9	27	0			2.5
Source of repair funds: I will use money from my income	109	63.3	54.1	72.5	81	60.5	49.7	71.3	28	71.4	54.2	88.7	-10.9
Source of repair funds: I will use money from my existing savings	109	17.4	11	23.9	81	9.9	3.9	15.9	28	39.3	20.8	57.8	-29.4***
Source of repair funds: I will have to wait longer until I have saved the money	109	19.3	12	26.6	81	21	12.3	29.7	28	14.3	1	27.6	6.7
Source of repair funds:I will borrow the money	109	21.1	13.2	29	81	23.5	13.9	33	28	14.3	1.3	27.3	9.2

Source of repair funds: I will have to sell another asset	109	7.3	2.4	12.3	81	8.6	2.4	14.9	28	3.6	-3.3	10.4	5.1
Source of repair funds: Other	109	2.8	-0.4	5.9	81	3.7	-0.5	7.9	28	0			3.7*
Households willing to repair device if it requires a minor repair	215	89.3	85.1	93.5	160	88.1	83.1	93.2	55	92.7	85.9	99.6	-4.6
Reason for not repairing device- I cannot afford the repair costs	23	100			19	100			4	100			0
Reason for not repairing device- I don't have time to take device for repair	23	4.3	-4.7	13.4	19	0			4	25	-17.7	67.7	-25
Reason for not repairing device- No convenient place to take device for repair	23	4.3	-4.7	13.4	19	0			4	25	-17.7	67.7	-25
Reason for not repairing device- Don't know where to go for repair	23	4.3	-4.7	13.4	19	0			4	25	-17.7	67.7	-25
Reason for not repairing device- Don't value device given low light quality	23	0			19	0			4	0			0
Reason for not repairing device- Don't value device given difficulty to operate	23	0			19	0			4	0			0
Reason for not repairing device- Other	23	0			19	0			4	0			0
Source of financing minor repair: I will use money from my income	192	63	56.1	70	141	61.7	53.7	69.7	51	66.7	52.9	80.4	-5
Source of financing minor repair: I will use money from my existing savings	192	15.1	10.3	19.9	141	13.5	8.1	18.9	51	19.6	9.5	29.7	-6.1
Source of financing minor repair: I will have to wait until I have saved money	192	17.7	12.3	23.1	141	16.3	10.3	22.3	51	21.6	9.8	33.3	-5.3
Source of financing minor repair: I will borrow the money	192	16.7	11.5	21.9	141	17.7	11.3	24.1	51	13.7	5.4	22.1	4
Source of financing minor repair: I will have to sell another asset	192	3.1	0.7	5.6	141	4.3	0.9	7.6	51	0			4.3**
Source of financing minor repair: Other	192	1.6	-0.2	3.3	141	2.1	-0.2	4.5	51	0			2.1*
Household willing to replace device if it breaks and pay full price upfront	350	3.4	1.5	5.3	241	3.7	1.3	6.1	109	2.8	-0.4	5.9	1
Household willing to replace device if it breaks & pay full price 1yr instalment	353	22.1	17.9	26.3	244	24.6	19.3	29.9	109	16.5	9.9	23.1	8.1*
Household willing to replace device if it breaks & pay full price 2yr instalment	360	48.3	43.3	53.4	251	53	46.9	59.1	109	37.6	28.7	46.5	15.4***
Source of financing to pay upfront-I will use money from my income	13	53.8	22.5	85.2	10	60	34.5	85.5	3	33.3	-53.3	119.9	26.7
Source of financing to pay upfront-I will use money from my existing savings	13	15.4	-18	48.7	10	10	-22.4	42.4	3	33.3	-53.3	119.9	-23.3
Source of financing to pay upfront-I will have to wait until I have saved money	13	0			10	0			3	0			0
Source of financing to pay upfront-I will borrow the money	13	30.8	-9.2	70.7	10	40	-11.7	91.7	3	0			40.0*
Source of financing to pay upfront-I will have to sell another asset	13	38.5	-8.8	85.7	10	40	-15.5	95.5	3	33.3	-53.3	119.9	6.7
Source of financing to pay upfront- other	13	0			10	0			3	0			0
Source of financing to pay instal-I will use money from my income	237	62	55.9	68.2	182	63.2	56.1	70.3	55	58.2	45.9	70.5	5

Source of financing to pay instal-I will use money from my existing savings	237	16.9	12.2	21.5	182	12.1	7.4	16.7	55	32.7	19.9	45.6	-20.6***
Source of financing to pay instal-I will have to wait until I have saved money	237	21.9	16.8	27.1	182	24.2	18	30.3	55	14.5	5.7	23.4	9.6*
Source of financing to pay instal-I will borrow the money	237	16.5	11.9	21.1	182	18.1	12.5	23.7	55	10.9	4.1	17.8	7.2
Source of financing to pay instal-I will have to sell another asset	237	15.6	11	20.2	182	12.6	7.8	17.5	55	25.5	13.6	37.3	-12.8**
Source of financing to pay instal- other	237	2.5	0.5	4.5	182	3.3	0.7	5.9	55	0			3.3**
Reason not willing to pay for replacing-I cannot afford it	40	100			27	100			13	100			0
Reason not willing to pay for replacing-No convenient place to purchase new one	40	0			27	0			13	0			0
Reason not willing to pay for replacing-Don't know where to purchase new one	40	2.5	-2.6	7.6	27	3.7	-3.9	11.3	13	0			3.7
Reason not willing to pay for replacing-Don't value device- low light quality	40	0			27	0			13	0			0
Reason not willing to pay for replacing-Don't value device- difficult to operate	40	0			27	0			13	0			0
Reason not willing to pay for replacing-Do not need electricity	40	0			27	0			13	0			0
Reason not willing to pay for replacing-Other	40	0			27	0			13	0			0
HH would buy additional solar device that is more powerful [willing to replace]	238	51.3	45.1	57.5	183	52.5	45.3	59.7	55	47.3	35.3	59.2	5.2
Lifespan of the solar device reported by the household	215	6.5	5.9	7	163	6.6	5.9	7.2	52	6.2	5.5	6.9	0.4
Household does not know lifespan of the solar device	382	43.7	38.8	48.6	271	39.9	34.1	45.6	111	53.2	43.7	62.7	-13.3**
Household reports fully owning the solar device	375	80.3	76.5	84	267	89.5	85.9	93.1	108	57.4	48	66.9	32.1***
Solar device impact on safety- Yes, Improved	382	85.3	81.9	88.7	271	90.8	87.4	94.2	111	72.1	63.9	80.3	18.7***
Solar device impact on safety- Yes, worsened	382	0.3	-0.2	0.8	271	0.4	-0.3	1.1	111	0			0.4
Solar device impact on safety- No change	382	14.4	11	17.8	271	8.9	5.5	12.2	111	27.9	19.7	36.1	-19.1***
Presence of pests or wild animals- Yes, deterred them	382	65.7	61	70.4	271	68.6	63.2	74.1	111	58.6	49.2	67.9	10.1*
Presence of pests or wild animals- Yes, attracted them	382	17	13.4	20.7	271	20.7	15.9	25.4	111	8.1	3.2	13	12.6***
Presence of pests or wild animals- No change	382	17.3	13.6	20.9	271	10.7	7	14.4	111	33.3	24.5	42.2	-22.6***
Change in opportunities for socialistaion-Yes improved	382	81.7	77.9	85.4	271	87.5	83.5	91.4	111	67.6	58.9	76.2	19.9***
Change in opportunities for socialistaion-Yes, worsened	382	0.3	-0.2	0.8	271	0.4	-0.3	1.1	111	0			0.4

Change in opportunities for socialistaion- Not changed	382	18.1	14.4	21.8	271	12.2	8.3	16	111	32.4	23.8	41.1	-20.3***
Access to general information-Yes improved	382	71.2	66.7	75.7	271	74.2	69	79.4	111	64	55.1	72.8	10.2*
Access to general information-Yes, worsened	382	0.5	-0.2	1.2	271	0.4	-0.3	1.1	111	0.9	-0.9	2.7	-0.5
Access to general information- Not changed	382	28.3	23.8	32.7	271	25.5	20.3	30.6	111	35.1	26.4	43.9	-9.7*
Status in the community-Yes improved	382	73	68.7	77.3	271	79	74.2	83.8	111	58.6	49.5	67.7	20.4***
Status in the community-Yes, worsened	382	0.5	-0.2	1.2	271	0			111	1.8	-0.7	4.3	-1.8
Status in the community-Not changed	382	26.4	22.1	30.7	271	21	16.2	25.8	111	39.6	30.6	48.7	-18.6***
Households earned additional income from using the MM solar device	383	15.7	12.2	19.1	271	21	16.3	25.8	112	2.7	-0.4	5.7	18.4***
Add income source- Renting out solar device to members in the community	60	1.7	-1.7	5	57	1.8	-1.8	5.3	3	0			1.8
Add income source- Having increased illuminated hours per day to work on IGAs	60	3.3	-1.3	8	57	1.8	-1.8	5.3	3	33.3	-21.3	88	-31.6
Add income source- Other	60	0			57	0			3	0			0
Add income source- Charging other households mobile phones	60	96.7	92	101.3	57	98.2	94.7	101.8	3	66.7	12	121.3	31.6
Households would recommend solar device to family and friends	382	93.7	91.4	96	271	95.2	92.7	97.7	111	90.1	85	95.2	5.1*
Community Champion in the area-Yes	382	58.6	54.4	62.8	271	74.2	69.1	79.3	111	20.7	13.5	27.9	53.4***
Community Champion in the area-No	382	28.5	24.3	32.8	271	19.2	14.5	23.8	111	51.4	42	60.7	-32.2***
Community Champion in the area-Dont know	382	12.8	9.6	16	271	6.6	3.7	9.6	111	27.9	19.6	36.3	-21.3***
Frequency of contacting CC-Never interacted or contacted them	210	18.1	13.1	23.1	188	14.9	9.9	19.9	22	45.5	24	66.9	-30.6***
Frequency of contacting CC-Once per week or more often	210	11.4	7.1	15.7	188	12.8	7.9	17.6	22	0			12.8***
Frequency of contacting CC-Every two weeks	210	6.7	3.3	10	188	7.4	3.7	11.2	22	0			7.4***
Frequency of contacting CC-Once per month	210	21.4	16	26.9	188	23.4	17.4	29.4	22	4.5	-4.4	13.5	18.9***
Frequency of contacting CC-Once every two months	210	15.2	10.4	20.1	188	14.9	9.8	20	22	18.2	1.7	34.7	-3.3
Frequency of contacting CC-Once every four months	210	2.4	0.3	4.4	188	2.1	0.1	4.2	22	4.5	-4.5	13.5	-2.4
Frequency of contacting CC-Less often than every four months	210	24.8	18.9	30.6	188	24.5	18.3	30.6	22	27.3	7.8	46.8	-2.8
Reason never contacted CC: Never had an issue to report	38	81.6	69	94.2	28	78.6	63.3	93.8	10	90	69.2	110.8	-11.4
Reason never contacted CC: Contact details are not available/don't know them	38	10.5	-0.3	21.4	28	10.7	-2	23.4	10	10	-10.8	30.8	0.7
Reason never contacted CC: I do not find them helpful	38	10.5	-0.3	21.4	28	7.1	-3.2	17.5	10	20	-9.9	49.9	-12.9

Reason never contacted CC: Prefer to contact someone else when I have issues	38	0			28	0			10	0			0
Reason never contacted CC: Other	38	2.6	-2.8	8	28	3.6	-3.8	10.9	10	0			3.6
Contacted anyone for issues faced with the device since Sep 2020 besides repair	382	31.4	26.9	35.9	271	36.2	30.6	41.7	111	19.8	12.2	27.5	16.3***
Reason for contacting someone: Issues related to device not working	120	59.2	50.8	67.6	98	65.3	55.7	75	22	31.8	16.1	47.6	33.5***
Reason for contacting someone: Issues related to how to use the device	120	7.5	2.7	12.3	98	7.1	2	12.3	22	9.1	-3.1	21.3	-1.9
Reason for contacting someone: Issues related to the payment for the device	120	35	26.8	43.2	98	27.6	18.7	36.4	22	68.2	48.7	87.7	-40.6***
Reason for contacting someone: Issues related to receiving top up from programme	120	11.7	6	17.3	98	10.2	4.4	16	22	18.2	1.7	34.6	-8
Reason for contacting someone: Other	120	2.5	-0.4	5.4	98	1	-1	3	22	9.1	-3.7	21.9	-8.1
Point of contact-Solar provider (Dlight, Biolite)	120	24.2	16.3	32.1	98	25.5	16.6	34.4	22	18.2	0.8	35.5	7.3
Point of contact- Mwangaza Mashinani programme staff	120	7.5	2.9	12.1	98	6.1	1.3	10.9	22	13.6	0.8	26.5	-7.5
Point of contact- Chief	120	15	9.9	20.1	98	3.1	-0.4	6.5	22	68.2	45.1	91.3	-65.1***
Point of contact- BWC	120	3.3	0.1	6.6	98	4.1	0.1	8	22	0			4.1**
Point of contact- Inua Jamii programme staff	120	5	1.1	8.9	98	2	-0.8	4.9	22	18.2	1.2	35.2	-16.1*
Point of contact- Community champion	120	63.3	55.3	71.3	98	71.4	62.2	80.6	22	27.3	11.8	42.7	44.2***
Point of contact- Family or friends or neighbours	120	4.2	0.6	7.8	98	5.1	0.7	9.5	22	0			5.1**
Point of contact- Other	120	0			98	0			22	0			0
Reason for not contacting anyone: Did not have any issues with device to report	262	72.5	67.4	77.7	173	77.5	71.6	83.3	89	62.9	52.9	72.9	14.5**
Reason for not contacting anyone: Didn't know who to contact	262	21	16.3	25.7	173	13.9	8.7	19	89	34.8	25.3	44.4	-21.0***
Reason for not contacting anyone: Do not find contacts helpful	262	5	2.3	7.6	173	6.4	2.7	10	89	2.2	-0.9	5.4	4.1*
Reason for not contacting anyone: No one available to help	262	5.7	3	8.5	173	6.4	2.7	10	89	4.5	0.5	8.5	1.9
Reason for not contacting anyone: Other (specify)	262	1.1	-0.2	2.4	173	1.7	-0.2	3.7	89	0			1.7*
Household have received any training/information by the program	382	39	34.6	43.4	271	51.7	45.8	57.5	111	8.1	3.3	13	43.6***
Training topics: Installation of the device	382	28.5	24.4	32.7	271	37.3	31.7	42.8	111	7.2	2.7	11.7	30.1***
Training topics: Maintenance and care of the device	382	26.4	22.3	30.6	271	35.1	29.5	40.6	111	5.4	1.3	9.5	29.6***
Training topics: Payment modalities	382	31.9	27.6	36.3	271	42.4	36.6	48.3	111	6.3	2.1	10.5	36.1***
Training topics: General use of solar device	382	33.2	28.9	37.6	271	43.9	38.1	49.7	111	7.2	2.6	11.8	36.7***
Training topics: Use of solar device for income generating activities	382	21.2	17.4	25	271	28	22.8	33.2	111	4.5	0.9	8.1	23.5***

Training topics: Other ways to promote & diversify livelihoods & increase income	382	13.6	10.3	16.9	271	17.7	13.3	22.1	111	3.6	0.4	6.8	14.1***
Training topics: Financial management including saving	382	11.3	8.2	14.3	271	14.4	10.3	18.5	111	3.6	0.4	6.8	10.8***
Training topics: Others	382	0			271	0			111	0			0
Household owns other solar device besides the one from the MM project	383	26.1	22	30.2	271	34.3	28.8	39.9	112	6.3	1.7	10.8	28.1***

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 14: Solar device condition, maintenance, and use at endline (Household level indicators) – continued

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Type of solar device-D.light	155	51	43.1	58.8	228	50.9	44.5	57.3	0.1	202	52	45.1	58.8	171	49.7	42.2	57.2	2.3
Type of solar device-Biolite	155	48.4	40.5	56.2	228	48.7	42.3	55.1	-0.3	202	48	41.2	54.9	171	49.1	41.6	56.6	-1.1
Type of solar device-Sun King	155	0.6	-0.6	1.9	228	0.4	-0.4	1.3	0.2	202	0			171	1.2	-0.4	2.8	-1.2
Household still has a solar device	155	98.1	95.9	100.2	228	98.2	96.5	99.9	-0.2	202	98	96.1	99.9	171	98.2	96.3	100.2	-0.2
Reason for no solar device-Sold device for cash	3	0			4	0			0	4	0			3	0			0
Reason for no solar device-Gave away the device	3	0			4	25	-250	300	-25	4	0			3	33.3	-312.4	379	-33.3
Reason for no solar device-Lent the device for cash	3	0			4	0			0	4	0			3	0			0
Reason for no solar device-Device was stolen	3	66.7	-279	412.4	4	50	-267.5	367.5	16.7	4	50	-267.5	367.5	3	66.7	-279	412.4	-16.7
Reason for no solar device-Device was broken and I threw it away	3	33.3	-312.4	379	4	25	-250	300	8.3	4	50	-267.5	367.5	3	0			50
Reason for no solar device-Device was repossessed for lack of payment	3	0			4	0			0	4	0			3	0			0
Reason for no solar device-Device was used as collateral and taken	3	0			4	0			0	4	0			3	0			0
Reason for no solar device-Other	3	0			4	0			0	4	0			3	0			0
Device is fully working	152	57.9	50.1	65.7	224	57.1	50.8	63.5	0.8	198	56.1	49.3	62.8	168	59.5	52.1	66.9	-3.5
Device is partially working	152	13.2	7.9	18.5	224	20.1	14.9	25.3	-6.9*	198	19.7	14.3	25.1	168	13.7	8.5	18.9	6
Device is not working at all	152	28.9	21.9	36	224	22.8	17.4	28.1	6.2	198	24.2	18.4	30.1	168	26.8	20.2	33.4	-2.5
Days since device has been completely not working	64	202.6	170.6	234.6	96	207	181.9	232.1	-4.4	87	196.7	169.4	224.1	68	214.3	184.5	244	-17.5
Parts of the device not working: Battery	64	12.5	4.5	20.5	96	17.7	10.3	25.1	-5.2	87	13.8	6.4	21.2	68	17.6	8.6	26.7	-3.9
Parts of the device not working: Wires	64	18.8	9	28.5	96	26	17.4	34.7	-7.3	87	25.3	16	34.6	68	17.6	8.7	26.6	7.6

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Parts of the device not working: Lamp/Bulb	64	20.3	11.1	29.5	96	19.8	11.7	27.8	0.5	87	21.8	13.1	30.5	68	17.6	8.8	26.5	4.2
Parts of the device not working: Solar panels	64	1.6	-1.5	4.6	96	1	-1	3.1	0.5	87	0			68	2.9	-1.1	7	-2.9
Parts of the device not working: Switches	64	3.1	-1.2	7.5	96	3.1	-0.3	6.6	0	87	2.3	-0.8	5.4	68	4.4	-0.6	9.4	-2.1
Parts of the device not working: Charge controller	64	6.3	0.5	12	96	4.2	0.1	8.2	2.1	87	3.4	-0.4	7.3	68	7.4	1.5	13.2	-3.9
Parts of the device not working: USB charging	64	4.7	-0.5	9.9	96	6.3	1.4	11.1	-1.6	87	5.7	0.8	10.7	68	5.9	0.1	11.7	-0.1
Parts of the device not working: Radio	64	3.1	-1.2	7.4	96	9.4	3.6	15.1	-6.2*	87	8	2.4	13.7	68	5.9	0.2	11.6	2.2
Parts of the device not working: Phone charging cables	64	3.1	-1.2	7.5	96	1	-1	3.1	2.1	87	2.3	-0.9	5.5	68	1.5	-1.4	4.4	0.8
Parts of the device not working: Base unit	64	6.3	0.3	12.2	96	5.2	0.8	9.7	1	87	5.7	0.9	10.6	68	5.9	0.3	11.5	-0.1
Parts of the device not working: switched off for lack of payment	64	28.1	18.2	38	96	19.8	12.9	26.7	8.3	87	18.4	10.9	25.9	68	29.4	19.9	38.9	-11.0*
Parts of the device not working: Others	64	4.7	-0.5	9.9	96	2.1	-0.8	5	2.6	87	3.4	-0.4	7.3	68	2.9	-1.2	7.1	0.5
Parts of the device not working: Don't know	64	12.5	4.9	20.1	96	11.5	4.9	18	1	87	14.9	7.3	22.6	68	8.8	2.6	15.1	6.1
Device will require repair to fully function again	44	22.7	10.8	34.6	51	25.5	13.4	37.6	-2.8	48	29.2	17	41.4	45	17.8	6.4	29.2	11.4
Device will require replacement to fully function again	44	20.5	8.9	32	51	19.6	8.9	30.3	0.8	48	20.8	10.2	31.5	45	20	8.3	31.7	0.8
Dont know if device needs to be replaced or repaired to fully function again	44	56.8	42.8	70.8	51	54.9	41.5	68.3	1.9	48	50	36.9	63.1	45	62.2	48.3	76.2	-12.2
Household intends to repair their faulty solar device (requiring repair)	55	56.4	43.3	69.4	86	51.2	41.3	61.1	5.2	77	55.8	45.8	65.9	59	50.8	38.3	63.4	5
Reason for not repairing: I cannot afford the repair costs	19	26.3	6.2	46.4	32	46.9	29	64.8	-20.6	25	48	28.9	67.1	23	30.4	9.6	51.3	17.6
Reason for not repairing: I don't have the time to take my device for repair	19	0			32	0			0	25	0			23	0			0
Reason for not repairing: no convenient or close place to take device for repair	19	0			32	6.3	-2.5	15	-6.2	25	0			23	4.3	-4.2	12.9	-4.3
Reason for not repairing: Don't know where to go for repair	19	10.5	-4.2	25.2	32	6.3	-2.5	15	4.3	25	8	-3.5	19.5	23	8.7	-3.5	20.9	-0.7
Reason for not repairing: Don't value having device given its low light quality	19	0			32	3.1	-3.2	9.5	-3.1	25	0			23	4.3	-4.6	13.3	-4.3

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Reason for not repairing: Don't value having device given its difficulty to main	19	0			32	0			0	25	0			23	0			0
Reason for not repairing: Device was switched off for lack of payment	19	57.9	38.1	77.7	32	37.5	22.9	52.1	20.4*	25	44	24.7	63.3	23	47.8	29	66.6	-3.8
Reason for not repairing: Other	19	5.3	-5.5	16.1	32	0			5.3	25	0			23	4.3	-4.6	13.3	-4.3
Repair person: I or other household members will do it ourselves	36	0			54	1.9	-1.8	5.5	-1.9	52	0			36	2.8	-2.7	8.3	-2.8
Repair person: Friends/family/neighbour	36	5.6	-1.7	12.8	54	0			5.6	52	3.8	-1.4	9.1	36	0			3.8
Repair person: Solar provider I got the device from	36	36.1	19.8	52.4	54	24.1	12.3	35.8	12	52	30.8	17.4	44.1	36	25	10.3	39.7	5.8
Repair person: BWC	36	0			54	0			0	52	0			36	0			0
Repair person: Chief	36	0			54	0			0	52	0			36	0			0
Repair person: Community Champion	36	19.4	6.5	32.4	54	27.8	15.7	39.9	-8.3	52	26.9	14.6	39.2	36	22.2	8.2	36.3	4.7
Repair person: Local technician/shop	36	22.2	9.1	35.4	54	22.2	10.7	33.7	0	52	23.1	11.8	34.4	36	22.2	7.9	36.5	0.9
Repair person: Other	36	2.8	-2.7	8.3	54	1.9	-1.8	5.5	0.9	52	1.9	-1.8	5.7	36	2.8	-2.6	8.2	-0.9
Repair person: Don't know	36	13.9	2.4	25.4	54	22.2	11.2	33.3	-8.3	52	13.5	4.3	22.6	36	25	10.1	39.9	-11.5
Household don't know repair cost of solar device (intend to repair)	36	83.3	71.5	95.1	54	72.2	60.2	84.2	11.1	52	69.2	56.4	82	36	86.1	74.5	97.7	-16.9*
Household intends to replace faulty solar device (requiring replacement)	9	33.3	-7.8	74.4	10	20	-8.6	48.6	13.3	10	30	-4.7	64.7	9	22.2	-13.2	57.7	7.8
Households do not know how much the replacement would cost (intend to replace)	4	75	-18.1	168.1	4	100			-25	5	100			3	66.7	-50.4	183.7	33.3
Households have needed to repair the device at some point since getting it	154	41.6	34	49.1	228	44.3	38.1	50.5	-2.7	201	45.3	38.6	52	171	40.4	33.3	47.4	4.9
# times households have needed to repair the device since getting it	154	0.6	0.4	0.8	228	0.6	0.5	0.7	0	201	0.6	0.5	0.7	171	0.6	0.4	0.8	0
Households have needed to repair the device since getting it: 0 times	154	58.4	50.9	66	228	55.7	49.5	61.9	2.7	201	54.7	48	61.4	171	59.6	52.6	66.7	-4.9
Households have needed to repair the device since getting it: 1 time	154	30.5	23.4	37.7	228	33.8	27.7	39.8	-3.3	201	32.3	25.9	38.7	171	31.6	24.8	38.4	0.8
Households have needed to repair the device since getting it: 2+ times	154	11	6.1	16	228	10.5	6.6	14.4	0.5	201	12.9	8.5	17.3	171	8.8	4.6	13	4.2

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Source for repair of solar device: Friends/family/neighbour	22	36.4	14.2	58.5	25	28	9.7	46.3	8.4	26	30.8	13.2	48.4	21	33.3	11.7	55	-2.6
Source for repair of solar device: Solar provider	22	18.2	0.9	35.5	25	20	4.2	35.8	-1.8	26	23.1	6	40.1	21	14.3	-2.1	30.7	8.8
Source for repair of solar device: BWC	22	0			25	4	-4.1	12.1	-4	26	0			21	4.8	-4.7	14.3	-4.8
Source for repair of solar device: Chief	22	0			25	0			0	26	0			21	0			0
Source for repair of solar device: Community Champion	22	18.2	0.2	36.1	25	28	9.9	46.1	-9.8	26	23.1	7	39.1	21	23.8	2.7	44.9	-0.7
Source for repair of solar device: Local technician/shop	22	27.3	6.4	48.1	25	20	3.9	36.1	7.3	26	23.1	5.6	40.6	21	23.8	3.8	43.8	-0.7
Source for repair of solar device: Other	22	0			25	0			0	26	0			21	0			0
Components most commonly faulty: Battery	29	10.3	-0.9	21.6	41	14.6	3.6	25.7	-4.3	38	18.4	5.1	31.7	31	6.5	-2	14.9	12
Components most commonly faulty: Wires	29	51.7	34.7	68.7	41	58.5	43.2	73.9	-6.8	38	60.5	43.8	77.3	31	51.6	34.3	68.9	8.9
Components most commonly faulty: Lamp/bulb	29	17.2	3.2	31.3	41	22	8.9	35	-4.7	38	18.4	5.5	31.3	31	22.6	7.4	37.8	-4.2
Components most commonly faulty: Solar panel	29	0			41	0			0	38	0			31	0			0
Components most commonly faulty: Switches	29	0			41	2.4	-2.4	7.3	-2.4	38	0			31	3.2	-3.2	9.6	-3.2
Components most commonly faulty: Charge controller	29	0			41	0			0	38	0			31	0			0
Components most commonly faulty: USB charging	29	10.3	-1	21.7	41	2.4	-2.4	7.3	7.9	38	7.9	-1.1	16.9	31	3.2	-3.2	9.6	4.7
Components most commonly faulty: Radio	29	10.3	-1.5	22.2	41	2.4	-2.4	7.3	7.9	38	5.3	-1.2	11.8	31	3.2	-3.3	9.7	2
Components most commonly faulty: Phone charging	29	6.9	-2.9	16.7	41	2.4	-2.4	7.3	4.5	38	0			31	9.7	-1.1	20.5	-9.7*
Components most commonly faulty: Base unit/token unit	29	10.3	-1.3	21.9	41	0			10.3*	38	5.3	-2.1	12.6	31	3.2	-3.2	9.7	2
Components most commonly faulty: Other	29	0			41	2.4	-2.4	7.3	-2.4	38	2.6	-2.6	7.9	31	0			2.6
Spent 0 on repairs to date (for those who had to repair)	25	60	42.9	77.1	34	70.6	54.6	86.6	-10.6	34	61.8	45.5	78	24	70.8	52.6	89	-9.1
Households incurred additional costs related to device beside repayment&repair	154	11	6.2	15.9	228	13.2	8.8	17.5	-2.1	201	12.9	8.3	17.5	171	10.5	6.1	14.9	2.4
Additional expense- Transport costs to top up the device	17	94.1	82.2	106.1	28	78.6	68.7	88.5	15.5*	24	79.2	69.4	89	18	88.9	74.3	103.4	-9.7
Additional expense- Transport costs to repair the device	16	6.3	-6.2	18.7	28	10.7	-1.6	23	-4.5	23	8.7	-4	21.4	18	11.1	-4.8	27	-2.4

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Additional expense- Installation costs (e.g. roof work and wiring)	16	25	2.2	47.8	30	20	5.8	34.2	5	25	24	6.3	41.7	18	22.2	2	42.4	1.8
Additional expense- Extra fees paid to top up the device	17	41.2	19.6	62.8	30	30	14.2	45.8	11.2	26	38.5	20.8	56.1	18	27.8	5.6	50	10.7
Additional expense- Other	17	0			28	0			0	24	0			18	0			0
Total amount spent on installation costs	154	4.5	-0.6	9.7	228	9.6	0.1	19.2	-5.1	201	10.9	0.1	21.8	171	4.1	-0.5	8.7	6.9
Total amount spent on extra fee to top up the device	154	96.4	3.1	189.8	228	84.9	9.2	160.5	11.6	201	103	19.3	186.7	171	78.9	-7.6	165.5	24
Total amount spent on transport cost to top up the device	154	578.2	197.3	959.2	228	623.9	296.6	951.2	-45.7	201	624.4	272.1	976.7	171	469.6	157.4	781.7	154.8
Total amount spent on transport cost to repair the device	154	2.6	-2.5	7.7	228	8.3	-1.8	18.4	-5.7	201	4.5	-1.7	10.7	171	8.2	-4.1	20.5	-3.7
Households willing to repair device if it requires a substantial repair	87	54	43.5	64.6	127	48	39.2	56.9	6	110	50.9	41.4	60.4	99	48.5	38.3	58.7	2.4
Reason for not repairing device-I cannot afford the repair costs	40	97.5	92.6	102.4	66	97	92.7	101.2	0.5	54	98.1	94.5	101.8	51	96.1	90.6	101.6	2.1
Reason for not repairing device-I don't have time to take device for repair	40	5	-1.7	11.7	66	3	-1.2	7.3	2	54	1.9	-1.8	5.5	51	5.9	-0.7	12.4	-4
Reason for not repairing device- No convenient place to take device for repair	40	0			66	1.5	-1.5	4.5	-1.5	54	0			51	2	-1.9	5.9	-2
Reason for not repairing device-Don't know where to go for repair	40	0			66	1.5	-1.5	4.5	-1.5	54	0			51	2	-1.9	5.8	-2
Reason for not repairing device-Don't value device given low light quality	40	0			66	0			0	54	0			51	0			0
Reason for not repairing device-Don't value device given difficulty to operate	40	0			66	0			0	54	0			51	0			0
Reason for not repairing device- Other	40	0			66	3	-1	7.1	-3	54	0			51	3.9	-1.3	9.2	-3.9
Source of repair funds: I will use money from my income	47	66	52.3	79.6	62	61.3	48.9	73.6	4.7	56	62.5	49.4	75.6	49	63.3	49.3	77.2	-0.8
Source of repair funds: I will use money from my existing savings	47	10.6	2.9	18.3	62	22.6	12.3	32.8	-11.9*	56	14.3	5.3	23.2	49	20.4	9.4	31.4	-6.1
Source of repair funds: I will have to wait longer until I have saved the money	47	23.4	11.6	35.2	62	16.1	7	25.3	7.3	56	12.5	3.7	21.3	49	26.5	14.5	38.5	-14.0*

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Source of repair funds: I will borrow the money	47	17	6	28.1	62	24.2	13.9	34.5	-7.2	56	23.2	12.1	34.4	49	20.4	8.8	32.1	2.8
Source of repair funds: I will have to sell another asset	47	10.6	1.6	19.7	62	4.8	-0.5	10.2	5.8	56	10.7	2.6	18.8	49	4.1	-1.6	9.8	6.6
Source of repair funds: Other	47	4.3	-1.7	10.2	62	1.6	-1.6	4.8	2.6	56	3.6	-1.5	8.6	49	2	-2	6.1	1.5
Households willing to repair device if it requires a minor repair	87	88.5	81.7	95.3	128	89.8	84.6	95	-1.3	110	89.1	83.2	95	100	89	82.8	95.2	0.1
Reason for not repairing device- I cannot afford the repair costs	10	100			13	100			0	12	100			11	100			0
Reason for not repairing device- I don't have time to take device for repair	10	10	-10	30	13	0			10	12	0			11	9.1	-9.1	27.3	-9.1
Reason for not repairing device- No convenient place to take device for repair	10	10	-10	30	13	0			10	12	0			11	9.1	-9.1	27.3	-9.1
Reason for not repairing device- Don't know where to go for repair	10	10	-10	30	13	0			10	12	0			11	9.1	-9.1	27.3	-9.1
Reason for not repairing device- Don't value device given low light quality	10	0			13	0			0	12	0			11	0			0
Reason for not repairing device- Don't value device given difficulty to operate	10	0			13	0			0	12	0			11	0			0
Reason for not repairing device- Other	10	0			13	0			0	12	0			11	0			0
Source of financing minor repair: I will use money from my income	77	59.7	48.5	71	115	65.2	56.4	74	-5.5	98	66.3	57	75.7	89	58.4	48.1	68.8	7.9
Source of financing minor repair: I will use money from my existing savings	77	11.7	4.8	18.6	115	17.4	10.6	24.2	-5.7	98	14.3	7.4	21.1	89	15.7	8.5	23	-1.4
Source of financing minor repair: I will have to wait until I have saved money	77	18.2	9.7	26.7	115	17.4	10.4	24.4	0.8	98	16.3	9.1	23.5	89	20.2	11.7	28.8	-3.9
Source of financing minor repair: I will borrow the money	77	18.2	9.4	27	115	15.7	9	22.3	2.5	98	10.2	4.2	16.2	89	23.6	14.6	32.6	-13.4**
Source of financing minor repair: I will have to sell another asset	77	2.6	-1	6.2	115	3.5	0.1	6.8	-0.9	98	4.1	0.2	8	89	1.1	-1.1	3.3	3
Source of financing minor repair: Other	77	1.3	-1.3	3.9	115	1.7	-0.6	4.1	-0.4	98	1	-1	3	89	2.2	-0.8	5.3	-1.2
Household willing to replace device if it breaks and pay full price upfront	137	3.6	0.5	6.8	213	3.3	0.9	5.7	0.4	183	2.7	0.4	5.1	158	3.8	0.8	6.8	-1.1

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Household willing to replace device if it breaks & pay full price 1yr instalment	139	28.1	20.7	35.4	214	18.2	13.2	23.3	9.8**	185	15.7	10.5	20.9	159	28.3	21.4	35.2	-12.6***
Household willing to replace device if it breaks & pay full price 2yr instalment	143	48.3	40	56.5	217	48.4	41.9	54.9	-0.1	189	50.8	43.8	57.7	161	46	38.4	53.5	4.8
Source of financing to pay upfront-I will use money from my income	5	80	23.1	136.9	8	37.5	-12.7	87.7	42.5	6	50	-3	103	6	50	-3	103	0
Source of financing to pay upfront-I will use money from my existing savings	5	20	-36.9	76.9	8	12.5	-24	49	7.5	6	33.3	-37.4	104	6	0			33.3
Source of financing to pay upfront-I will have to wait until I have saved money	5	0			8	0			0	6	0			6	0			0
Source of financing to pay upfront-I will borrow the money	5	20	-36.9	76.9	8	37.5	-23.4	98.4	-17.5	6	16.7	-39.2	72.5	6	50	-3	103	-33.3
Source of financing to pay upfront-I will have to sell another asset	5	60	-9.7	129.7	8	25	-29.4	79.4	35	6	66.7	-4	137.4	6	16.7	-30.1	63.4	50
Source of financing to pay upfront- other	5	0			8	0			0	6	0			6	0			0
Source of financing to pay instal-I will use money from my income	97	64.9	55.3	74.6	140	60	52.1	67.9	4.9	122	61.5	52.9	70.1	107	62.6	53.3	71.9	-1.1
Source of financing to pay instal-I will use money from my existing savings	97	16.5	9	24	140	17.1	11	23.2	-0.6	122	18	11.2	24.8	107	15.9	8.9	22.9	2.1
Source of financing to pay instal-I will have to wait until I have saved money	97	18.6	11	26.2	140	24.3	17.3	31.3	-5.7	122	19.7	12.9	26.4	107	24.3	16.2	32.4	-4.6
Source of financing to pay instal-I will borrow the money	97	14.4	7.5	21.4	140	17.9	11.5	24.2	-3.4	122	16.4	9.9	22.9	107	15.9	8.9	22.9	0.5
Source of financing to pay instal-I will have to sell another asset	97	14.4	7.3	21.6	140	16.4	10.3	22.6	-2	122	18	11.1	24.9	107	13.1	6.7	19.5	4.9
Source of financing to pay instal- other	97	1	-1	3.1	140	3.6	0.5	6.6	-2.5	122	3.3	0.1	6.5	107	1.9	-0.7	4.4	1.4
Reason not willing to pay for replacing-I cannot afford it	18	100			22	100			0	21	100			19	100			0
Reason not willing to pay for replacing-No convenient place to purchase new one	18	0			22	0			0	21	0			19	0			0
Reason not willing to pay for replacing-Don't know where to purchase new one	18	5.6	-6	17.1	22	0			5.6	21	0			19	5.3	-5.6	16.2	-5.3

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Reason not willing to pay for replacing-Don't value device-low light quality	18	0			22	0			0	21	0			19	0			0
Reason not willing to pay for replacing-Don't value device-difficult to operate	18	0			22	0			0	21	0			19	0			0
Reason not willing to pay for replacing-Do not need electricity	18	0			22	0			0	21	0			19	0			0
Reason not willing to pay for replacing-Other	18	0			22	0			0	21	0			19	0			0
HH would buy additional solar device that is more powerful [willing to replace]	99	49.5	39.8	59.2	139	52.5	44.4	60.6	-3	125	52.8	44	61.6	106	49.1	40	58.1	3.7
Lifespan of the solar device reported by the household	87	6.7	5.9	7.6	128	6.3	5.6	6.9	0.5	125	6.5	5.8	7.2	83	6.6	5.7	7.5	-0.1
Household does not know lifespan of the solar device	154	43.5	35.9	51.1	228	43.9	37.5	50.2	-0.4	201	37.8	31.2	44.4	171	51.5	44	59	-13.7***
Household reports fully owning the solar device	151	79.5	73.3	85.6	224	80.8	75.9	85.7	-1.3	197	79.2	73.9	84.4	168	82.7	77.1	88.3	-3.6
Solar device impact on safety-Yes, Improved	154	83.1	77.4	88.8	228	86.8	82.5	91.2	-3.7	201	86.6	82	91.1	171	83.6	78.2	89.1	2.9
Solar device impact on safety-Yes, worsened	154	0.6	-0.6	1.9	228	0			0.6	201	0			171	0.6	-0.6	1.7	-0.6
Solar device impact on safety-No change	154	16.2	10.7	21.8	228	13.2	8.8	17.5	3.1	201	13.4	8.9	18	171	15.8	10.4	21.1	-2.4
Presence of pests or wild animals- Yes, deterred them	154	66.2	58.8	73.7	228	65.4	59.3	71.4	0.9	201	64.7	58.1	71.2	171	66.7	59.5	73.8	-2
Presence of pests or wild animals- Yes, attracted them	154	15.6	9.9	21.3	228	18	13.2	22.8	-2.4	201	18.9	13.6	24.2	171	14.6	9.3	19.9	4.3
Presence of pests or wild animals- No change	154	18.2	12.3	24	228	16.7	11.8	21.5	1.5	201	16.4	11.4	21.4	171	18.7	12.9	24.5	-2.3
Change in opportunities for socialistaion-Yes improved	154	80.5	74.4	86.6	228	82.5	77.6	87.3	-1.9	201	80.1	74.7	85.5	171	83	77.5	88.5	-2.9
Change in opportunities for socialistaion-Yes, worsened	154	0.6	-0.6	1.9	228	0			0.6	201	0			171	0.6	-0.5	1.7	-0.6
Change in opportunities for socialistaion- Not changed	154	18.8	12.8	24.8	228	17.5	12.7	22.4	1.3	201	19.9	14.5	25.3	171	16.4	11	21.8	3.5
Access to general information-Yes improved	154	69.5	62.3	76.7	228	72.4	66.6	78.1	-2.9	201	73.6	67.6	79.7	171	67.8	60.8	74.8	5.8
Access to general information-Yes, worsened	154	0.6	-0.6	1.9	228	0.4	-0.4	1.3	0.2	201	0.5	-0.5	1.5	171	0.6	-0.6	1.7	-0.1
Access to general information-Not changed	154	29.9	22.8	37	228	27.2	21.4	32.9	2.7	201	25.9	19.8	31.9	171	31.6	24.6	38.5	-5.7
Status in the community-Yes improved	154	75.3	68.8	81.9	228	71.5	65.6	77.3	3.8	201	71.1	65	77.3	171	74.9	68.6	81.1	-3.7
Status in the community-Yes, worsened	154	1.3	-0.5	3.1	228	0			1.3	201	0.5	-0.5	1.5	171	0.6	-0.6	1.7	-0.1

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Status in the community-Not changed	154	23.4	16.9	29.9	228	28.5	22.7	34.4	-5.1	201	28.4	22.2	34.5	171	24.6	18.4	30.8	3.8
Households earned additional income from using the MM solar device	155	9.7	5.1	14.3	228	19.7	14.7	24.7	-10.1***	202	19.8	14.6	25	171	11.1	6.5	15.7	8.7**
Add income source- Renting out solar device to members in the community	15	0			45	2.2	-2.2	6.6	-2.2	40	0			19	5.3	-5.2	15.8	-5.3
Add income source- Having increased illuminated hours per day to work on IGAs	15	6.7	-6	19.3	45	2.2	-2.2	6.6	4.4	40	2.5	-2.4	7.4	19	5.3	-5	15.6	-2.8
Add income source- Other	15	0			45	0			0	40	0			19	0			0
Add income source- Charging other households mobile phones	15	93.3	80.7	106	45	97.8	93.4	102.2	-4.4	40	97.5	92.6	102.4	19	94.7	84.4	105	2.8
Households would recommend solar device to family and friends	154	95.5	92.2	98.7	228	92.5	89.2	95.9	2.9	201	93	89.5	96.5	171	94.2	90.7	97.6	-1.1
Community Champion in the area-Yes	154	63	56.2	69.8	228	55.7	49.8	61.6	7.3	201	57.7	51.7	63.7	171	61.4	55	67.8	-3.7
Community Champion in the area-No	154	25.3	18.6	32	228	30.7	25	36.4	-5.4	201	28.4	22.4	34.3	171	27.5	21.1	33.9	0.9
Community Champion in the area-Dont know	154	11.7	6.9	16.5	228	13.6	9.2	17.9	-1.9	201	13.9	9.3	18.5	171	11.1	6.5	15.7	2.8
Frequency of contacting CC- Never interacted or contacted them	91	19.8	12.1	27.5	119	16.8	10.1	23.5	3	110	14.5	8.3	20.8	97	22.7	14.5	30.9	-8.1
Frequency of contacting CC- Once per week or more often	91	14.3	7	21.5	119	9.2	4.1	14.4	5	110	13.6	7.2	20.1	97	8.2	2.7	13.8	5.4
Frequency of contacting CC- Every two weeks	91	6.6	1.4	11.7	119	6.7	2.3	11.2	-0.1	110	5.5	1.2	9.7	97	8.2	2.8	13.7	-2.8
Frequency of contacting CC- Once per month	91	13.2	6.1	20.2	119	27.7	19.8	35.7	-14.5***	110	27.3	19	35.5	97	14.4	7.4	21.4	12.8**
Frequency of contacting CC- Once every two months	91	13.2	6.3	20.1	119	16.8	10	23.6	-3.6	110	13.6	7.3	20	97	16.5	9	24	-2.9
Frequency of contacting CC- Once every four months	91	1.1	-1.1	3.3	119	3.4	0.1	6.6	-2.3	110	1.8	-0.7	4.3	97	3.1	-0.4	6.6	-1.3
Frequency of contacting CC- Less often than every four months	91	31.9	22.1	41.6	119	19.3	12.3	26.4	12.5**	110	23.6	15.7	31.5	97	26.8	17.9	35.7	-3.2
Reason never contacted CC: Never had an issue to report	18	83.3	64.3	102.4	20	80	61	99	3.3	16	75	51.6	98.4	22	86.4	70.7	102	-11.4
Reason never contacted CC: Contact details are not available/don't know them	18	11.1	-4.3	26.5	20	10	-4.4	24.4	1.1	16	6.3	-6.7	19.2	22	13.6	-2	29.3	-7.4
Reason never contacted CC: I do not find them helpful	18	5.6	-6	17.1	20	15	-2.4	32.4	-9.4	16	12.5	-5.3	30.3	22	9.1	-4.2	22.4	3.4

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Reason never contacted CC: Prefer to contact someone else when I have issues	18	0			20	0			0	16	0			22	0			0
Reason never contacted CC: Other	18	0			20	5	-5.4	15.4	-5	16	6.3	-6.7	19.2	22	0			6.3
Contacted anyone for issues faced with the device since Sep 2020 besides repair	154	32.5	25.3	39.7	228	30.7	24.8	36.6	1.8	201	28.9	22.9	34.8	171	34.5	27.5	41.5	-5.6
Reason for contacting someone: Issues related to device not working	50	50	36.7	63.3	70	65.7	55.3	76.1	-15.7*	58	65.5	53.4	77.6	59	52.5	40.2	64.9	13
Reason for contacting someone: Issues related to how to use the device	50	8	0.2	15.8	70	7.1	1.1	13.2	0.9	58	5.2	-0.6	10.9	59	8.5	1.3	15.7	-3.3
Reason for contacting someone: Issues related to the payment for the device	50	42	28.8	55.2	70	30	20.1	39.9	12	58	27.6	16.6	38.6	59	40.7	28.2	53.1	-13.1
Reason for contacting someone: Issues related to receiving top up from programme	50	8	0.4	15.6	70	14.3	6.3	22.3	-6.3	58	10.3	2.2	18.5	59	11.9	3.9	19.8	-1.5
Reason for contacting someone: Other	50	2	-1.9	5.9	70	2.9	-1.1	6.9	-0.9	58	1.7	-1.7	5.1	59	3.4	-1.4	8.1	-1.7
Point of contact-Solar provider (Dlight, Biolite)	50	22	10.4	33.6	70	25.7	15.1	36.4	-3.7	58	25.9	14.5	37.3	59	20.3	9.4	31.2	5.5
Point of contact- Mwangaza Mashinani programme staff	50	10	2.2	17.8	70	5.7	0.2	11.3	4.3	58	10.3	3	17.7	59	5.1	-0.7	10.9	5.3
Point of contact- Chief	50	18	10.3	25.7	70	12.9	5.2	20.5	5.1	58	15.5	7.6	23.4	59	15.3	5.9	24.6	0.3
Point of contact- BWC	50	2	-1.9	5.9	70	4.3	-0.6	9.2	-2.3	58	5.2	-0.7	11	59	1.7	-1.6	5	3.5
Point of contact- Inua Jamii programme staff	50	4	-1.6	9.6	70	5.7	0.4	11	-1.7	58	1.7	-1.7	5.1	59	8.5	1.6	15.4	-6.8*
Point of contact- Community champion	50	60	46.6	73.4	70	65.7	55.1	76.3	-5.7	58	69	57.6	80.4	59	59.3	47.3	71.3	9.6
Point of contact- Family or friends or neighbours	50	6	-0.7	12.7	70	2.9	-1.1	6.8	3.1	58	3.4	-1.3	8.2	59	5.1	-0.6	10.8	-1.6
Point of contact- Other	50	0			70	0			0	58	0			59	0			0
Reason for not contacting anyone: Did not have any issues with device to report	104	73.1	64.9	81.3	158	72.2	65.3	79	0.9	143	70.6	63.5	77.7	112	77.7	70.2	85.1	-7
Reason for not contacting anyone: Didn't know who to contact	104	20.2	12.6	27.8	158	21.5	15.3	27.8	-1.3	143	21	14.6	27.3	112	18.8	11.9	25.6	2.2
Reason for not contacting anyone: Do not find contacts helpful	104	4.8	0.6	9	158	5.1	1.6	8.5	-0.3	143	6.3	2.3	10.3	112	3.6	0.1	7	2.7
Reason for not contacting anyone: No one available to help	104	6.7	1.9	11.6	158	5.1	1.7	8.4	1.7	143	5.6	1.9	9.3	112	5.4	1.3	9.4	0.2

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Reason for not contacting anyone:Other (specify)	104	1.9	-0.8	4.6	158	0.6	-0.6	1.9	1.3	143	1.4	-0.5	3.3	112	0.9	-0.9	2.6	0.5
Household have received any training/information by the program	154	39	31.6	46.3	228	39	33.1	44.9	-0.1	201	37.8	31.6	44	171	39.8	33.1	46.4	-2
Training topics: Installation of the device	154	27.9	21.2	34.6	228	28.9	23.3	34.6	-1	201	30.8	24.8	36.9	171	24.6	18.5	30.7	6.3
Training topics: Maintenance and care of the device	154	29.2	22.3	36.1	228	24.6	19.2	30	4.7	201	24.4	18.7	30	171	28.7	22.2	35.1	-4.3
Training topics: Payment modalities	154	32.5	25.4	39.5	228	31.6	25.8	37.4	0.9	201	33.8	27.7	40	171	28.7	22.1	35.2	5.2
Training topics: General use of solar device	154	33.1	25.9	40.3	228	33.3	27.6	39.1	-0.2	201	34.8	28.6	41	171	30.4	23.9	36.9	4.4
Training topics: Use of solar device for income generating activities	154	18.8	12.9	24.8	228	22.8	17.6	28	-4	201	23.9	18.3	29.5	171	17.5	12	23.1	6.3
Training topics: Other ways to promote & diversify livelihoods & increase income	154	13.6	8.3	18.9	228	13.6	9.2	17.9	0	201	16.4	11.5	21.3	171	9.4	5	13.7	7.1**
Training topics: Financial management including saving	154	13	7.8	18.2	228	10.1	6.2	14	2.9	201	13.4	8.8	18	171	7.6	3.6	11.6	5.8*
Training topics: Others	154	0			228	0			0	201	0			171	0			0
Household owns other solar device besides the one from the MM project	155	26.5	19.7	33.2	228	25.9	20.4	31.4	0.6	202	22.8	17.2	28.3	171	29.2	23	35.5	-6.5
Type of solar device-D.light	155	51	43.1	58.8	228	50.9	44.5	57.3	0.1	202	52	45.1	58.8	171	49.7	42.2	57.2	2.3
Type of solar device-Biolite	155	48.4	40.5	56.2	228	48.7	42.3	55.1	-0.3	202	48	41.2	54.9	171	49.1	41.6	56.6	-1.1
Type of solar device-Sun King	155	0.6	-0.6	1.9	228	0.4	-0.4	1.3	0.2	202	0			171	1.2	-0.4	2.8	-1.2
Household still has a solar device	155	98.1	95.9	100.2	228	98.2	96.5	99.9	-0.2	202	98	96.1	99.9	171	98.2	96.3	100.2	-0.2
Reason for no solar device-Sold device for cash	3	0			4	0			0	4	0			3	0			0
Reason for no solar device-Gave away the device	3	0			4	25	-250	300	-25	4	0			3	33.3	-312.4	379	-33.3
Reason for no solar device-Lent the device for cash	3	0			4	0			0	4	0			3	0			0
Reason for no solar device-Device was stolen	3	66.7	-279	412.4	4	50	-267.5	367.5	16.7	4	50	-267.5	367.5	3	66.7	-279	412.4	-16.7
Reason for no solar device-Device was broken and I threw it away	3	33.3	-312.4	379	4	25	-250	300	8.3	4	50	-267.5	367.5	3	0			50
Reason for no solar device-Device was repossessed for lack of payment	3	0			4	0			0	4	0			3	0			0
Reason for no solar device-Device was used as collateral and taken	3	0			4	0			0	4	0			3	0			0

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Reason for no solar device- Other	3	0			4	0			0	4	0			3	0			0
Device is fully working	152	57.9	50.1	65.7	224	57.1	50.8	63.5	0.8	198	56.1	49.3	62.8	168	59.5	52.1	66.9	-3.5
Device is partially working	152	13.2	7.9	18.5	224	20.1	14.9	25.3	-6.9*	198	19.7	14.3	25.1	168	13.7	8.5	18.9	6
Device is not working at all	152	28.9	21.9	36	224	22.8	17.4	28.1	6.2	198	24.2	18.4	30.1	168	26.8	20.2	33.4	-2.5
Days since device has been completely not working	64	202.6	170.6	234.6	96	207	181.9	232.1	-4.4	87	196.7	169.4	224.1	68	214.3	184.5	244	-17.5
Parts of the device not working: Battery	64	12.5	4.5	20.5	96	17.7	10.3	25.1	-5.2	87	13.8	6.4	21.2	68	17.6	8.6	26.7	-3.9
Parts of the device not working: Wires	64	18.8	9	28.5	96	26	17.4	34.7	-7.3	87	25.3	16	34.6	68	17.6	8.7	26.6	7.6
Parts of the device not working: Lamp/Bulb	64	20.3	11.1	29.5	96	19.8	11.7	27.8	0.5	87	21.8	13.1	30.5	68	17.6	8.8	26.5	4.2
Parts of the device not working: Solar panels	64	1.6	-1.5	4.6	96	1	-1	3.1	0.5	87	0			68	2.9	-1.1	7	-2.9
Parts of the device not working: Switches	64	3.1	-1.2	7.5	96	3.1	-0.3	6.6	0	87	2.3	-0.8	5.4	68	4.4	-0.6	9.4	-2.1
Parts of the device not working: Charge controller	64	6.3	0.5	12	96	4.2	0.1	8.2	2.1	87	3.4	-0.4	7.3	68	7.4	1.5	13.2	-3.9
Parts of the device not working: USB charging	64	4.7	-0.5	9.9	96	6.3	1.4	11.1	-1.6	87	5.7	0.8	10.7	68	5.9	0.1	11.7	-0.1
Parts of the device not working: Radio	64	3.1	-1.2	7.4	96	9.4	3.6	15.1	-6.2*	87	8	2.4	13.7	68	5.9	0.2	11.6	2.2
Parts of the device not working: Phone charging cables	64	3.1	-1.2	7.5	96	1	-1	3.1	2.1	87	2.3	-0.9	5.5	68	1.5	-1.4	4.4	0.8
Parts of the device not working: Base unit	64	6.3	0.3	12.2	96	5.2	0.8	9.7	1	87	5.7	0.9	10.6	68	5.9	0.3	11.5	-0.1
Parts of the device not working: switched off for lack of payment	64	28.1	18.2	38	96	19.8	12.9	26.7	8.3	87	18.4	10.9	25.9	68	29.4	19.9	38.9	-11.0*
Parts of the device not working: Others	64	4.7	-0.5	9.9	96	2.1	-0.8	5	2.6	87	3.4	-0.4	7.3	68	2.9	-1.2	7.1	0.5
Parts of the device not working: Don't know	64	12.5	4.9	20.1	96	11.5	4.9	18	1	87	14.9	7.3	22.6	68	8.8	2.6	15.1	6.1
Device will require repair to fully function again	44	22.7	10.8	34.6	51	25.5	13.4	37.6	-2.8	48	29.2	17	41.4	45	17.8	6.4	29.2	11.4
Device will require replacement to fully function again	44	20.5	8.9	32	51	19.6	8.9	30.3	0.8	48	20.8	10.2	31.5	45	20	8.3	31.7	0.8
Don't know if device needs to be replaced or repaired to fully function again	44	56.8	42.8	70.8	51	54.9	41.5	68.3	1.9	48	50	36.9	63.1	45	62.2	48.3	76.2	-12.2
Household intends to repair their faulty solar device (requiring repair)	55	56.4	43.3	69.4	86	51.2	41.3	61.1	5.2	77	55.8	45.8	65.9	59	50.8	38.3	63.4	5
Reason for not repairing: I cannot afford the repair costs	19	26.3	6.2	46.4	32	46.9	29	64.8	-20.6	25	48	28.9	67.1	23	30.4	9.6	51.3	17.6

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Reason for not repairing: I don't have the time to take my device for repair	19	0			32	0			0	25	0			23	0			0
Reason for not repairing: no convenient or close place to take device for repair	19	0			32	6.3	-2.5	15	-6.2	25	0			23	4.3	-4.2	12.9	-4.3
Reason for not repairing: Don't know where to go for repair	19	10.5	-4.2	25.2	32	6.3	-2.5	15	4.3	25	8	-3.5	19.5	23	8.7	-3.5	20.9	-0.7
Reason for not repairing: Don't value having device given its low light quality	19	0			32	3.1	-3.2	9.5	-3.1	25	0			23	4.3	-4.6	13.3	-4.3
Reason for not repairing: Don't value having device given its difficulty to main	19	0			32	0			0	25	0			23	0			0
Reason for not repairing: Device was switched off for lack of payment	19	57.9	38.1	77.7	32	37.5	22.9	52.1	20.4*	25	44	24.7	63.3	23	47.8	29	66.6	-3.8
Reason for not repairing: Other	19	5.3	-5.5	16.1	32	0			5.3	25	0			23	4.3	-4.6	13.3	-4.3
Repair person: I or other household members will do it ourselves	36	0			54	1.9	-1.8	5.5	-1.9	52	0			36	2.8	-2.7	8.3	-2.8
Repair person: Friends/family/neighbour	36	5.6	-1.7	12.8	54	0			5.6	52	3.8	-1.4	9.1	36	0			3.8
Repair person: Solar provider I got the device from	36	36.1	19.8	52.4	54	24.1	12.3	35.8	12	52	30.8	17.4	44.1	36	25	10.3	39.7	5.8
Repair person: BWC	36	0			54	0			0	52	0			36	0			0
Repair person: Chief	36	0			54	0			0	52	0			36	0			0
Repair person: Community Champion	36	19.4	6.5	32.4	54	27.8	15.7	39.9	-8.3	52	26.9	14.6	39.2	36	22.2	8.2	36.3	4.7
Repair person: Local technician/shop	36	22.2	9.1	35.4	54	22.2	10.7	33.7	0	52	23.1	11.8	34.4	36	22.2	7.9	36.5	0.9
Repair person: Other	36	2.8	-2.7	8.3	54	1.9	-1.8	5.5	0.9	52	1.9	-1.8	5.7	36	2.8	-2.6	8.2	-0.9
Repair person: Don't know	36	13.9	2.4	25.4	54	22.2	11.2	33.3	-8.3	52	13.5	4.3	22.6	36	25	10.1	39.9	-11.5
Household don't know repair cost of solar device (intend to repair)	36	83.3	71.5	95.1	54	72.2	60.2	84.2	11.1	52	69.2	56.4	82	36	86.1	74.5	97.7	-16.9*
Household intends to replace faulty solar device (requiring replacement)	9	33.3	-7.8	74.4	10	20	-8.6	48.6	13.3	10	30	-4.7	64.7	9	22.2	-13.2	57.7	7.8
Households do not know how much the replacement would cost (intend to replace)	4	75	-18.1	168.1	4	100			-25	5	100			3	66.7	-50.4	183.7	33.3
Households have needed to repair the device at some point since getting it	154	41.6	34	49.1	228	44.3	38.1	50.5	-2.7	201	45.3	38.6	52	171	40.4	33.3	47.4	4.9

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
# times households have needed to repair the device since getting it	154	0.6	0.4	0.8	228	0.6	0.5	0.7	0	201	0.6	0.5	0.7	171	0.6	0.4	0.8	0
Households have needed to repair the device since getting it: 0 times	154	58.4	50.9	66	228	55.7	49.5	61.9	2.7	201	54.7	48	61.4	171	59.6	52.6	66.7	-4.9
Households have needed to repair the device since getting it: 1 time	154	30.5	23.4	37.7	228	33.8	27.7	39.8	-3.3	201	32.3	25.9	38.7	171	31.6	24.8	38.4	0.8
Households have needed to repair the device since getting it: 2+ times	154	11	6.1	16	228	10.5	6.6	14.4	0.5	201	12.9	8.5	17.3	171	8.8	4.6	13	4.2
Source for repair of solar device: Friends/family/neighbour	22	36.4	14.2	58.5	25	28	9.7	46.3	8.4	26	30.8	13.2	48.4	21	33.3	11.7	55	-2.6
Source for repair of solar device: Solar provider	22	18.2	0.9	35.5	25	20	4.2	35.8	-1.8	26	23.1	6	40.1	21	14.3	-2.1	30.7	8.8
Source for repair of solar device: BWC	22	0			25	4	-4.1	12.1	-4	26	0			21	4.8	-4.7	14.3	-4.8

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 15: Household exposure to promotion of solar products at endline (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	
There is a BWC in the community	566	44.2	40.6	47.7	378	61.4	56.5	66.2	188	9.6	5.3	13.8	51.8***
Visited by agent promoting solar devices (All households)	566	23.3	20.1	26.6	378	31.2	26.7	35.7	188	7.4	3.7	11.2	23.8***
Agent promoting solar visited in June 2021	132	0			118	0			14	0			0
Agent promoting solar visited in May 2021	132	3	0.1	6	118	0.8	-0.8	2.5	14	21.4	-2.2	45.1	-20.6*
Agent promoting solar visited in April 2021	132	22.7	15.8	29.7	118	22	14.8	29.3	14	28.6	3.4	53.7	-6.5
Agent promoting solar visited in March 2021	132	15.2	9	21.3	118	11.9	6	17.7	14	42.9	15.7	70	-31.0**
Agent promoting solar visited in February 2021	132	16.7	10.5	22.8	118	15.3	9	21.5	14	28.6	5.8	51.4	-13.3
Agent promoting solar visited in January 2021	132	21.2	14.7	27.7	118	22.9	15.7	30	14	7.1	-6.1	20.4	15.7**
Agent promoting solar visited in 2020	132	38.6	31.1	46.2	118	39	31	46.9	14	35.7	11.5	59.9	3.3
Agent promoting solar visited in don't know	132	12.9	7.2	18.6	118	12.7	6.7	18.7	14	14.3	-4.8	33.3	-1.6
Agents promoting solar: Agents from the solar provider	132	94.7	90.8	98.6	118	94.1	89.8	98.4	14	100			-5.9***
Agents promoting solar: BWC	132	1.5	-0.6	3.6	118	1.7	-0.7	4.1	14	0			1.7

Agents promoting solar: Chiefs	132	0.8	-0.7	2.3	118	0.8	-0.8	2.5	14	0			0.8
Agents promoting solar: Community Champion	132	3.8	0.5	7.1	118	3.4	0.1	6.7	14	7.1	-7.2	21.5	-3.8
Agents promoting solar: Inua Jamii Programme Staff	132	0			118	0			14	0			0
Agents promoting solar: Mwangaza Mashinani Programme Staff	132	0			118	0			14	0			0
Agents promoting solar: Other	132	0			118	0			14	0			0
Ovc energy - promotion:Uses and benefits of solar devices	132	61.4	53.4	69.3	118	58.5	49.9	67	14	85.7	66.7	104.8	-27.2**
Ovc energy - promotion:Costs of purchasing a solar device	132	75.8	68.2	83.3	118	75.4	67.4	83.4	14	78.6	54.9	102.2	-3.1
Ovc energy - promotion:Costs of maintaing a solar device	132	23.5	16.3	30.7	118	21.2	13.8	28.6	14	42.9	17.6	68.2	-21.7
Ovc energy - promotion:Maintenance and repair	132	12.1	6.7	17.5	118	11	5.7	16.4	14	21.4	-2.2	45.1	-10.4
Ovc energy - promotion:Solar device technical information	132	23.5	16.3	30.6	118	22	14.6	29.4	14	35.7	10.2	61.2	-13.7
Ovc energy - promotion:Quantity of energy produced	132	16.7	10.2	23.1	118	15.3	8.8	21.8	14	28.6	3	54.1	-13.3
Ovc energy - promotion:Types of solar devices	132	24.2	16.7	31.7	118	23.7	15.9	31.5	14	28.6	3	54.1	-4.8
Ovc energy - promotion:Don't remember	132	4.5	0.9	8.2	118	5.1	1.1	9.1	14	0			5.1**
Ovc energy - promotion:Other	132	1.5	-0.6	3.6	118	1.7	-0.7	4.1	14	0			1.7
Households that have discussed solar systems (All households)	566	37.5	33.6	41.3	378	44.4	39.5	49.4	188	23.4	17.3	29.5	21.0***
Ovc energy - Visited by agent selling solar devices	566	36.7	33	40.5	378	42.6	37.9	47.3	188	25	18.8	31.2	17.6***
Ovc energy - product sold:Solar latern kit	208	53.4	46.8	59.9	161	59	51.5	66.5	47	34	20.7	47.4	25.0***
Ovc energy - product sold:Solar panel	208	34.1	27.9	40.4	161	37.9	30.4	45.4	47	21.3	11.2	31.3	16.6***
Ovc energy - product sold:Solar home system	208	84.6	79.8	89.4	161	82	76.1	87.8	47	93.6	86.5	100.7	-11.6**
Ovc energy - product sold: Other	208	1	-0.3	2.3	161	1.2	-0.4	2.9	47	0			1.2

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 16: Household exposure to promotion of solar products at endline (Household level indicators) – continued

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI		N	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	
There is a BWC in the community	241	40.7	34.9	46.5	325	46.8	41.9	51.6	-6.1	271	46.1	40.9	51.4	268	44.8	39.4	50.2	1.3
Visited by agent promoting solar devices (All households)	241	21.2	16.1	26.2	325	24.9	20.5	29.4	-3.8	271	24.7	19.9	29.6	268	22	17.3	26.8	2.7
Agent promoting solar visited in June 2021	51	0			81	0			0	67	0			59	0			0

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Agent promoting solar visited in May 2021	51	3.9	-1.5	9.4	81	2.5	-1	5.9	1.5	67	1.5	-1.5	4.5	59	3.4	-1.4	8.1	-1.9
Agent promoting solar visited in April 2021	51	19.6	8.8	30.4	81	24.7	15.6	33.8	-5.1	67	29.9	18.9	40.8	59	15.3	6.3	24.2	14.6**
Agent promoting solar visited in March 2021	51	15.7	5.8	25.5	81	14.8	6.9	22.7	0.9	67	16.4	7.4	25.5	59	11.9	3.7	20	4.6
Agent promoting solar visited in February 2021	51	13.7	4.7	22.8	81	18.5	10.3	26.8	-4.8	67	13.4	5.5	21.4	59	18.6	9	28.3	-5.2
Agent promoting solar visited in January 2021	51	19.6	9.2	30	81	22.2	13.3	31.1	-2.6	67	17.9	9.1	26.8	59	25.4	14.9	36	-7.5
Agent promoting solar visited in 2020	51	43.1	30.9	55.4	81	35.8	26.5	45.1	7.3	67	35.8	25.8	45.8	59	44.1	32.5	55.6	-8.2
Agent promoting solar visited in don't know	51	7.8	0.6	15	81	16	8.1	24	-8.2	67	13.4	5.1	21.8	59	11.9	3.8	19.9	1.6
Agents promoting solar: Agents from the solar provider	51	96.1	90.6	101.6	81	93.8	88.6	99.1	2.3	67	92.5	86.1	99	59	96.6	92.1	101.1	-4.1
Agents promoting solar: BWC	51	2	-1.9	5.8	81	1.2	-1.2	3.7	0.7	67	3	-1.2	7.2	59	0			3
Agents promoting solar: Chiefs	51	0			81	1.2	-1.2	3.7	-1.2	67	0			59	1.7	-1.6	5	-1.7
Agents promoting solar: Community Champion	51	2	-1.9	5.9	81	4.9	0.1	9.7	-3	67	4.5	-0.6	9.6	59	3.4	-1.3	8.1	1.1
Agents promoting solar: Inua Jamii Programme Staff	51	0			81	0			0	67	0			59	0			0
Agents promoting solar: Mwangaza Mashinani Programme Staff	51	0			81	0			0	67	0			59	0			0
Agents promoting solar: Other	51	0			81	0			0	67	0			59	0			0
Ovc energy - promotion: Uses and benefits of solar devices	51	58.8	45.9	71.7	81	63	52.8	73.1	-4.1	67	61.2	49.9	72.5	59	57.6	45.8	69.4	3.6
Ovc energy - promotion: Costs of purchasing a solar device	51	74.5	61.9	87.2	81	76.5	67.4	85.6	-2	67	79.1	68.9	89.3	59	71.2	59.3	83.1	7.9
Ovc energy - promotion: Costs of maintaining a solar device	51	25.5	13.5	37.5	81	22.2	13	31.5	3.3	67	16.4	7.3	25.5	59	28.8	17.3	40.3	-12.4*

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Ovc energy - promotion:Maintenance and repair	51	9.8	1.6	18	81	13.6	6.2	21	-3.8	67	10.4	3	17.8	59	13.6	5.3	21.9	-3.1
Ovc energy - promotion:Solar device technical information	51	23.5	11.6	35.4	81	23.5	14.4	32.5	0.1	67	20.9	11.4	30.4	59	27.1	15.8	38.4	-6.2
Ovc energy - promotion:Quantity of energy produced	51	13.7	4.1	23.4	81	18.5	10.1	27	-4.8	67	22.4	12	32.8	59	11.9	3.6	20.2	10.5
Ovc energy - promotion:Types of solar devices	51	25.5	12.8	38.2	81	23.5	14.3	32.6	2	67	22.4	12.1	32.6	59	25.4	13.9	36.9	-3
Ovc energy - promotion:Don't remember	51	3.9	-1.5	9.3	81	4.9	0.2	9.7	-1	67	3	-1.1	7.1	59	6.8	0.2	13.3	-3.8
Ovc energy - promotion:Other	51	2	-1.9	5.8	81	1.2	-1.2	3.7	0.7	67	1.5	-1.4	4.4	59	1.7	-1.7	5	-0.2
Households that have discussed solar systems (All households)	241	34	28.2	39.9	325	40	34.8	45.2	-6	271	37.3	31.6	42.9	268	38.8	33.1	44.5	-1.5
Ovc energy - Visited by agent selling solar devices	241	32.4	26.5	38.2	325	40	34.9	45.1	-7.6*	271	39.9	34.3	45.4	268	34	28.6	39.3	5.9
Ovc energy - product sold:Solar latern kit	78	56.4	45.5	67.3	130	51.5	43.1	59.9	4.9	108	53.7	44.6	62.8	91	54.9	44.9	65	-1.2
Ovc energy - product sold:Solar panel	78	32.1	22.2	41.9	130	35.4	27.3	43.4	-3.3	108	27.8	19.4	36.2	91	42.9	32.9	52.8	-15.1**
Ovc energy - product sold:Solar home system	78	82.1	73.6	90.5	130	86.2	80.2	92.1	-4.1	108	86.1	79.7	92.6	91	82.4	74.5	90.3	3.7
Ovc energy - product sold: Other	78	1.3	-1.2	3.8	130	0.8	-0.7	2.3	0.5	108	0			91	2.2	-0.8	5.2	-2.2

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

I.3 Awareness and use of solar energy

Table 17: Awareness of solar lighting at endline among households that use solar lighting (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Number of benefits of solar for lighting cited	455	4.3	4.1	4.5	335	4.4	4.2	4.6	120	4	3.5	4.4	0.4
HH knows at least 1 benefit of solar systems for lighting	455	100			335	100			120	100			0

HH knows more than 1 benefit of solar systems for lighting	455	98.7	97.7	99.7	335	98.5	97.3	99.8	120	99.2	97.5	100.8	-0.7
Benefits-reduce spend on kerosene or candles or batteries	455	36.9	32.8	41.1	335	43.3	38.1	48.4	120	19.2	12.8	25.5	24.1***
Benefits-better for respiratory health	455	7	4.8	9.3	335	7.2	4.5	9.8	120	6.7	2.2	11.1	0.5
Benefits-better for eye health or less eye irritation	455	8.1	5.7	10.6	335	9	6	11.9	120	5.8	1.9	9.8	3.1
Benefits-experience fewer burns due to lighting fuel	455	4.6	2.7	6.5	335	3.6	1.6	5.5	120	7.5	2.8	12.2	-3.9
Benefits-create less smoke in the house	455	17.6	14.2	21	335	20.6	16.4	24.8	120	9.2	4.2	14.1	11.4***
Benefits-help me do productive work after dark	455	17.1	13.9	20.4	335	16.7	13	20.4	120	18.3	11.5	25.2	-1.6
Benefits-lower environmental impact	455	6.6	4.4	8.8	335	6.3	3.8	8.8	120	7.5	2.8	12.2	-1.2
Benefits-make me feel safer	455	29.2	25.3	33.2	335	28.1	23.6	32.5	120	32.5	24.2	40.8	-4.4
Benefits-deter pests such as rats	455	17.4	14.1	20.7	335	13.7	10.3	17.2	120	27.5	19.4	35.6	-13.8***
Benefits-allow my children to study when its dark	455	78.5	74.7	82.2	335	80.6	76.4	84.8	120	72.5	64.5	80.5	8.1*
Benefits-allow for increased leisure time	455	10.8	8	13.5	335	10.1	7	13.3	120	12.5	6.7	18.3	-2.4
Benefits-brighter or better quality lighting or reliable	455	76.5	72.7	80.2	335	76.4	72.1	80.8	120	76.7	69.2	84.1	-0.2
Benefits-charge mobile phones or radios or other devices	455	70.8	66.7	74.9	335	73.7	69.1	78.4	120	62.5	53.9	71.1	11.2**
Benefits-lower risk of fire in the house	455	7	4.8	9.3	335	6.6	4	9.1	120	8.3	3.5	13.2	-1.8
Benefits-reduce time spent looking for other energy sources	455	8.1	5.6	10.6	335	6.9	4.2	9.5	120	11.7	5.9	17.5	-4.8
Benefits-allow household members to do HH chores after dark	455	19.3	15.8	22.9	335	22.1	17.7	26.4	120	11.7	6	17.3	10.4***
Benefits-improve the quality of sleep at night	455	6.6	4.3	8.8	335	7.2	4.4	9.9	120	5	1.2	8.8	2.2
Benefits-allows household to earn more money	455	5.1	3.1	7	335	6.3	3.7	8.8	120	1.7	-0.6	4	4.6***
Benefits-Other	455	0.2	-0.2	0.6	335	0.3	-0.3	0.9	120	0			0.3

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 18: Awareness of solar lighting at endline among households that use solar lighting (Household level indicators) – continued

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Number of benefits of solar for lighting cited	184	4.2	3.9	4.6	271	4.3	4	4.6	-0.1	227	4.2	3.9	4.5	215	4.3	4	4.6	0
HH knows at least 1 benefit of solar systems for lighting	184	100			271	100			0	227	100			215	100			0
HH knows more than 1 benefit of solar systems for lighting	184	98.9	97.4	100.4	271	98.5	97.1	99.9	0.4	227	99.1	97.9	100.3	215	98.1	96.4	99.9	1

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Benefits-reduce spend on kerosene or candles or batteries	184	37	30.2	43.7	271	36.9	31.4	42.4	0.1	227	35.2	29.3	41.1	215	38.6	32.4	44.8	-3.4
Benefits-better for respiratory health	184	7.1	3.4	10.7	271	7	4	10	0.1	227	6.2	3.1	9.2	215	8.4	4.8	12	-2.2
Benefits-better for eye health or less eye irritation	184	9.2	5.1	13.4	271	7.4	4.3	10.4	1.9	227	8.8	5.2	12.4	215	7	3.6	10.3	1.8
Benefits-experience fewer burns due to lighting fuel	184	4.9	1.8	7.9	271	4.4	2	6.9	0.5	227	3.1	0.9	5.3	215	6	2.9	9.2	-3
Benefits-create less smoke in the house	184	16.3	11	21.6	271	18.5	14	22.9	-2.1	227	17.6	12.8	22.4	215	17.7	12.6	22.7	-0.1
Benefits-help me do productive work after dark	184	15.8	10.6	20.9	271	18.1	13.6	22.5	-2.3	227	17.2	12.4	22	215	16.7	12	21.5	0.4
Benefits-lower environmental impact	184	6	2.6	9.3	271	7	4	10	-1	227	5.3	2.4	8.2	215	7.4	4	10.9	-2.2
Benefits-make me feel safer	184	30.4	24	36.9	271	28.4	23.2	33.6	2	227	28.2	22.5	33.8	215	29.3	23.5	35.1	-1.1
Benefits-deter pests such as rats	184	17.4	12.1	22.7	271	17.3	13	21.6	0	227	15.9	11.3	20.4	215	17.2	12.3	22.1	-1.4
Benefits-allow my children to study when its dark	184	75.5	69.4	81.7	271	80.4	75.8	85.1	-4.9	227	78.9	73.7	84	215	77.7	72.1	83.3	1.2
Benefits-allow for increased leisure time	184	10.9	6.4	15.3	271	10.7	7.1	14.3	0.2	227	10.1	6.3	13.9	215	11.6	7.4	15.9	-1.5
Benefits-brighter or better quality lighting or reliable	184	78.8	73.1	84.5	271	74.9	69.8	80	3.9	227	76.2	70.8	81.7	215	77.7	72.4	83	-1.5
Benefits-charge mobile phones or radios or other devices	184	69.6	62.9	76.3	271	71.6	66.4	76.8	-2	227	72.2	66.6	77.9	215	69.8	63.7	75.8	2.5
Benefits-lower risk of fire in the house	184	7.6	3.8	11.4	271	6.6	3.7	9.5	1	227	6.2	3.1	9.2	215	7.4	4	10.9	-1.3
Benefits-reduce time spent looking for other energy sources	184	9.8	5.5	14.1	271	7	4.1	10	2.8	227	7	3.8	10.3	215	9.3	5.4	13.2	-2.3
Benefits-allow household members to do HH chores after dark	184	18.5	13	24	271	19.9	15.3	24.5	-1.4	227	19.4	14.4	24.3	215	18.6	13.5	23.7	0.8
Benefits-improve the quality of sleep at night	184	4.3	1.4	7.3	271	8.1	4.9	11.3	-3.8*	227	10.1	6.2	14	215	2.3	0.3	4.3	7.8***
Benefits-allows household to earn more money	184	4.9	1.8	8	271	5.2	2.6	7.7	-0.3	227	6.2	3.1	9.3	215	4.2	1.6	6.8	2
Benefits-Other	184	0			271	0.4	-0.3	1.1	-0.4	227	0.4	-0.4	1.3	215	0			0.4

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 19: Awareness of solar lighting at endline among households that do not use solar lighting (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Household aware of solar systems for lighting	112	88.4	82.5	94.3	43	88.4	79.4	97.4	69	88.4	80.6	96.2	0
Household aware of solar systems for phone charging	105	89.5	83.6	95.4	38	97.4	92.1	102.6	67	85.1	76.3	93.8	12.3**
Number of benefits of solar for lighting cited	99	3.4	3.1	3.8	38	4.2	3.5	4.9	61	3	2.6	3.4	1.2***
HH knows at least 1 benefit of solar systems for lighting	99	100			38	100			61	100			0
HH knows more than 1 benefit of solar systems for lighting	99	96	91.9	100	38	94.7	87.3	102.1	61	96.7	92.1	101.3	-2
Benefits-reduce spend on kerosene or candles or batteries	99	29.3	21.8	36.8	38	50	32.9	67.1	61	16.4	10.1	22.7	33.6***
Benefits-better for respiratory health	99	4	0.3	7.8	38	10.5	0.7	20.3	61	0			10.5**
Benefits-better for eye health or less eye irritation	99	6.1	1.5	10.6	38	15.8	3.8	27.7	61	0			15.8**
Benefits-experience fewer burns due to lighting fuel	99	1	-1	3	38	0			61	1.6	-1.6	4.9	-1.6
Benefits-create less smoke in the house	99	6.1	1.6	10.5	38	13.2	2.7	23.6	61	1.6	-1.6	4.9	11.5**
Benefits-help me do productive work after dark	99	12.1	5.6	18.6	38	18.4	5.6	31.2	61	8.2	1.3	15.1	10.2
Benefits-lower environmental impact	99	5.1	0.8	9.3	38	10.5	0.8	20.3	61	1.6	-1.6	4.9	8.9*
Benefits-make me feel safer	99	21.2	13	29.4	38	28.9	14.4	43.5	61	16.4	6.6	26.2	12.6
Benefits-deter pests such as rats	99	20.2	12.2	28.2	38	21.1	8.2	33.9	61	19.7	9.5	29.8	1.4
Benefits-allow my children to study when its dark	99	62.6	53.8	71.5	38	63.2	49.2	77.1	61	62.3	50.8	73.8	0.9
Benefits-allow for increased leisure time	99	8.1	3	13.1	38	13.2	3.6	22.7	61	4.9	-0.7	10.6	8.2
Benefits-brighter or better-quality lighting or reliable	99	73.7	65	82.5	38	68.4	52.9	84	61	77	66.6	87.5	-8.6
Benefits-charge mobile phones or radios or other devices	99	61.6	51.5	71.7	38	63.2	47.2	79.2	61	60.7	47.7	73.6	2.5
Benefits-lower risk of fire in the house	99	5.1	0.8	9.3	38	7.9	-0.4	16.2	61	3.3	-1.3	7.9	4.6
Benefits-reduce time spent looking for other energy sources	99	10.1	4	16.2	38	10.5	0.7	20.3	61	9.8	1.9	17.7	0.7
Benefits-allow household members to do HH chores after dark	99	12.1	5.3	18.9	38	15.8	3.5	28.1	61	9.8	1.9	17.8	6
Benefits-improve the quality of sleep at night	99	6.1	1.4	10.8	38	7.9	-0.4	16.2	61	4.9	-0.7	10.6	3
Benefits-Other	99	0			38	0			61	0			0
Household would like to buy a solar device	112	77.7	70.1	85.3	43	83.7	72.3	95.2	69	73.9	63.8	84	9.8

Reason haven't bought device yet: Too expensive	87	49.4	39.1	59.7	36	61.1	45.9	76.4	51	41.2	27.4	55	19.9*
Reason haven't bought device yet: Don't have money right now	87	64.4	54.5	74.2	36	63.9	48.5	79.3	51	64.7	51.9	77.5	-0.8
Reason haven't bought device yet: Don't know where to buy	87	4.6	0.2	9	36	5.6	-2.3	13.4	51	3.9	-1.1	9	1.6
Reason haven't bought device yet: Don't know how to set up device	87	2.3	-0.7	5.3	36	0			51	3.9	-1.1	9	-3.9
Reason haven't bought device yet: Cannot afford regular energy costs	87	1.1	-1.1	3.4	36	0			51	2	-1.9	5.9	-2
Reason haven't bought device yet: Lack of availability of device in retail shops	87	0			36	0			51	0			0
Reason haven't bought device yet: Not a priority	87	5.7	0.7	10.8	36	0			51	9.8	1.2	18.4	-9.8**
Reason haven't bought device yet: Other	87	2.3	-0.9	5.5	36	0			51	3.9	-1.5	9.3	-3.9
Reasons don't want to buy: It is too expensive	25	80	60.4	99.6	7	100			18	72.2	45	99.4	27.8**
Reasons don't want to buy: I don't know where to buy it	25	4	-4.7	12.7	7	14.3	-17.2	45.7	18	0			14.3
Reasons don't want to buy: I don't know how to set it up	25	0			7	0			18	0			0
Reasons don't want to buy: I can't afford to pay for regular energy costs	25	8	-4.3	20.3	7	14.3	-17.2	45.7	18	5.6	-6.5	17.6	8.7
Reasons don't want to buy: Lack of availability of SL/SHS in market/retail shops	25	0			7	0			18	0			0
Reasons don't want to buy: It's not a priority	25	8	-4.3	20.3	7	0			18	11.1	-6	28.2	-11.1
Reasons don't want to buy: I do not see the benefit of buying one	25	4	-4.7	12.7	7	0			18	5.6	-6.5	17.6	-5.6
Reason don't want to buy: Access to national grid electricity	25	8	-4.3	20.3	7	0			18	11.1	-6	28.2	-11.1
Reasons don't want to buy: Other	25	0			7	0			18	0			0

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 20: Awareness of solar lighting at endline among households that do not use solar lighting (Household level indicators) - continued

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Household aware of solar systems for lighting	58	84.5	75.4	93.5	54	92.6	85.4	99.8	-8.1	45	91.1	82.5	99.7	53	86.8	78.1	95.5	4.3
Household aware of solar systems for phone charging	55	90.9	83.3	98.5	50	88	78.7	97.3	2.9	44	88.6	79.3	97.9	49	93.9	87	100.8	-5.2

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Number of benefits of solar for lighting cited	49	3.4	2.8	3.9	50	3.5	3	4.1	-0.2	41	3.4	2.9	3.9	46	3.7	3.1	4.4	-0.3
HH knows at least 1 benefit of solar systems for lighting	49	100			50	100			0	41	100			46	100			0
HH knows more than 1 benefit of solar systems for lighting	49	95.9	90.2	101.7	50	96	90.5	101.5	-0.1	41	97.6	92.7	102.4	46	95.7	89.5	101.8	1.9
Benefits-reduce spend on kerosene or candles or batteries	49	28.6	16.3	40.8	50	30	19	41	-1.4	41	34.1	20.9	47.4	46	26.1	13.9	38.3	8.1
Benefits-better for respiratory health	49	2	-2	6.1	50	6	-0.6	12.6	-4	41	4.9	-1.9	11.7	46	4.3	-1.4	10.1	0.5
Benefits-better for eye health or less eye irritation	49	4.1	-1.6	9.8	50	8	0.6	15.4	-3.9	41	4.9	-1.9	11.6	46	6.5	-0.7	13.7	-1.6
Benefits-experience fewer burns due to lighting fuel	49	2	-2	6.1	50	0			2	41	2.4	-2.4	7.3	46	0			2.4
Benefits-create less smoke in the house	49	4.1	-1.6	9.8	50	8	1.3	14.7	-3.9	41	2.4	-2.3	7.2	46	10.9	2	19.8	-8.4
Benefits-help me do productive work after dark	49	10.2	1.3	19.1	50	14	4.4	23.6	-3.8	41	12.2	2.2	22.2	46	13	3.1	23	-0.8
Benefits-lower environmental impact	49	2	-2	6.1	50	8	0.7	15.3	-6	41	4.9	-1.9	11.6	46	6.5	-0.6	13.7	-1.6
Benefits-make me feel safer	49	16.3	5.5	27.2	50	26	13.5	38.5	-9.7	41	17.1	5.1	29	46	26.1	12.7	39.5	-9
Benefits-deter pests such as rats	49	20.4	8.8	32	50	20	8.5	31.5	0.4	41	24.4	11.1	37.7	46	19.6	7.6	31.5	4.8
Benefits-allow my children to study when its dark	49	59.2	45.6	72.7	50	66	53.4	78.6	-6.8	41	63.4	48.3	78.5	46	67.4	54.6	80.2	-4
Benefits-allow for increased leisure time	49	4.1	-1.6	9.8	50	12	3.5	20.5	-7.9	41	7.3	-0.6	15.2	46	10.9	2.1	19.7	-3.6
Benefits-brighter or better quality lighting or reliable	49	79.6	68.5	90.7	50	68	55.4	80.6	11.6	41	68.3	53.3	83.3	46	76.1	63.9	88.3	-7.8
Benefits-charge mobile phones or radios or other devices	49	65.3	51.9	78.7	50	58	44.7	71.3	7.3	41	65.9	50.8	80.9	46	58.7	43.7	73.7	7.2
Benefits-lower risk of fire in the house	49	4.1	-1.6	9.8	50	6	-0.5	12.5	-1.9	41	2.4	-2.3	7.2	46	8.7	0.5	16.9	-6.3
Benefits-reduce time spent looking for other energy sources	49	10.2	1.6	18.8	50	10	1.8	18.2	0.2	41	9.8	0.1	19.4	46	10.9	1.6	20.1	-1.1
Benefits-allow household members to	49	14.3	4.2	24.4	50	10	1.2	18.8	4.3	41	9.8	0.2	19.3	46	17.4	6.1	28.7	-7.6

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
do HH chores after dark																		
Benefits-improve the quality of sleep at night	49	10.2	1.6	18.9	50	2	-1.9	5.9	8.2*	41	4.9	-1.9	11.6	46	8.7	0.4	17	-3.8
Benefits-Other	49	0			50	0			0	41	0			46	0			0
Household would like to buy a solar device	58	82.8	73.1	92.4	54	72.2	60.4	84	10.5	45	86.7	77	96.3	53	71.7	59.4	84	15.0*
Reason haven't bought device yet: Too expensive	48	43.8	29.1	58.4	39	56.4	41.5	71.4	-12.7	39	43.6	27.1	60.1	38	55.3	39.5	71	-11.7
Reason haven't bought device yet: Don't have money right now	48	70.8	57.6	84.1	39	56.4	41.1	71.7	14.4	39	61.5	47	76.1	38	71.1	56.4	85.7	-9.5
Reason haven't bought device yet: Don't know where to buy	48	4.2	-1.2	9.5	39	5.1	-2.1	12.3	-1	39	2.6	-2.6	7.7	38	7.9	-0.6	16.4	-5.3
Reason haven't bought device yet: Don't know how to set up device	48	4.2	-1.2	9.5	39	0			4.2	39	0			38	5.3	-1.5	12	-5.3
Reason haven't bought device yet: Cannot afford regular energy costs	48	2.1	-2.1	6.2	39	0			2.1	39	0			38	2.6	-2.6	7.9	-2.6
Reason haven't bought device yet: Lack of availability of device in retail shops	48	0			39	0			0	39	0			38	0			0
Reason haven't bought device yet: Not a priority	48	4.2	-1.6	10	39	7.7	-0.9	16.3	-3.5	39	7.7	-0.9	16.3	38	5.3	-2.1	12.6	2.4
Reason haven't bought device yet: Other	48	2.1	-2	6.2	39	2.6	-2.5	7.6	-0.5	39	5.1	-2	12.2	38	0			5.1
Reasons don't want to buy: It is too expensive	10	90	67.8	112.2	15	73.3	47	99.7	16.7	6	83.3	45.2	121.5	15	80	53.6	106.4	3.3
Reasons don't want to buy: I don't know where to buy it	10	10	-10	30	15	0			10	6	0			15	6.7	-7.3	20.6	-6.7
Reasons don't want to buy: I don't know how to set it up	10	0			15	0			0	6	0			15	0			0
Reasons don't want to buy :I can't afford to pay for regular energy costs	10	10	-11.1	31.1	15	6.7	-7.4	20.8	3.3	6	0			15	6.7	-7.3	20.6	-6.7
Reasons don't want to buy: Lack of availability of S L/SHS in market/retail shops	10	0			15	0			0	6	0			15	0			0

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Reasons don't want to buy: It's not a priority	10	0			15	13.3	-4.7	31.4	-13.3	6	0			15	6.7	-8.3	21.6	-6.7
Reasons don't want to buy: I do not see the benefit of buying one	10	10	-12.2	32.2	15	0			10	6	0			15	6.7	-8.3	21.6	-6.7
Reason don't want to buy: Access to national grid electricity	10	0			15	13.3	-7.6	34.2	-13.3	6	16.7	-21.5	54.8	15	6.7	-8.3	21.6	10
Reasons don't want to buy: Other	10	0			15	0			0	6	0			15	0			0

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 21: Use of energy and expenditure at endline (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Light sources used-Candle	567	0.4	-0.1	0.8	378	0.5	-0.2	1.2	189	0			0.5
Light sources used-Kerosene-Paraffin-Tin lamp-lantern	567	15.3	12.5	18.2	378	22.5	18.3	26.6	189	1.1	-0.4	2.5	21.4***
Light sources used-Diesel or gasoline lamp	567	0			378	0			189	0			0
Light sources used-LPG (gas) lamp	567	0			378	0			189	0			0
Light sources used-Biogas lamp	567	0			378	0			189	0			0
Light sources used-Dry-cell battery torch	567	42	38.3	45.6	378	28	23.6	32.5	189	69.8	63.4	76.3	-41.8***
Light sources used-Rechargeable battery	567	0.4	-0.1	0.8	378	0.5	-0.2	1.2	189	0			0.5
Light sources used-Solar lantern	567	19	16.1	22	378	25.1	21.1	29.1	189	6.9	3.3	10.5	18.3***
Light sources used-Solar home system	567	56.6	52.9	60.3	378	70.1	65.6	74.7	189	29.6	23.2	36.1	40.5***
Light sources used-Mini-grid	567	0			378	0			189	0			0
Light sources used-National grid (KPLC)	567	4.9	3.3	6.6	378	0.8	-0.1	1.7	189	13.2	8.5	17.9	-12.4***
Light sources used-Mobile phone torch	567	70.5	66.9	74.1	378	66.9	62.3	71.6	189	77.8	72.3	83.3	-10.8***
Light sources used-Generator	567	0			378	0			189	0			0
Light sources used-Firewood	567	22	18.7	25.4	378	23.3	19.1	27.5	189	19.6	14.1	25.1	3.7
Light sources used-Solar torch	567	4.8	3	6.5	378	6.9	4.4	9.4	189	0.5	-0.5	1.6	6.3***
Light sources used-Other	567	0			378	0			189	0			0
HH owns SL,SP,SC. [All HHs]	567	74.3	70.9	77.6	378	82	78.2	85.8	189	58.7	51.9	65.5	23.3***
HH used SHS or SL or ST for lighting in last 30 days	567	66.1	62.7	69.5	378	81.5	77.7	85.3	189	35.4	28.7	42.2	46.0***
Number of lamps/bulbs/lanterns powered by kerosene in use [All HHs]	567	0.2	0.2	0.3	378	0.3	0.3	0.4	189	0	0	0.1	0.3***
Number of liters of kerosene/paraffin used in the last month	86	2.9	2.4	3.4	84	2.8	2.3	3.3	2	8.5	7.8	9.2	-5.7***
Number of batteries used in the last month[Households using the light source]	235	12.5	9.7	15.3	105	13.5	8.1	19	130	11.6	9.2	14.1	1.9

HH monthly energy expenditure KES - Kerosene/Paraffin/Tin lamp/lantern	86	451.3	301.2	601.4	84	441.8	288.7	594.9	2	850	779.6	920.4	-408.2***
HH monthly energy expenditure KES - Dry-cell battery torch	235	160.1	144.1	176	105	156.8	124.3	189.4	130	162.7	150.8	174.6	-5.8
HH monthly energy expenditure KES - Solar lantern	107	75	36.2	113.8	94	76.8	36.1	117.5	13	61.5	-61.7	184.8	15.3
HH monthly energy expenditure KES - Solar home system	316	179.6	117.9	241.4	260	214.5	140.2	288.8	56	17.9	-17.2	52.9	196.6***
HH monthly energy expenditure KES - National Grid (PLC)	28	514.3	411.8	616.8	3	300	99.1	500.9	25	540	425.9	654.1	-240.0**
HH monthly energy expenditure KES - Firewood	125	0			88	0			37	0			0
HH monthly energy expenditure KES - Solar torch	27	0			26	0			1	0			0
Monthly household expenditure on kerosene, batteries and candles[All households]	295	261.5	213.7	309.2	163	333	247.9	418.1	132	173.1	154.5	191.7	159.9***
Total household expenditure on all lighting sources per month[All households]	558	280.2	234.3	326.2	372	317.8	251	384.6	186	205.1	172.6	237.6	112.7***
Households charge mobile phone at home[HH with a phone]	536	57.3	53.4	61.2	354	68.4	63.6	73.1	182	35.7	28.9	42.6	32.6***
Households charge mobile phone <500m from home[HH no charge in-house]	229	74.2	68.5	79.9	112	81.3	74	88.5	117	67.5	58.8	76.2	13.7**
Cost per mobile phone recharge-KES. [HH no charge in-house]	229	14.4	13.3	15.5	112	13.1	11.6	14.6	117	15.6	14.1	17.1	-2.5**
Monthly exp on mobile phone recharge[Households do not charge at home]	229	152.1	134.3	170	112	131.7	108.7	154.7	117	171.7	144.7	198.7	-40.0**
Monthly expenditure on mobile phone recharge [All HHs]	567	61.4	52.4	70.4	378	39	30	48	189	106.3	86.2	126.3	-67.3***
Monthly expenditure on lighting & mobile recharge [All HHs]	558	340.8	294.3	387.2	372	356.7	289.6	423.9	186	308.8	272.8	344.8	47.9
HH monthly expenditure on cooking fuel KES. [All HHs]	565	160.1	124.6	195.7	377	10.6	0.8	20.4	188	460	354.8	565.2	-449.4***
Solar used for lighting the house to work on usual business	451	29	25	33	332	35.8	30.8	40.9	119	10.1	4.7	15.5	25.8***
Solar used for lighting the house to work on unpaid activities	451	80.3	77.1	83.5	332	91	87.9	94	119	50.4	41.8	59	40.5***
Solar used for powering the fan	451	0.7	-0.1	1.4	332	0.9	-0.1	1.9	119	0			0.9*
Solar used for watching TV	451	1.8	0.6	3	332	2.4	0.8	4	119	0			2.4***
Solar used for charging household members mobile phones	451	72.9	69.1	76.8	332	80.7	76.6	84.8	119	51.3	42.4	60.1	29.5***
Solar used for charging phone of people outside the household	451	23.3	19.5	27.1	332	28	23.2	32.8	119	10.1	4.8	15.4	17.9***
Solar used for charging or powering the radio	451	29.9	25.8	34	332	36.7	31.6	41.9	119	10.9	5.2	16.7	25.8***

Solar used for lighting the surrounding of the households	451	69.6	65.8	73.5	332	80.4	76.2	84.6	119	39.5	30.9	48.1	40.9***
Solar used for lighting the way when household members leave the household	451	67.6	63.5	71.8	332	75.3	70.7	79.9	119	46.2	37	55.4	29.1***
Solar used for lighting the house so that the children can play	451	63	58.8	67.2	332	72.3	67.5	77	119	37	28.2	45.7	35.3***
Solar used for lighting the house so that children can study	451	83.6	80.5	86.7	332	92.2	89.3	95	119	59.7	50.9	68.5	32.5***
Solar used for lighting the house in evening for socialising with family	451	68.7	64.7	72.8	332	75.6	71.1	80.1	119	49.6	40.8	58.4	26.0***
Solar used for lighting the house in evening for socialising with community	451	40.8	36.4	45.2	332	44.3	39.1	49.4	119	31.1	22.8	39.4	13.2***
Solar used for other purposes	451	0.2	-0.2	0.7	332	0			119	0.8	-0.8	2.5	-0.8
HH uses SS to charge their phone. [HH with SS]	452	73	69.2	76.8	332	80.7	76.6	84.8	120	51.7	42.8	60.5	29.1***
HH uses SS to charge other people phone. [HH with SS]	452	23.5	19.7	27.2	332	28	23.2	32.8	120	10.8	5.4	16.3	17.2***
HH uses SS for productive purposes. [HH with SS]	452	81	77.9	84.1	332	92.2	89.3	95	120	50	41.4	58.6	42.2***
Household uses SHS every day or most of the week [Households using SHS]	320	95.6	93.4	97.8	264	95.5	93	97.9	56	96.4	91.5	101.3	-1
Average hours SS is used for lighting each day. [HHs with SS]	452	10.8	10	11.5	332	12.6	11.7	13.5	120	5.7	4.7	6.6	6.9***
HH uses SS to charge other people phone for a fee. [HH using SS to charge other	105	67.6	58.9	76.4	93	73.1	63.9	82.4	12	25	0.2	49.8	48.1***
Average fee charged by HH to charge others mobile phones [HH charging for a fee]	71	11	9.9	12	68	10.9	9.9	11.8	3	13.3	2.4	24.2	-2.5
Frequency of charging for a fee-more than once a day [HH charging for a fee]	71	21.1	11.3	31	68	20.6	10.6	30.6	3	33.3	-21.1	87.8	-12.7
Frequency of charging for a fee-once a day [HH charging for a fee]	71	21.1	11.2	31.1	68	20.6	10.5	30.7	3	33.3	-21.1	87.8	-12.7
Frequency of charging for a fee-more than once a week [HH charging for a fee]	71	38	26.2	49.9	68	38.2	26.1	50.4	3	33.3	-21.1	87.8	4.9
Frequency of charging for a fee-once a week [HH charging for a fee]	71	16.9	7.9	25.9	68	17.6	8.3	27	3	0			17.6***
Frequency of charging for a fee-more than once a month [HH charging for a fee]	71	1.4	-1.4	4.2	68	1.5	-1.5	4.4	3	0			1.5
Frequency of charging for a fee-once a month [HH charging for a fee]	71	1.4	-1.4	4.2	68	1.5	-1.5	4.4	3	0			1.5
Number of solar systems/devices for lighting HH owns [All HHs]	452	1.3	1.3	1.4	332	1.4	1.3	1.5	120	1.1	1	1.1	0.3***
Household has a Solar Home System [All HHs with SS]	452	92.3	89.9	94.6	332	91	88	94	120	95.8	92.5	99.2	-4.9**

Household has a Solar Lantern [All HHs with SS]	452	19.7	16.2	23.2	332	24.1	19.7	28.5	120	7.5	2.9	12.1	16.6***
HH falls into tier 0 for lighting. [All HHs]	567	56.1	52.3	59.9	378	46.3	41.5	51.1	189	75.7	69.5	81.8	-29.4***
HH falls into tier 1 for lighting. [All HHs]	567	32.5	28.8	36.1	378	39.7	34.9	44.5	189	18	12.5	23.4	21.7***
HH falls into tier 2 for lighting or above [All HHs]	567	11.5	8.9	14	378	14	10.6	17.5	189	6.3	2.8	9.9	7.7***

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 22: Use of energy and expenditure at endline (Household level indicators) – continued

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Light sources used-Candle	242	0.4	-0.4	1.2	325	0.3	-0.3	0.9	0.1	272	0.4	-0.3	1.1	268	0.4	-0.3	1.1	0
Light sources used-Kerosene-Paraffin-Tin lamp-lantern	242	13.2	9.1	17.4	325	16.9	13	20.8	-3.7	272	15.1	11	19.2	268	16	11.9	20.2	-1
Light sources used-Diesel or gasoline lamp	242	0			325	0			0	272	0			268	0			0
Light sources used-LPG (gas) lamp	242	0			325	0			0	272	0			268	0			0
Light sources used-Biogas lamp	242	0			325	0			0	272	0			268	0			0
Light sources used-Dry-cell battery torch	242	52.1	46.1	58	325	34.5	29.7	39.3	17.6***	272	39	33.7	44.2	268	44.4	38.8	50	-5.4
Light sources used-Rechargeable battery	242	0.4	-0.4	1.2	325	0.3	-0.3	0.9	0.1	272	0.4	-0.3	1.1	268	0.4	-0.3	1.1	0
Light sources used-Solar lantern	242	19	14.3	23.7	325	19.1	15.1	23	-0.1	272	12.5	8.7	16.3	268	25.4	20.9	29.9	-12.9***
Light sources used-Solar home system	242	52.9	46.9	58.9	325	59.4	54.4	64.3	-6.5	272	59.6	54.1	65	268	56	50.3	61.6	3.6
Light sources used-Mini-grid	242	0			325	0			0	272	0			268	0			0
Light sources used-National grid (KPLC)	242	4.1	1.6	6.6	325	5.5	3.1	7.9	-1.4	272	3.7	1.4	5.9	268	5.6	3.1	8.1	-1.9
Light sources used-Mobile phone torch	242	68.2	62.5	73.9	325	72.3	67.6	77	-4.1	272	75	69.9	80.1	268	66	60.6	71.5	9.0**
Light sources used-Generator	242	0			325	0			0	272	0			268	0			0
Light sources used-Firewood	242	28.5	22.9	34.1	325	17.2	13.2	21.3	11.3***	272	18.4	13.8	22.9	268	24.6	19.6	29.7	-6.2*
Light sources used-Solar torch	242	5	2.3	7.6	325	4.6	2.4	6.8	0.3	272	4.4	2	6.8	268	5.6	2.9	8.3	-1.2

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Light sources used-Other	242	0			325	0			0	272	0			268	0			0
HH owns SL,SP,SC. [All HHs]	242	70.7	65.1	76.2	325	76.9	72.5	81.3	-6.3*	272	78.7	74	83.4	268	72	66.8	77.2	6.7*
HH used SHS or SL or ST for lighting in last 30 days	242	62.4	56.7	68.1	325	68.9	64.3	73.5	-6.5*	272	66.2	61	71.4	268	68.3	63.4	73.2	-2.1
Number of lamps/bulbs/lanterns powered by kerosene in use [All HHs]	242	0.2	0.1	0.3	325	0.2	0.2	0.3	0	272	0.2	0.1	0.2	268	0.3	0.2	0.4	-0.1
Number of liters of kerosene/paraffin used in the last month[Households using th	32	3	2.3	3.7	54	2.9	2.2	3.6	0.1	40	3	2.1	3.8	43	2.9	2.3	3.5	0.1
Number of batteries used in the last month[Households using the light source]	123	12.2	8.5	15.9	112	12.8	8.6	17	-0.6	104	13.6	9.3	17.9	118	12.3	8.3	16.3	1.3
HH monthly energy expenditure KES - Kerosene/Paraffin/Tin lamp/lantern	32	411.4	274.3	548.5	54	474.9	249.3	700.5	-63.5	40	335.8	246.3	425.2	43	529.8	244.6	814.9	-194
HH monthly energy expenditure KES -Dry-cell battery torch	123	175	149.3	200.6	112	143.7	126.9	160.6	31.2**	104	151.3	129.7	172.9	118	170.4	145.1	195.7	-19.1
HH monthly energy expenditure KES -Solar lantern	45	73.3	16.3	130.4	62	76.2	22.8	129.5	-2.8	34	65	-5.6	135.6	67	86.7	36.3	137.2	-21.7
HH monthly energy expenditure KES -Solar home system	126	289	163.7	414.4	190	107.1	47.7	166.5	182.0**	159	135.5	58.4	212.6	148	238	136.3	339.7	-102.5
HH monthly energy expenditure KES -National Grid (PLC)	10	490	322.1	657.9	18	527.8	401.6	654	-37.8	10	450	292.2	607.8	15	506.7	338.3	675	-56.7
HH monthly energy expenditure KES -Firewood	69	0			56	0			0	50	0			66	0			0
HH monthly energy expenditure KES -Solar torch	12	0			15	0			0	12	0			15	0			0
Monthly household expenditure on kerosene, batteries and candles[All households]	143	243.3	201.7	284.8	152	278.6	193.5	363.7	-35.3	137	217.3	184.7	249.9	143	300.6	208.5	392.6	-83.3*
Total household expenditure on all lighting sources per month[All households]	237	335.3	258.2	412.3	321	239.6	183.2	296	95.6*	268	216.5	165.7	267.3	263	348.5	267.6	429.5	-132.0***
Households charge mobile phone at home[HH with a phone]	228	52.6	46.4	58.8	308	60.7	55.5	65.9	-8.1*	264	59.8	54.3	65.4	248	56.5	50.5	62.4	3.4
Households charge mobile phone <500m from home[HH no charge in-house]	108	70.4	61.7	79	121	77.7	70.2	85.2	-7.3	106	77.4	69.3	85.4	108	71.3	62.7	79.9	6.1

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Cost per mobile phone recharge-KES. [HH no charge in-house]	108	15.1	13.7	16.5	121	13.8	12.2	15.3	1.3	106	15.1	13.5	16.8	108	14	12.5	15.5	1.2
Monthly exp on mobile phone recharge[Households do not charge at home]	108	170.6	145.5	195.8	121	135.6	111.8	159.5	35.0**	106	158.2	131.3	185.1	108	151.9	126	177.9	6.3
Monthly expenditure on mobile phone recharge [All HHs]	242	76.2	61.1	91.2	325	50.5	39.4	61.6	25.7***	272	61.7	48.2	75.1	268	61.2	48	74.4	0.4
Monthly expenditure on lighting & mobile recharge [All HHs]	237	408.9	332	485.8	321	290.5	232.9	348	118.4**	268	277.9	225.4	330.4	263	408.1	327	489.2	-130.2***
HH monthly expenditure on cooking fuel KES. [All HHs]	240	160	106.1	213.9	325	160.2	109.2	211.3	-0.2	272	190.4	134.3	246.6	266	129.6	82.5	176.8	60.8
Solar used for lighting the house to work on usual business	181	23.8	17.7	29.8	270	32.6	27.2	38	-8.8**	226	31.9	26.1	37.6	212	25.9	20.2	31.7	5.9
Solar used for lighting the house to work on unpaid activities	181	80.1	74.9	85.3	270	80.4	76	84.7	-0.3	226	80.1	75.5	84.7	212	80.7	75.8	85.6	-0.6
Solar used for powering the fan	181	0			270	1.1	-0.1	2.3	-1.1*	226	1.3	-0.1	2.8	212	0			1.3*
Solar used for watching TV	181	1.7	-0.2	3.5	270	1.9	0.3	3.4	-0.2	226	1.3	-0.2	2.8	212	2.4	0.4	4.3	-1
Solar used for charging household members mobile phones	181	73.5	67.4	79.6	270	72.6	67.5	77.7	0.9	226	75.2	69.9	80.6	212	70.8	64.8	76.7	4.5
Solar used for charging phone of people outside the household	181	22.1	16.2	28	270	24.1	19.1	29.1	-2	226	25.7	20.2	31.2	212	21.2	15.8	26.7	4.4
Solar used for charging or powering the radio	181	29.8	23.4	36.3	270	30	24.6	35.4	-0.2	226	29.6	23.9	35.4	212	31.1	25.1	37.2	-1.5
Solar used for lighting the surrounding of the households	181	72.4	66.4	78.3	270	67.8	62.4	73.1	4.6	226	69	63.4	74.6	212	70.3	64.5	76	-1.3
Solar used for lighting the way when household members leave the household	181	69.6	63.2	76.1	270	66.3	60.8	71.8	3.3	226	68.1	62.3	74	212	67.5	61.3	73.6	0.7
Solar used for lighting the house so that the children can play	181	62.4	55.7	69.1	270	63.3	57.7	69	-0.9	226	66.8	60.9	72.7	212	59	52.6	65.3	7.9*
Solar used for lighting the house so that children can study	181	82.3	77.1	87.5	270	84.4	80.4	88.5	-2.1	226	83.2	78.6	87.7	212	83.5	78.7	88.2	-0.3
Solar used for lighting the house in evening for socialising with family	181	67.4	61	73.8	270	69.6	64.3	75	-2.2	226	70.4	64.6	76.1	212	67.5	61.4	73.5	2.9
Solar used for lighting the house in evening for socialising with community	181	40.3	33.4	47.2	270	41.1	35.4	46.8	-0.8	226	45.6	39.4	51.8	212	36.3	29.9	42.8	9.3**

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Solar used for other purposes	181	0			270	0.4	-0.4	1.1	-0.4	226	0			212	0.5	-0.5	1.4	-0.5
HH uses SS to charge their phone. [HH with SS]	182	73.6	67.5	79.7	270	72.6	67.5	77.7	1	227	75.3	70	80.7	212	70.8	64.8	76.7	4.6
HH uses SS to charge other people phone. [HH with SS]	182	22.5	16.6	28.4	270	24.1	19.1	29.1	-1.5	227	26	20.5	31.5	212	21.2	15.8	26.7	4.8
HH uses SS for productive purposes. [HH with SS]	182	80.8	75.6	85.9	270	81.1	76.8	85.4	-0.3	227	80.6	76.1	85.1	212	81.6	76.8	86.4	-1
Household uses SHS every day or most of the week [Households using SHS]	128	96.1	92.7	99.5	192	95.3	92.4	98.3	0.8	162	96.9	94.3	99.5	149	94.6	91	98.2	2.3
Average hours SS is used for lighting each day. [HHs with SS]	182	11.2	9.9	12.5	270	10.4	9.5	11.4	0.8	227	9.8	8.9	10.7	212	11.7	10.5	12.9	-1.9**
HH uses SS to charge other people phone for a fee. [HH using SS to charge other	40	47.5	32.2	62.8	65	80	69.9	90.1	-32.5***	58	74.1	63.2	85.1	45	60	46.4	73.6	14.1
Average fee charged by HH to charge others mobile phones [HH charging for a fee]	19	11.8	10.2	13.5	52	10.6	9.4	11.9	1.2	43	10.6	9.1	12	27	11.7	10.3	13	-1.1
Frequency of charging for a fee-more than once a day [HH charging for a fee]	19	10.5	-3.9	25	52	25	12.9	37.1	-14.5	43	18.6	6.8	30.4	27	25.9	8.3	43.5	-7.3
Frequency of charging for a fee-once a day [HH charging for a fee]	19	10.5	-4.3	25.3	52	25	12.8	37.2	-14.5	43	20.9	8.4	33.4	27	22.2	5.6	38.8	-1.3
Frequency of charging for a fee-more than once a week [HH charging for a fee]	19	52.6	27.8	77.4	52	32.7	19.4	46	19.9	43	39.5	24.5	54.6	27	33.3	14.7	52	6.2
Frequency of charging for a fee-once a week [HH charging for a fee]	19	21.1	0.7	41.4	52	15.4	5.7	25	5.7	43	18.6	6.9	30.3	27	14.8	0.9	28.7	3.8
Frequency of charging for a fee-more than once a month [HH charging for a fee]	19	0			52	1.9	-1.9	5.7	-1.9	43	2.3	-2.3	7	27	0			2.3
Frequency of charging for a fee-once a month [HH charging for a fee]	19	5.3	-5.1	15.6	52	0			5.3	43	0			27	3.7	-3.7	11.1	-3.7
Number of solar systems/devices for lighting HH owns [All HHs]	182	1.4	1.3	1.5	270	1.3	1.2	1.4	0.1	227	1.2	1.2	1.3	212	1.4	1.3	1.5	-0.2**
Household has a Solar Home System [All HHs with SS]	182	94	90.5	97.4	270	91.1	87.8	94.4	2.8	227	94.7	91.9	97.5	212	90.6	86.8	94.4	4.1*
Household has a Solar Lantern [All HHs with SS]	182	19.8	14.1	25.4	270	19.6	15.1	24.2	0.2	227	16.3	11.6	21	212	22.6	17.4	27.8	-6.3*
HH falls into tier 0 for lighting. [All HHs]	242	65.7	59.9	71.5	325	48.9	43.8	54.1	16.8***	272	48.2	42.7	53.7	268	61.9	56.2	67.6	-13.8***

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
HH falls into tier 1 for lighting. [All HHs]	242	28.1	22.5	33.7	325	35.7	30.7	40.7	-7.6**	272	37.5	32.1	42.9	268	28.7	23.4	34.1	8.8**
HH falls into tier 2 for lighting or above [All HHs]	242	6.2	3.2	9.2	325	15.4	11.5	19.2	-9.2**	272	14.3	10.3	18.4	268	9.3	5.9	12.8	5.0*

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

I.4 Health

Table 23: Health indicators and outcomes at endline (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Household cooks outdoors or in separate building	566	84.1	81.3	86.9	378	76.7	72.5	80.9	188	98.9	97.5	100.4	-22.2***
Household cooks indoors	566	62.9	59.2	66.6	378	57.1	52.2	62.1	188	74.5	69.1	79.8	-17.3***
Primary type of cooking appliance: Traditional stone fire	567	94.9	93.2	96.6	378	98.9	97.9	100	189	86.8	82	91.6	12.2***
Primary type of cooking appliance: Improved traditional stone fire	567	0.7	0	1.4	378	0.3	-0.2	0.8	189	1.6	-0.2	3.4	-1.3
Primary type of cooking appliance: Ordinary jiko	567	3	1.7	4.3	378	0.5	-0.2	1.2	189	7.9	4.3	11.6	-7.4***
Primary type of cooking appliance: Improved jiko	567	1.4	0.5	2.4	378	0.3	-0.2	0.8	189	3.7	1	6.4	-3.4**
Primary type of cooking appliance: Kerosene stove	567	0			378	0			189	0			0
Primary type of cooking appliance: Gas cooker	567	0			378	0			189	0			0
Primary type of cooking appliance: Electric cooker	567	0			378	0			189	0			0
Main source of cooking fuel: Electricity	567	0			378	0			189	0			0
Main source of cooking fuel: Paraffin/kerosene	567	0			378	0			189	0			0
Main source of cooking fuel: Gas	567	0			378	0			189	0			0
Main source of cooking fuel: Firewood	567	97	95.7	98.3	378	99.5	98.8	100.2	189	92.1	88.4	95.7	7.4***
Main source of cooking fuel: Charcoal	567	3	1.7	4.3	378	0.5	-0.2	1.2	189	7.9	4.3	11.6	-7.4***
Main source of cooking fuel: Biomass residue	567	0			378	0			189	0			0
Household burns kerosene inside the home	567	15.3	12.5	18.2	378	22.5	18.3	26.6	189	1.1	-0.4	2.5	21.4***
High risk to average household member's health	566	15.9	13.1	18.7	378	23.3	19.1	27.5	188	1.1	-0.4	2.5	22.2***

Modest risk to average household member's health	566	84.1	81.3	86.9	378	76.7	72.5	80.9	188	98.9	97.5	100.4	-22.2***
Low risk to average household member's health	566	0			378	0			188	0			0
Total HH expenditure on resp illness, fever, watery eyes & burns in last 6 month	567	320.4	235.5	405.2	378	446.5	321.1	572	189	68	25.6	110.4	378.6***
Household got new cooker stove since Feb 2021 from organisation or suppliers	567	4.8	3.1	6.5	378	3.4	1.6	5.2	189	7.4	3.8	11	-4.0*

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 24: Health indicators and outcomes at endline (Household level indicators) – continued

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Household cooks outdoors or in separate building	241	84.6	80.3	89	325	83.7	79.8	87.6	1	271	84.9	80.8	89	268	82.8	78.5	87.2	2
Household cooks indoors	241	64.7	59	70.4	325	61.5	56.4	66.7	3.2	271	63.1	57.6	68.6	268	63.1	57.5	68.6	0
Primary type of cooking appliance: Traditional stone fire	242	95.9	93.4	98.4	325	94.2	91.7	96.6	1.7	272	95.2	92.7	97.7	268	94.8	92.3	97.3	0.4
Primary type of cooking appliance: Improved traditional stone fire	242	0.4	-0.4	1.2	325	0.9	-0.1	1.9	-0.5	272	0.4	-0.3	1.1	268	0.4	-0.4	1.1	0
Primary type of cooking appliance: Ordinary jiko	242	2.1	0.3	3.8	325	3.7	1.8	5.6	-1.6	272	2.6	0.7	4.4	268	3.7	1.6	5.8	-1.2
Primary type of cooking appliance: Improved jiko	242	1.7	0.1	3.2	325	1.2	0	2.4	0.4	272	1.8	0.3	3.4	268	1.1	-0.1	2.4	0.7
Primary type of cooking appliance: Kerosene stove	242	0			325	0			0	272	0			268	0			0
Primary type of cooking appliance: Gas cooker	242	0			325	0			0	272	0			268	0			0
Primary type of cooking appliance: Electric cooker	242	0			325	0			0	272	0			268	0			0
Main source of cooking fuel: Electricity	242	0			325	0			0	272	0			268	0			0
Main source of cooking fuel: Paraffin/kerosene	242	0			325	0			0	272	0			268	0			0
Main source of cooking fuel: Gas	242	0			325	0			0	272	0			268	0			0
Main source of cooking fuel: Firewood	242	97.9	96.2	99.7	325	96.3	94.4	98.2	1.6	272	97.4	95.6	99.3	268	96.3	94.2	98.4	1.2
Main source of cooking fuel: Charcoal	242	2.1	0.3	3.8	325	3.7	1.8	5.6	-1.6	272	2.6	0.7	4.4	268	3.7	1.6	5.8	-1.2
Main source of cooking fuel: Biomass residue	242	0			325	0			0	272	0			268	0			0
Household burns kerosene inside the home	242	13.2	9.1	17.4	325	16.9	13	20.8	-3.7	272	15.1	11	19.2	268	16	11.9	20.2	-1
High risk to average household member's health	241	15.4	11	19.7	325	16.3	12.4	20.2	-1	271	15.1	11	19.2	268	17.2	12.8	21.5	-2
Modest risk to average household member's health	241	84.6	80.3	89	325	83.7	79.8	87.6	1	271	84.9	80.8	89	268	82.8	78.5	87.2	2

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Low risk to average household member's health	241	0			325	0			0	271	0			268	0			0
Total HH expenditure on resp illness, fever, watery eyes & burns in last 6 month	242	271.3	144.8	397.7	325	356.9	242.4	471.4	-85.6	272	323.1	201.7	444.5	268	306	181.2	430.8	17.1
Household got new cooker stove since Feb 2021 from organisation or suppliers	242	4.5	1.9	7.2	325	4.9	2.7	7.2	-0.4	272	2.9	1	4.9	268	7.1	4	10.1	-4.1**

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 25: Health outcomes of household members at endline (Member level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Experienced cough in last 2 weeks [All members]	3966	7.7	7.1	8.4	2850	9.4	8.6	10.3	1116	3.3	2.5	4.1	6.1***
Experienced cough in last 2 weeks [Members with a cough]	306	44.4	40.1	48.8	269	43.5	38.9	48.1	37	51.4	38.4	64.3	-7.9
Experienced dry cough in last 2 weeks [All members]	3966	3.4	3	3.9	2850	4.1	3.5	4.7	1116	1.7	1.1	2.3	2.4***
Experienced cough with fever in last 2 weeks [Members with a cough]	306	53.9	49.6	58.3	269	50.6	45.8	55.3	37	78.4	68.2	88.5	-27.8***
Experienced cough with fever in last 2 weeks [All members]	3966	4.2	3.7	4.7	2850	4.8	4.2	5.4	1116	2.6	1.9	3.3	2.2***
Experienced difficulty breathing w cough in last 2 weeks [Members with a cough]	305	8.2	5.8	10.6	268	9	6.2	11.7	37	2.7	-1.5	6.9	6.3**
Experienced difficulty breathing with cough in last 2 weeks [All members]	3965	0.6	0.4	0.8	2849	0.8	0.6	1.1	1116	0.1	0	0.2	0.8***
Experienced fever without cough in last 2 weeks [All members]	3961	4.9	4.3	5.4	2847	6.4	5.7	7.1	1114	0.9	0.5	1.3	5.5***
Experienced symptoms of ARI in last 2 weeks [All members]	3964	0.6	0.4	0.8	2848	0.8	0.5	1.1	1116	0.1	0	0.2	0.7***
Experienced eye irritation due to smoke in last month [All members]	3965	8.9	8.2	9.5	2850	11.9	10.9	12.8	1115	1.2	0.7	1.7	10.7***
School child experienced eye irritation due to smoke in last month	1081	5.3	4.2	6.3	790	7.2	5.8	8.6	291	0			7.2***
Eye irritation cause: While cooking	351	75.5	72	79	338	74.6	70.9	78.2	13	100			-25.4***
Eye irritation cause: While others are cooking	351	59.8	56.3	63.4	338	60.4	56.7	64	13	46.2	28.2	64.1	14.2
Eye irritation cause: While doing homework	351	1.4	0.4	2.4	338	1.5	0.5	2.5	13	0			1.5***
Eye irritation cause: While reading or studying	351	0.6	-0.1	1.2	338	0.6	-0.1	1.2	13	0			0.6*
Eye irritation cause: All the time	351	2	0.8	3.2	338	2.1	0.9	3.3	13	0			2.1***

Eye irritation address: Need to have a break from activity	351	16.2	13.2	19.3	338	16	12.9	19.1	13	23.1	4.3	41.9	-7.1
Eye irritation address: Need to close eyes	351	24.5	21.1	27.9	338	25.1	21.7	28.6	13	7.7	-3.9	19.3	17.5***
Eye irritation address: Need to splash water	351	42.7	39	46.5	338	43.5	39.6	47.3	13	23.1	3.4	42.8	20.4**
Eye irritation address: Need to wipe eyes	351	61	56.9	65	338	61.5	57.5	65.6	13	46.2	23.1	69.2	15.4
Eye irritation address: Apply medication	351	3.4	1.9	4.9	338	3.6	2	5.1	13	0			3.6***
Eye irritation address: Do nothing	351	6.3	4.3	8.2	338	5.3	3.4	7.2	13	30.8	10.1	51.4	-25.4**
Household member experienced a burn related to lighting fuel in last 6 months	3964	0.6	0.4	0.8	2849	0.8	0.5	1.1	1115	0.2	0	0.4	0.6***

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 26: Health outcomes of household members at endline (Member level indicators) - continued

Indicator	Male				Female				Diff	<6 years old				6-15 years old				>15 years old			
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI
Experienced cough in last 2 weeks [All members]	1808	7	6	7.9	2158	8.3	7.4	9.3	-1.4**	419	9.8	7.5	12	1543	4.8	4	5.6	2004	9.5	8.5	10.5
Experienced cough in last 2 weeks [Members with a cough]	126	45.2	38.5	52	180	43.9	38	49.7	1.3	41	26.8	16	37.7	74	51.4	42.2	60.5	191	45.5	40	51.1
Experienced dry cough in last 2 weeks [All members]	1808	3.2	2.5	3.8	2158	3.7	3	4.3	-0.5	419	2.6	1.4	3.8	1543	2.5	1.9	3.1	2004	4.3	3.6	5
Experienced cough with fever in last 2 weeks [Members with a cough]	126	48.4	41.5	55.4	180	57.8	52.1	63.4	-9.4**	41	65.9	54.3	77.4	74	60.8	52	69.7	191	48.7	43	54.3
Experienced cough with fever in last 2 weeks [All members]	1808	3.4	2.7	4	2158	4.8	4.1	5.5	-1.4***	419	6.4	4.6	8.3	1543	2.9	2.3	3.6	2004	4.6	3.9	5.4
Experienced difficulty breathing w cough in last 2 weeks [Members with a cough]	126	6.3	3	9.7	179	9.5	6.1	12.9	-3.1	41	4.9	-0.4	10.1	74	14.9	8.4	21.3	190	6.3	3.6	9.1
Experienced difficulty breathing with cough in last	1808	0.4	0.2	0.7	2157	0.8	0.5	1.1	-0.3*	419	0.5	0	1	1543	0.7	0.4	1	2003	0.6	0.3	0.9

Indicator	Male				Female				Diff	<6 years old				6-15 years old				>15 years old			
2 weeks [All members]																					
Experienced fever without cough in last 2 weeks [All members]	1806	4.3	3.5	5	2155	5.4	4.6	6.1	-1.1**	419	5	3.4	6.7	1540	3.5	2.8	4.2	2002	5.9	5.1	6.7
Experienced symptoms of ARI in last 2 weeks [All members]	1808	0.4	0.2	0.7	2156	0.7	0.5	1	-0.3	419	0.5	0	1	1543	0.7	0.4	1	2002	0.5	0.3	0.8
Experienced eye irritation due to smoke in last month [All members]	1809	5.9	5.1	6.8	2156	11.3	10.3	12.4	-5.4***	419	4.1	2.6	5.6	1542	5.1	4.2	5.9	2004	12.8	11.6	13.9
School child experienced eye irritation due to smoke in last month	534	3.7	2.5	5	547	6.8	5.1	8.4	-3.0***	1081	5.3	4.2	6.3								
Eye irritation cause: While cooking	107	55.1	47.7	62.6	244	84.4	80.8	88	-29.3***	17	17.6	3.2	32.1	78	61.5	53	70.1	256	83.6	80	87.2
Eye irritation cause: While others are cooking	107	84.1	78.6	89.6	244	49.2	44.7	53.7	34.9***	17	94.1	85.2	103	78	78.2	71	85.4	256	52	47.5	56.4
Eye irritation cause: While doing homework	107	2.8	0.3	5.3	244	0.8	-0.1	1.7	2	17	0			78	3.8	0.4	7.3	256	0.8	-0.1	1.6
Eye irritation cause: While reading or studying	107	0.9	-0.5	2.4	244	0.4	-0.2	1	0.5	17	0			78	2.6	-0.2	5.4	256	0		
Eye irritation cause: All the time	107	1.9	-0.2	3.9	244	2	0.6	3.5	-0.2	17	0			78	1.3	-0.7	3.3	256	2.3	0.9	3.8
Eye irritation address: Need to have a break from activity	107	9.3	5	13.7	244	19.3	15.3	23.2	-9.9***	17	5.9	-3	14.8	78	7.7	3	12.4	256	19.5	15.7	23.4
Eye irritation address: Need to close eyes	107	29.9	23.1	36.7	244	22.1	18.2	26.1	7.8*	17	23.5	7.6	39.5	78	25.6	18.1	33.2	256	24.2	20.2	28.2
Eye irritation address: Need to splash water	107	49.5	42.2	56.9	244	39.8	35.2	44.3	9.8**	17	41.2	22.6	59.8	78	43.6	35	52.2	256	42.6	38.1	47.1
Eye irritation address: Need to wipe eyes	107	64.5	57.3	71.7	244	59.4	54.5	64.3	5.1	17	76.5	60.4	92.5	78	70.5	62.5	78.6	256	57	52.2	61.8

Indicator	Male				Female				Diff	<6 years old				6-15 years old				>15 years old			
Eye irritation address: Apply medication	107	2.8	0.3	5.3	244	3.7	1.8	5.6	-0.9	17	0			78	2.6	-0.2	5.4	256	3.9	2	5.8
Eye irritation address: Do nothing	107	4.7	1.5	7.8	244	7	4.5	9.5	-2.3	17	0			78	2.6	-0.2	5.3	256	7.8	5.3	10.4
Household member experienced a burn related to lighting fuel in last 6 months	1807	0.4	0.2	0.7	2157	0.8	0.5	1.1	-0.3*	419	0.2	-0.1	0.6	1542	0.5	0.2	0.7	2003	0.8	0.5	1.2

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

I.5 Livelihoods

Table 27: Livelihood outcomes at endline (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
# HH members >14 years old engaged in income generating activities [All HHs]	567	3.3	3.2	3.5	378	3.9	3.7	4.1	189	2.2	2	2.4	1.6***
Total # work activities per HH [HHs with at least 1 working member]	558	6.5	6.2	6.9	378	8.1	7.6	8.6	180	3.3	3	3.6	4.8***
# activities per HH started in last year [HHs with at least 1 working member]	558	2.1	1.9	2.4	378	2.3	1.9	2.6	180	1.8	1.5	2.1	0.4*
Mean % of HH activities done at home [HHs with at least 1 working member]	558	50.7	48.3	53.1	378	46.6	43.7	49.5	180	59.4	55.1	63.6	-12.7***
Household monthly income excluding remittances - KES [All households]	562	3680.4	3111.4	4249.4	377	3375.8	2802.2	3949.3	185	4301.1	3027.5	5574.7	-925.3
Household monthly income from remittances and gift - KES [All households]	554	888.8	692.7	1084.9	366	441	340.6	541.4	188	1760.6	1217.3	2303.8	- 1319.6***
Household monthly total income - KES [All households]	562	4550.5	3967.5	5133.4	377	3803.9	3227.5	4380.3	185	6071.8	4747	7396.7	- 2267.9***
OVC beneficiary [All HHs]	566	47.9	45.1	50.6	378	47.9	44.7	51.1	188	47.9	42.5	53.2	0
OP beneficiary [All HHs]	566	47.7	44.9	50.5	378	48.7	45.4	52	188	45.7	40.5	51	2.9
PWSD beneficiary [All HHs]	566	1.9	0.8	3.1	378	2.1	0.7	3.5	188	1.6	-0.2	3.4	0.5
Does not receive regular cash transfer [All HHs]	566	2.8	1.5	4.2	378	1.9	0.5	3.2	188	4.8	1.7	7.8	-2.9*
Received other assistance since March-Food assistance [All beneficiary HHs]	566	16.6	13.6	19.6	378	21.4	17.4	25.5	188	6.9	3.4	10.5	14.5***
Received other assistance since March-Food/cash for work [All beneficiary HHs]	563	3	1.6	4.4	375	4.3	2.3	6.3	188	0.5	-0.5	1.6	3.7***

Received other assistance since March-Cash transfers [All beneficiary HHs]	564	12.1	9.5	14.6	376	17.6	13.8	21.3	188	1.1	-0.4	2.5	16.5***
Received other assistance since March-Other [All beneficiary HHs]	564	0			377	0			187	0			0

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 28: Livelihood outcomes at endline (Household level indicators) – continued

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
# HH members >14 years old engaged in income generating activities [All HHs]	242	3.7	3.5	4	325	3	2.8	3.2	0.7** *	272	3	2.8	3.2	268	3.6	3.4	3.8	-0.6***
Total # work activities per HH [HHs with at least 1 working member]	238	6.7	6.2	7.2	320	6.4	5.9	6.9	0.2	270	6.3	5.8	6.8	261	6.9	6.3	7.4	-0.5
# activities per HH started in last year [HHs with at least 1 working member]	238	2.1	1.7	2.5	320	2.2	1.8	2.5	-0.1	270	2.3	1.9	2.6	261	2	1.6	2.4	0.3
Mean % of HH activities done at home [HHs with at least 1 working member]	238	49.8	45.9	53.6	320	51.5	48.3	54.6	-1.7	270	47.8	44.4	51.1	261	52.6	49	56.3	-4.9*
Household monthly income excluding remittances - KES [All households]	240	376 5.6	2941.8	4589.5	322	3616.8	2838	4395.6	148. 8	269	362 7	2860.4	4393.7	266	3768.2	2861.2	4675.2	-141.2
Household monthly income from remittances and gift - KES [All households]	233	944. 5	604.8	1284.2	321	848.3	614.3	1082.3	96.2	269	819	537.7	1100.2	258	991.9	692.9	1290.9	-173
Household monthly total income - KES [All households]	240	466 8.4	3817.9	5519	322	4462.5	3664.9	5260.1	205. 9	269	443 3.4	3642.2	5224.5	266	4730.3	3810.1	5650.5	-296.9
OVC beneficiary [All HHs]	241	30.3	25.6	35	325	60.9	56.6	65.2	- 30.6 ***	271	100			268	0			100
OP beneficiary [All HHs]	241	65.1	60.2	70.1	325	34.8	30.6	38.9	30.4 ***	271	0.7	-0.3	1.7	268	100			-99.3***
PWSD beneficiary [All HHs]	241	2.1	0.3	3.8	325	1.8	0.4	3.3	0.2	271	0			268	0			0
Does not receive regular cash transfer [All HHs]	241	2.5	0.5	4.4	325	3.1	1.2	4.9	-0.6	271	0			268	0			0
Received other assistance since March-Food assistance [All beneficiary HHs]	241	15.8	11.3	20.3	325	17.2	13.2	21.3	-1.5	271	15.1	11	19.3	268	17.5	13.1	22	-2.4
Received other assistance since March-Food/cash for work [All beneficiary HHs]	239	3.3	1.1	5.6	324	2.8	1	4.5	0.6	269	1.5	0.1	2.9	267	4.9	2.3	7.4	-3.4**
Received other assistance since March-Cash transfers [All beneficiary HHs]	239	10.9	7	14.7	325	12.9	9.4	16.4	-2	271	14.8	10.8	18.7	266	10.2	6.6	13.7	4.6*
Received other assistance since March-Other [All beneficiary HHs]	240	0			324	0			0	270	0			267	0			0

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 29: Household livelihoods at endline (Member level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Household member is working [All HH members>14]	2155	87.2	86.1	88.3	1588	91.9	90.8	92.9	567	74.1	71.2	76.9	17.8***
Household member is not working-too old [All HH members>14 not working]	276	43.1	38.6	47.6	129	45.7	39.1	52.4	147	40.8	34.7	46.9	4.9
Household member is not working-unable [All HH members>14 not working]	276	26.8	22.8	30.8	129	39.5	32.9	46.2	147	15.6	10.9	20.4	23.9***
Household member is not working-unemployed [All HH members>14 not working]	276	9.8	7.2	12.3	129	0.8	-0.4	2	147	17.7	13	22.4	-16.9***
Household member is not working-in education [All HH members>14 not working]	276	18.8	15.3	22.4	129	10.9	6.7	15	147	25.9	20.3	31.4	-15.0***
Household member is not working-voc training [All HH members>14 not working]	276	0.4	-0.2	0.9	129	0.8	-0.4	2	147	0			0.8
Household member is not working-volunteering [All HH members>14 not working]	276	0			129	0			147	0			0
Household member is not working-COVID19 [All HH members>14 not working]	276	0.7	-0.1	1.5	129	1.6	-0.2	3.3	147	0			1.6*
Household member is not working-other [All HH members>14 not working]	276	0.4	-0.2	0.9	129	0.8	-0.4	2	147	0			0.8
Job: Herding/Livestock producer(unpaid) [All working HH members]	1879	18	16.6	19.4	1459	17.1	15.6	18.7	420	21	17.9	24	-3.8**
Job: Herding/Livestock producer(paid) [All working HH members]	1879	0.3	0.1	0.5	1459	0.3	0.1	0.6	420	0			0.3***
Job: Livestock trader [All working HH members]	1879	0.1	0	0.1	1459	0.1	0	0.2	420	0			0.1
Job: Farming/Agricultural producer [All working HH members]	1879	1.8	1.3	2.3	1459	1.6	1.1	2.2	420	2.4	1.3	3.5	-0.7
Job: Farming for own consumption [All working HH members]	1879	51.3	49.8	52.8	1459	65.5	63.6	67.5	420	1.9	0.9	2.9	63.6***
Job: Fishmonger, fisherman (paid) [All working HH members]	1879	0.5	0.3	0.8	1459	0.7	0.4	1	420	0			0.7***
Job: Fishing for own consumption [All working HH members]	1879	1.9	1.4	2.3	1459	2.3	1.7	2.9	420	0.2	-0.1	0.6	2.1***
Job: Teacher at school [All working HH members]	1879	0.5	0.2	0.7	1459	0.4	0.2	0.7	420	0.7	0.1	1.4	-0.3
Job: Tutor (self-employed) [All working HH members]	1879	0			1459	0			420	0			0

Job: Religious teacher/leader (at madrasa) [All working HH members]	1879	0.4	0.2	0.7	1459	0			420	1.9	0.9	2.9	-1.9***
Job: Religious tutor (self-employed) [All working HH members]	1879	0.1	0	0.1	1459	0			420	0.2	-0.1	0.6	-0.2
Job: Handicraft workers [All working HH members]	1879	0.9	0.6	1.2	1459	1.2	0.7	1.6	420	0			1.2***
Job: Potters, Glass-Makers and Related Trades Workers [All working HH members]	1879	0.1	0	0.2	1459	0.1	0	0.3	420	0			0.1*
Job: Butchers, Fishmongers and Related Food Preparers [All working HH members]	1879	0.1	0	0.1	1459	0			420	0.2	-0.1	0.6	-0.2
Job: Bakers, Pastry-Cooks and Confectionery Makers [All working HH members]	1879	0.2	0	0.4	1459	0.2	0	0.4	420	0.2	-0.1	0.6	0
Job: Woodworking Trades Workers [All working HH members]	1879	0.1	0	0.1	1459	0.1	0	0.2	420	0			0.1
Job: Textile, Garment and Related Trades Workers [All working HH members]	1879	0.2	0	0.4	1459	0.2	0	0.4	420	0.2	-0.1	0.6	0
Job: Small scale business (self-employed) [All working HH members]	1879	10.9	9.7	12	1459	9.5	8.3	10.6	420	15.7	12.9	18.5	-6.3***
Job: Shoe-Making, repairs and Related Trades Workers [All working HH members]	1879	0.1	0	0.2	1459	0.1	0	0.3	420	0			0.1*
Job: Shoe Cleaning [All working HH members]	1879	0			1459	0			420	0			0
Job: Cleaners, Launderers, Domestic Workers (paid) [All working HH members]	1879	0.5	0.3	0.8	1459	0.3	0.1	0.6	420	1.2	0.4	2	-0.8*
Job: Unpaid domestic work [All working HH members]	1879	52.4	50.6	54.1	1459	47.2	45.2	49.2	420	70.2	66.8	73.7	-23.0***
Job: Building Caretakers [All working HH members]	1879	0.2	0	0.3	1459	0.2	0	0.4	420	0			0.2**
Job: Messengers, Porters, Watchmen and Related Workers [All working HH members]	1879	0.6	0.4	0.9	1459	0.3	0.1	0.5	420	1.9	0.9	2.9	-1.6***
Job: Labourers in Mining, Constr, Manufac, Agri, Transp [All working HH members]	1879	5.2	4.4	6	1459	6	5.1	7	420	2.1	1	3.2	3.9***
Job: Public official (incl. armed forces, police) [All working HH members]	1879	0.2	0	0.4	1459	0.1	0	0.2	420	0.7	0.1	1.4	-0.6*
Job: Street and market vendors [All working HH members]	1879	0.1	0	0.2	1459	0.1	0	0.3	420	0			0.1*
Job: Unpaid work in family business [All working HH members]	1879	0.2	0	0.4	1459	0			420	1	0.2	1.7	-1.0**
Job: Collecting bush products [All working HH members]	1879	1.1	0.7	1.4	1459	1.2	0.7	1.6	420	0.7	0.1	1.4	0.5

Job: Collecting water [All working HH members]	1879	25	23.4	26.5	1459	28.9	27.1	30.8	420	11.2	8.8	13.6	17.7***
Job: Collecting firewood or other fuel materials [All working HH members]	1879	20.9	19.4	22.3	1459	24.9	23.2	26.7	420	6.7	4.8	8.5	18.3***
Job: Collecting forest products for consumption/medicine [All working HH members]	1879	0.4	0.2	0.6	1459	0.5	0.2	0.8	420	0			0.5***
Job: Other [All working HH members]	1879	0.2	0	0.4	1459	0.2	0	0.4	420	0.2	-0.1	0.6	0
Number of work activities per working member [All working HH members]	1879	1.9	1.9	2	1459	2.1	2	2.1	420	1.4	1.4	1.5	0.7***
Number of hours worked per week [All working HH members]	1859	41.5	40.5	42.5	1439	44	42.8	45.3	420	32.8	31.4	34.3	11.2***
HH members doing work activities at home using light [All working HH members]	1879	41.8	40.1	43.6	1459	38	36	39.9	420	55.2	51.5	59	-17.3***
# activities done at home using artificial light [All working HH members]	1879	0.4	0.4	0.4	1459	0.4	0.4	0.4	420	0.6	0.5	0.6	-0.2***
Number of hours worked per week using light [All members using artificial light]	779	9.7	9.3	10	549	10.2	9.8	10.7	230	8.4	7.8	8.9	1.9***
Light used for work-Candle [All members using artificial light]	786	0			554	0			232	0			0
Light used for work-Kerosene/Paraffin/Tin lamp/lantern [All members using artificial light]	786	8.3	6.8	9.8	554	11	9	13.1	232	1.7	0.4	3	9.3***
Light used for work-Dry-cell battery torch [All members using artificial light]	786	25.4	23.4	27.5	554	11.6	9.5	13.6	232	58.6	53.7	63.5	-47.1***
Light used for work-Solar lantern [All members using artificial light]	786	12.7	11	14.4	554	17.1	14.8	19.5	232	2.2	0.7	3.6	15.0***
Light used for work-Solar home system [All members using artificial light]	786	41.6	39	44.2	554	50	46.8	53.2	232	21.6	17.5	25.6	28.4***
Light used for work-National grid [All members using artificial light]	786	4.1	3.1	5.1	554	0			232	13.8	10.4	17.2	-13.8***
Light used for work-Mobile phone torch [All members using artificial light]	786	4.6	3.4	5.7	554	5.6	4.1	7.1	232	2.2	0.7	3.7	3.4***
Light used for work-Firewood [All members using artificial light]	786	1.8	1.1	2.5	554	2.5	1.5	3.6	232	0			2.5***
Light used for work-Solar torch [All members using artificial light]	786	1.8	1.1	2.5	554	2.3	1.4	3.3	232	0.4	-0.2	1.1	1.9***
HH member belongs to merry-go-round or savings scheme [All HH members>14]	2155	15.9	14.6	17.1	1588	17.2	15.7	18.7	567	12.2	10	14.3	5.0***
HH members who changed livelihood activities since schools reopened [All HH memb	1879	11.2	10.1	12.3	1459	11.8	10.5	13.1	420	9	6.9	11.2	2.7**
Reason for change-C19 rules [HH members w changed activity]	210	28.1	23.2	33	172	28.5	23.1	33.9	38	26.3	14.8	37.8	2.2
Reason for change-change to more IGA [HH members w changed activity]	210	4.3	2.1	6.5	172	5.2	2.6	7.9	38	0			5.2***

Reason for change-unable to work in former activity [HH members w changed activity]	210	1.9	0.4	3.4	172	2.3	0.5	4.1	38	0			2.3**
Reason for change-economic effects of C19 [HH members w changed activity]	210	29.5	24.8	34.2	172	26.2	21	31.3	38	44.7	33.7	55.7	-18.6***
Reason for change-went back to school [HH members w changed activity]	210	20.5	16.4	24.5	172	22.1	17.5	26.7	38	13.2	5.3	21	8.9*
Reason for change-child went back to school & can't help anymore [HH members w c]	210	6.2	3.6	8.8	172	6.4	3.5	9.3	38	5.3	-0.6	11.1	1.1
Reason for change-drought [HH members w changed activity]	210	0.5	-0.3	1.2	172	0.6	-0.3	1.5	38	0			0.6
Reason for change-other [HH members w changed activity]	210	9	6	12.1	172	8.7	5.4	12.1	38	10.5	3.4	17.7	-1.8

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 30: Household livelihoods at endline (Member level indicators) – continued

Indicator	Male				Female				Diff	CT-OVC				OP-CT				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Household member is working [All HH members>14]	912	83.7	81.8	85.5	1243	89.8	88.5	91.1	-6.1***	906	90.9	89.5	92.4	1143	84.6	83	86.2	6.3***
Household member is not working-too old [All HH members>14 not working]	149	34.2	28.3	40.1	127	53.5	47	60.1	-19.3***	82	18.3	11.6	24.9	176	54	48.3	59.6	-35.7***
Household member is not working-unable [All HH members>14 not working]	149	22.1	16.9	27.4	127	32.3	26	38.6	-10.1**	82	26.8	19.8	33.9	176	25.6	20.7	30.5	1.3
Household member is not working-unemployed [All HH members>14 not working]	149	15.4	11.1	19.8	127	3.1	1.4	4.9	12.3***	82	23.2	16.3	30.1	176	4.5	2.1	7	18.6***
Household member is not working-in education [All HH members>14 not working]	149	25.5	20	31	127	11	6.7	15.3	14.5***	82	29.3	21.8	36.7	176	14.8	10.7	18.8	14.5***
Household member is not working-voc training [All HH members>14 not working]	149	0.7	-0.4	1.7	127	0			0.7	82	0			176	0.6	-0.3	1.5	-0.6

Indicator	Male				Female				Diff	CT-OVC				OP-CT				Diff
Household member is not working-volunteering [All HH members>14 not working]	149	0			127	0			0	82	0			176	0			0
Household member is not working-COVID19 [All HH members>14 not working]	149	1.3	-0.1	2.8	127	0			1.3*	82	2.4	-0.2	5.1	176	0			2.4*
Household member is not working-other [All HH members>14 not working]	149	0.7	-0.4	1.7	127	0			0.7	82	0			176	0.6	-0.3	1.5	-0.6
Job: Herding/Livestock producer(unpaid) [All working HH members]	763	30.9	28.3	33.5	1116	9.1	7.8	10.5	21.8***	824	20	17.9	22.2	967	16.4	14.6	18.3	3.6**
Job: Herding/Livestock producer(paid) [All working HH members]	763	0.7	0.2	1.1	1116	0			0.7***	824	0.4	0	0.7	967	0.2	0	0.4	0.2
Job: Livestock trader [All working HH members]	763	0.1	-0.1	0.3	1116	0			0.1	824	0			967	0.1	-0.1	0.3	-0.1
Job: Farming/Agricultural producer [All working HH members]	763	1.7	1	2.4	1116	1.9	1.3	2.5	-0.2	824	2.8	1.9	3.7	967	0.9	0.5	1.4	1.9***
Job: Farming for own consumption [All working HH members]	763	48	45.3	50.7	1116	53.6	51.5	55.6	-5.6***	824	50.8	48.5	53.2	967	52.5	50.3	54.8	-1.7
Job: Fishmonger, fisherman (paid) [All working HH members]	763	0.9	0.4	1.5	1116	0.3	0	0.5	0.6**	824	0.7	0.3	1.2	967	0.4	0.1	0.7	0.3
Job: Fishing for own consumption [All working HH members]	763	1.6	0.9	2.3	1116	2.1	1.4	2.7	-0.5	824	1.8	1.1	2.5	967	1.9	1.2	2.5	0
Job: Teacher at school [All working HH members]	763	0.8	0.3	1.3	1116	0.3	0	0.5	0.5*	824	0.4	0	0.7	967	0.6	0.2	1	-0.3
Job: Tutor (self-employed) [All working HH members]	763	0			1116	0			0	824	0			967	0			0
Job: Religious teacher/leader (at madrasa) [All working HH members]	763	1	0.5	1.6	1116	0			1.0***	824	0.2	0	0.5	967	0.6	0.2	1	-0.4
Job: Religious tutor (self-employed) [All working HH members]	763	0.1	-0.1	0.3	1116	0			0.1	824	0			967	0.1	-0.1	0.3	-0.1

Indicator	Male				Female				Diff	CT-OVC				OP-CT				Diff
Job: Handicraft workers [All working HH members]	763	1.6	0.9	2.3	1116	0.4	0.1	0.8	1.1***	824	0.4	0	0.7	967	1.2	0.7	1.8	-0.9***
Job: Potters, Glass-Makers and Related Trades Workers [All working HH members]	763	0.3	0	0.5	1116	0			0.3*	824	0.2	0	0.5	967	0			0.2*
Job: Butchers, Fishmongers and Related Food Preparers [All working HH members]	763	0			1116	0.1	0	0.2	-0.1	824	0.1	-0.1	0.3	967	0			0.1
Job: Bakers, Pastry-Cooks and Confectionery Makers [All working HH members]	763	0.1	-0.1	0.3	1116	0.3	0	0.5	-0.1	824	0.1	-0.1	0.3	967	0.3	0	0.6	-0.2
Job: Woodworking Trades Workers [All working HH members]	763	0.1	-0.1	0.3	1116	0			0.1	824	0.1	-0.1	0.3	967	0			0.1
Job: Textile, Garment and Related Trades Workers [All working HH members]	763	0.3	0	0.5	1116	0.2	0	0.4	0.1	824	0.1	-0.1	0.3	967	0.3	0	0.6	-0.2
Job: Small scale business (self-employed) [All working HH members]	763	10.6	8.9	12.3	1116	11	9.6	12.5	-0.4	824	12.3	10.5	14	967	9.2	7.8	10.6	3.1***
Job: Shoe-Making, repairs and Related Trades Workers [All working HH members]	763	0.3	0	0.5	1116	0			0.3*	824	0.1	-0.1	0.3	967	0.1	-0.1	0.3	0
Job: Shoe Cleaning [All working HH members]	763	0			1116	0			0	824	0			967	0			0
Job: Cleaners, Launderers, Domestic Workers (paid) [All working HH members]	763	0.3	0	0.5	1116	0.7	0.3	1.1	-0.5*	824	0.5	0.1	0.9	967	0.6	0.2	1	-0.1
Job: Unpaid domestic work [All working HH members]	763	18.5	16.3	20.6	1116	75.5	73.6	77.5	-57.1***	824	55.7	53.1	58.3	967	49.7	47.3	52.2	6.0***
Job: Building Caretakers [All working HH members]	763	0.4	0	0.7	1116	0			0.4**	824	0.2	0	0.5	967	0.1	-0.1	0.3	0.1
Job: Messengers, Porters, Watchmen and Related Workers [All working HH members]	763	1.6	0.9	2.3	1116	0			1.6***	824	0.4	0	0.7	967	0.6	0.2	1	-0.3

Indicator	Male				Female				Diff	CT-OVC				OP-CT				Diff
Job: Labourers in Mining, Constr, Manufac, Agri, Transp [All working HH members]	763	9	7.4	10.7	1116	2.5	1.8	3.2	6.5***	824	6.3	5	7.6	967	4.6	3.5	5.6	1.8**
Job: Public official (incl. armed forces, police) [All working HH members]	763	0.5	0.1	0.9	1116	0			0.5**	824	0.5	0.1	0.9	967	0			0.5**
Job: Street and market vendors [All working HH members]	763	0.1	-0.1	0.3	1116	0.1	0	0.2	0	824	0			967	0.2	0	0.4	-0.2*
Job: Unpaid work in family business [All working HH members]	763	0.5	0.1	0.9	1116	0			0.5**	824	0.2	0	0.5	967	0.2	0	0.4	0
Job: Collecting bush products [All working HH members]	763	0.7	0.2	1.1	1116	1.3	0.8	1.9	-0.7*	824	1.3	0.7	2	967	0.8	0.4	1.3	0.5
Job: Collecting water [All working HH members]	763	11.7	9.9	13.5	1116	34.1	31.9	36.2	-22.4***	824	27.1	24.7	29.4	967	24	21.9	26.1	3.1*
Job: Collecting firewood or other fuel materials [All working HH members]	763	9.2	7.6	10.8	1116	28.9	26.8	30.9	-19.7***	824	23.9	21.6	26.2	967	18.9	17	20.9	5.0***
Job: Collecting forest products for consumption/medicine [All working HH members]	763	0.4	0	0.7	1116	0.4	0.1	0.6	0	824	0.6	0.2	1	967	0.2	0	0.4	0.4
Job: Other [All working HH members]	763	0.4	0	0.7	1116	0.1	0	0.2	0.3	824	0			967	0.4	0.1	0.7	-0.4**
Number of work activities per working member [All working HH members]	763	1.5	1.5	1.6	1116	2.2	2.2	2.3	-0.7***	824	2.1	2	2.1	967	1.9	1.8	1.9	0.2***
Number of hours worked per week [All working HH members]	756	37.1	35.6	38.6	1103	44.5	43.1	45.9	-7.4***	816	43.1	41.5	44.6	955	40.3	38.8	41.7	2.8**
HH members doing work activities at home using light [All working HH members]	763	10.9	9.1	12.6	1116	63	60.8	65.2	-52.1***	824	46.1	43.5	48.8	967	39	36.6	41.4	7.1***
# activities done at home using artificial light [All working HH members]	763	0.1	0.1	0.1	1116	0.6	0.6	0.7	-0.5***	824	0.5	0.4	0.5	967	0.4	0.4	0.4	0.1***
Number of hours worked per week using	83	12	10.8	13.3	696	9.4	9	9.8	2.6***	376	8.5	8.1	9	374	10.6	10.1	11.2	-2.1***

Indicator	Male				Female				Diff	CT-OVC				OP-CT				Diff
light [All members using artificial light]																		
Light used for work-Candle [All members using artificial light]	83	0			703	0			0	380	0			377	0			0
Light used for work-Kerosene/Paraffin/Tin lamp/lantern [All members using arti	83	7.2	2.8	11.6	703	8.4	6.8	10	-1.2	380	7.1	5.1	9.1	377	9.3	7	11.5	-2.2
Light used for work-Dry-cell battery torch [All members using artificial light]	83	25.3	17.9	32.7	703	25.5	23.3	27.6	-0.2	380	25	21.9	28.1	377	24.9	21.8	28	0.1
Light used for work-Solar lantern [All members using artificial light]	83	7.2	2.9	11.6	703	13.4	11.5	15.2	-6.1**	380	8.7	6.5	10.9	377	17.2	14.6	19.9	-8.6***
Light used for work-Solar home system [All members using artificial light]	83	47	38.5	55.5	703	41	38.2	43.7	6	380	45.8	41.9	49.6	377	39	35.2	42.8	6.8**
Light used for work-National grid [All members using artificial light]	83	2.4	-0.2	5	703	4.3	3.1	5.4	-1.9	380	3.4	2	4.8	377	3.4	2.2	4.7	0
Light used for work-Mobile phone torch [All members using artificial light]	83	7.2	2.8	11.7	703	4.3	3.1	5.4	3	380	6.1	4.2	7.9	377	3.4	2	4.9	2.6**
Light used for work-Firewood [All members using artificial light]	83	2.4	-0.2	5	703	1.7	0.9	2.5	0.7	380	1.8	0.8	2.9	377	1.6	0.6	2.6	0.3
Light used for work-Solar torch [All members using artificial light]	83	1.2	-0.7	3.1	703	1.8	1.1	2.6	-0.6	380	2.6	1.4	3.9	377	1.1	0.2	1.9	1.6**
HH member belongs to merry-go-round or savings scheme [All HH members>14]	912	5	3.9	6.2	1243	23.8	21.9	25.7	-18.8***	906	17.5	15.6	19.5	1143	15	13.3	16.6	2.6**
HH members who changed livelihood activities since schools reopened [All HH members]	763	12.7	10.8	14.6	1116	10.1	8.7	11.5	2.6**	824	10.9	9.2	12.6	967	11.8	10.2	13.4	-0.9
Reason for change-C19 rules [HH members w changed activity]	97	30.9	23.6	38.3	113	25.7	19.2	32.2	5.3	90	33.3	25.4	41.2	114	23.7	17.6	29.8	9.6*

Indicator	Male				Female				Diff	CT-OVC				OP-CT				Diff
Reason for change-change to more IGA [HH members w changed activity]	97	3.1	0.3	5.8	113	5.3	2	8.6	-2.2	90	7.8	3.3	12.3	114	1.8	-0.2	3.7	6.0**
Reason for change-unable to work in former activity [HH members w changed activity]	97	1	-0.6	2.6	113	2.7	0.3	5	-1.6	90	2.2	-0.2	4.7	114	1.8	-0.2	3.7	0.5
Reason for change-economic effects of C19 [HH members w changed activity]	97	33	25.6	40.4	113	26.5	20.5	32.6	6.4	90	35.6	27.8	43.3	114	25.4	19.2	31.7	10.1**
Reason for change-went back to school [HH members w changed activity]	97	26.8	20.3	33.3	113	15	9.8	20.3	11.8***	90	10	5.1	14.9	114	28.1	21.9	34.2	-18.1***
Reason for change-child went back to school & can't help anymore [HH members w changed activity]	97	1	-0.6	2.6	113	10.6	6.1	15.1	-9.6***	90	3.3	0.4	6.3	114	8.8	4.6	12.9	-5.4**
Reason for change-drought [HH members w changed activity]	97	1	-0.6	2.6	113	0			1	90	1.1	-0.6	2.8	114	0			1.1
Reason for change-other [HH members w changed activity]	97	3.1	0.3	5.9	113	14.2	9.1	19.2	-11.1***	90	6.7	2.5	10.8	114	10.5	6	15.1	-3.9

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 31: Women's time use at endline (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Number of hours awake.	534	15.4	15.4	15.5	357	15.4	15.3	15.5	177	15.5	15.4	15.7	-0.1*
Number of hours awake -daylight.	534	11			357	11			177	11			0
Number of hours awake in the dark.	534	4.4	4.4	4.5	357	4.4	4.3	4.5	177	4.5	4.4	4.7	-0.1*
Number of hours spent sleeping.	534	8.6	8.5	8.6	357	8.6	8.5	8.7	177	8.5	8.3	8.6	0.1*
Number of hours spent sleeping - daylight.	534	0			357	0			177	0			0
Number of hours spent sleeping in the dark.	534	8.6	8.5	8.6	357	8.6	8.5	8.7	177	8.5	8.3	8.6	0.1*
Number of hours spent to Get ready	534	0.4	0.3	0.4	357	0.4	0.3	0.4	177	0.3	0.2	0.3	0.1**
Number of hours spent to Prepare/eat a meal	534	3.1	3	3.2	357	3.2	3	3.3	177	2.9	2.7	3.1	0.3**
Number of hours spent to Attend to children	534	0.4	0.3	0.4	357	0.4	0.3	0.4	177	0.4	0.3	0.5	0

Number of hours spent to Get children ready for school	534	0.2	0.2	0.3	357	0.2	0.2	0.3	177	0.2	0.2	0.3	0
Number of hours spent to Care for children, sick, elderly, disabled	534	0.2	0.2	0.3	357	0.1	0	0.1	177	0.5	0.4	0.6	-0.4***
Number of hours spent to Do laundry	534	0.4	0.3	0.4	357	0.3	0.3	0.4	177	0.5	0.4	0.6	-0.2***
Number of hours spent to Clean utensils	534	0.4	0.4	0.5	357	0.4	0.3	0.4	177	0.5	0.4	0.5	-0.1**
Number of hours spent to Clean dwelling / homestead	534	0.4	0.4	0.4	357	0.3	0.3	0.4	177	0.5	0.4	0.6	-0.2***
Number of hours spent to Maintain / repair dwelling	534	0	0	0	357	0	0	0	177	0	0	0	0.0**
Number of hours spent to Fetch water	534	0.9	0.8	1	357	1.2	1.1	1.3	177	0.4	0.3	0.5	0.7***
Number of hours spent to Collect firewood	534	0.7	0.6	0.8	357	0.8	0.7	0.9	177	0.4	0.3	0.5	0.4***
Number of hours spent to Buy household goods	534	0.1	0.1	0.1	357	0.1	0.1	0.1	177	0.2	0.1	0.2	-0.1***
Number of hours spent to Go to the farm or work on the plot (not for pay)	534	2.1	1.9	2.3	357	3.1	2.8	3.4	177	0	0	0.1	3.1***
Number of hours spent to care/feed animals/cut grass for fodder (not for pay)	534	0.4	0.3	0.5	357	0.4	0.3	0.6	177	0.4	0.2	0.5	0.1
Number of hours spent to Travel to/from work	534	0.2	0.1	0.2	357	0.1	0.1	0.2	177	0.2	0.2	0.3	-0.1**
Number of hours spent to Time spent at work	534	1.3	1.1	1.5	357	0.8	0.6	1	177	2.3	1.8	2.8	-1.5***
Number of hours spent to Other leisure activities	534	0	0	0	357	0	0	0.1	177	0	0	0	0.0**
Number of hours spent to Take a walk	534	0	0	0.1	357	0	0	0	177	0.1	0	0.1	-0.1***
Number of hours spent to Listen to radio	534	0	0	0	357	0	0	0	177	0			0.0*
Number of hours spent to Watch television	534	0	0	0	357	0	0	0	177	0			0
Number of hours spent to Read	534	0	0	0	357	0	0	0	177	0			0
Number of hours spent to Rest	534	3.2	2.9	3.4	357	2.7	2.4	2.9	177	4.1	3.6	4.6	-1.4***
Number of hours spent to Religious activities	534	0.3	0.2	0.3	357	0	0	0	177	0.8	0.7	1	-0.8***
Number of hours spent to Drink tea/coffee	534	0	0	0.1	357	0	0	0	177	0.1	0	0.1	0.0***
Number of hours spent to Attend some entertainment	534	0.1	0	0.1	357	0	0	0.1	177	0.1	0.1	0.2	-0.1**
Number of hours spent to Visit a local club	534	0			357	0			177	0			0
Number of hours spent to Study	534	0.3	0.1	0.4	357	0.4	0.2	0.6	177	0	0	0.1	0.4***
Number of hours spent to Meet with other women of my community	534	0.1	0.1	0.2	357	0	0	0.1	177	0.3	0.2	0.5	-0.3***
Number of hours spent to Tell stories	534	0.2	0.2	0.3	357	0.3	0.3	0.4	177	0.1	0.1	0.2	0.2***
Number of hours spent to Other activities	534	0	0	0	357	0	0	0	177	0			0
Number of hours spent on leisure activities.	534	4.3	4	4.5	357	3.6	3.3	3.9	177	5.7	5.2	6.2	-2.1***
Number of hours spent on other activities	534	0.6	0.6	0.7	357	0.6	0.5	0.7	177	0.7	0.6	0.8	-0.1*

Number of hours spent on productive activities.	534	10.5	10.3	10.8	357	11.2	10.9	11.6	177	9.2	8.7	9.6	2.1***
Number of hours spent on productive activities -SNA def.	534	6.6	6.4	6.9	357	7.4	7.1	7.7	177	5.1	4.7	5.5	2.3***
Number of hours spent on paid labour.	534	1.5	1.2	1.7	357	1	0.8	1.3	177	2.3	1.8	2.8	-1.3***
Number of hours spent on unpaid labour.	534	9.1	8.8	9.4	357	10.2	9.8	10.6	177	6.8	6.3	7.3	3.4***
Hours spent on productive activities in the dark	534	2.7	2.6	2.8	357	2.9	2.7	3	177	2.5	2.3	2.7	0.4***
Number of hours spent on productive activities in the dark -SNA def. [One select	534	0.7	0.6	0.7	357	0.8	0.7	0.9	177	0.4	0.3	0.5	0.4***
Woman uses SL/SHS/ST for productive activities.	534	53.2	49.5	56.9	357	68.9	64.2	73.6	177	21.5	15.6	27.4	47.4***
Woman uses SL/SHS/ST for productive activities - SNA def.	534	9.7	7.3	12.1	357	14	10.5	17.5	177	1.1	-0.4	2.7	12.9***
Woman uses SL/SHS/ST for social activities.	534	48.9	45	52.8	357	61.3	56.4	66.3	177	23.7	17.6	29.8	37.6***
Woman is time poor - free time pline. [All women]	534	24.7	21.2	28.2	357	31.1	26.4	35.8	177	11.9	7.1	16.6	19.2***

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 32: Women's time use at endline (Household level indicators) – continued

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Number of hours awake.	212	15.5	15.4	15.6	322	15.4	15.3	15.5	0.1*	261	15.5	15.4	15.6	247	15.4	15.2	15.5	0.2*
Number of hours awake -daylight.	212	11			322	11			0	261	11			247	11			0
Number of hours awake in the dark.	212	4.5	4.4	4.6	322	4.4	4.3	4.5	0.1*	261	4.5	4.4	4.6	247	4.4	4.2	4.5	0.2*
Number of hours spent sleeping.	212	8.5	8.4	8.6	322	8.6	8.5	8.7	-0.1*	261	8.5	8.4	8.6	247	8.6	8.5	8.8	-0.2*
Number of hours spent sleeping - daylight.	212	0			322	0			0	261	0			247	0			0
Number of hours spent sleeping in the dark.	212	8.5	8.4	8.6	322	8.6	8.5	8.7	-0.1*	261	8.5	8.4	8.6	247	8.6	8.5	8.8	-0.2*
Number of hours spent to Get ready	212	0.4	0.3	0.4	322	0.3	0.3	0.4	0	261	0.3	0.3	0.4	247	0.4	0.3	0.4	0
Number of hours spent to Prepare/eat a meal	212	3.4	3.2	3.6	322	2.9	2.7	3	0.5** *	261	3.1	2.9	3.2	247	3.1	2.9	3.3	-0.1
Number of hours spent to Attend to children	212	0.4	0.3	0.5	322	0.3	0.3	0.4	0.1	261	0.4	0.3	0.5	247	0.4	0.3	0.4	0
Number of hours spent to Get children ready for school	212	0.3	0.2	0.3	322	0.2	0.2	0.2	0	261	0.2	0.2	0.3	247	0.2	0.2	0.3	0
Number of hours spent to Care for children, sick, elderly, disabled	212	0.3	0.2	0.3	322	0.2	0.1	0.3	0.1	261	0.2	0.2	0.3	247	0.2	0.2	0.3	0
Number of hours spent to Do laundry	212	0.5	0.4	0.6	322	0.3	0.3	0.4	0.1** *	261	0.4	0.3	0.5	247	0.4	0.3	0.4	0
Number of hours spent to Clean utensils	212	0.5	0.4	0.5	322	0.4	0.3	0.4	0.1	261	0.4	0.4	0.5	247	0.4	0.4	0.5	0

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Number of hours spent to Clean dwelling / homestead	212	0.4	0.4	0.5	322	0.4	0.3	0.4	0.1*	261	0.4	0.3	0.4	247	0.4	0.4	0.5	0
Number of hours spent to Maintain / repair dwelling	212	0	0	0	322	0	0	0	0	261	0	0	0	247	0	0	0	0
Number of hours spent to Fetch water	212	1.1	0.9	1.2	322	0.8	0.7	0.9	0.2** *	261	1	0.9	1.1	247	0.8	0.7	1	0.1
Number of hours spent to Collect firewood	212	0.7	0.6	0.8	322	0.7	0.5	0.8	0	261	0.7	0.6	0.9	247	0.6	0.5	0.7	0.1
Number of hours spent to Buy household goods	212	0.1	0.1	0.2	322	0.1	0.1	0.1	0	261	0.1	0.1	0.2	247	0.1	0	0.1	0.1**
Number of hours spent to Go to the farm or work on the plot (not for pay)	212	2	1.6	2.3	322	2.2	1.9	2.4	-0.2	261	2.2	1.9	2.5	247	2	1.7	2.3	0.2
Number of hours spent to care/feed animals/cut grass for fodder (not for pay)	212	0.3	0.2	0.4	322	0.5	0.4	0.7	- 0.2**	261	0.5	0.3	0.7	247	0.3	0.2	0.4	0.2*
Number of hours spent to Travel to/from work	212	0.2	0.1	0.2	322	0.2	0.1	0.2	0	261	0.2	0.1	0.2	247	0.1	0.1	0.2	0
Number of hours spent to Time spent at work	212	1.2	0.8	1.6	322	1.3	1.1	1.6	-0.1	261	1.6	1.2	1.9	247	1	0.7	1.4	0.5**
Number of hours spent to Other leisure activities	212	0	0	0	322	0	0	0.1	0	261	0	0	0	247	0	0	0	0
Number of hours spent to Take a walk	212	0	0	0	322	0.1	0	0.1	- 0.1** *	261	0	0	0.1	247	0	0	0.1	0
Number of hours spent to Listen to radio	212	0	0	0	322	0	0	0	0	261	0	0	0	247	0	0	0	0
Number of hours spent to Watch television	212	0			322	0	0	0	0	261	0			247	0	0	0	0
Number of hours spent to Read	212	0	0	0	322	0	0	0	0	261	0	0	0	247	0	0	0	0
Number of hours spent to Rest	212	2.8	2.5	3.1	322	3.4	3.1	3.7	- 0.6** *	261	2.7	2.5	3	247	3.6	3.2	4	-0.8***
Number of hours spent to Religious activities	212	0.2	0.2	0.3	322	0.3	0.3	0.4	-0.1*	261	0.3	0.3	0.4	247	0.3	0.2	0.3	0.1
Number of hours spent to Drink tea/coffee	212	0	0	0.1	322	0	0	0.1	0	261	0	0	0.1	247	0	0	0.1	0
Number of hours spent to Attend some entertainment	212	0.1	0	0.1	322	0	0	0.1	0	261	0	0	0.1	247	0.1	0	0.1	0
Number of hours spent to Visit a local club	212	0			322	0			0	261	0			247	0			0
Number of hours spent to Study	212	0.4	0.1	0.7	322	0.2	0	0.4	0.2	261	0.3	0.1	0.4	247	0.3	0.1	0.5	-0.1
Number of hours spent to Meet with other women of my community	212	0.2	0.1	0.2	322	0.1	0.1	0.2	0	261	0.1	0	0.2	247	0.2	0.1	0.2	-0.1*
Number of hours spent to Tell stories	212	0.2	0.2	0.3	322	0.3	0.2	0.3	0	261	0.2	0.1	0.2	247	0.3	0.2	0.4	-0.1***
Number of hours spent to Other activities	212	0	0	0	322	0			0	261	0			247	0	0	0	0
Number of hours spent on leisure activities.	212	3.9	3.5	4.3	322	4.5	4.1	4.9	- 0.6**	261	3.7	3.4	4	247	4.8	4.3	5.2	-1.1***

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Number of hours spent on other activities	212	0.7	0.6	0.7	322	0.6	0.5	0.7	0	261	0.7	0.6	0.7	247	0.6	0.5	0.7	0.1
Number of hours spent on productive activities.	212	10.9	10.5	11.3	322	10.3	9.9	10.7	0.7**	261	11.1	10.8	11.5	247	10	9.5	10.4	1.2***
Number of hours spent on productive activities -SNA def.	212	6.6	6.3	7	322	6.6	6.3	7	0	261	7.3	6.9	7.6	247	6	5.6	6.5	1.2***
Number of hours spent on paid labour.	212	1.3	0.9	1.7	322	1.5	1.2	1.8	-0.2	261	1.8	1.4	2.1	247	1.1	0.8	1.5	0.6**
Number of hours spent on unpaid labour.	212	9.6	9.1	10.1	322	8.7	8.3	9.2	0.8**	261	9.4	9	9.8	247	8.9	8.4	9.3	0.5
Hours spent on productive activities in the dark	212	2.9	2.8	3.1	322	2.6	2.5	2.7	0.3** *	261	2.8	2.7	3	247	2.6	2.5	2.8	0.2*
Number of hours spent on productive activities in the dark -SNA def. [One select	212	0.7	0.6	0.7	322	0.7	0.6	0.7	0	261	0.7	0.6	0.8	247	0.6	0.5	0.7	0.1*
Woman uses SL/SHS/ST for productive activities.	212	46.7	40.3	53.1	322	57.5	52.6	62.3	- 10.8 **	261	54.4	48.9	59.9	247	54.7	49	60.3	-0.2
Woman uses SL/SHS/ST for productive activities - SNA def.	212	45.8	39.2	52.3	322	50.9	45.9	56	-5.2	261	55.2	49.5	60.9	247	44.9	39.1	50.8	10.2**
Woman uses SL/SHS/ST for social activities.	212	25.9	20.2	31.7	322	23.9	19.4	28.5	2	261	25.3	20.2	30.4	247	23.9	18.7	29	1.4

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

I.6 Education

Table 33: Child time use at endline (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Number of hours awake. [One selected child per HH]	523	14.7	14.6	14.8	360	14.8	14.7	14.9	163	14.5	14.4	14.6	0.3***
Number of hours awake -daylight. [One selected child per HH]	523	11			360	11			163	11			0
Number of hours awake in the dark. [One selected child per HH]	523	3.7	3.6	3.8	360	3.8	3.7	3.9	163	3.5	3.4	3.6	0.3***
Number of hours spent sleeping. [One selected child per HH]	523	9.3	9.2	9.4	360	9.2	9.1	9.3	163	9.5	9.4	9.6	-0.3***
Number of hours spent sleeping - daylight. [One selected child per HH]	523	0			360	0			163	0			0
Number of hours spent sleeping in the dark. [One selected child per HH]	523	9.3	9.2	9.4	360	9.2	9.1	9.3	163	9.5	9.4	9.6	-0.3***
Number of hours spent to Get ready	523	0.6	0.5	0.6	360	0.6	0.5	0.6	163	0.5	0.5	0.6	0.1**
Number of hours spent to Prepare/eat a meal	523	1.6	1.6	1.7	360	1.7	1.6	1.7	163	1.5	1.4	1.6	0.1**

Number of hours spent to Go to school	523	8.2	8	8.3	360	8.5	8.2	8.7	163	7.5	7.2	7.8	1.0***
Number of hours spent to Go to duku/madrasa/other religious education	523	0.8	0.7	0.9	360	0	0	0	163	2.5	2.3	2.8	-2.5***
Number of hours spent to Do homework / study (at home)	523	0.8	0.8	0.9	360	1	0.9	1.1	163	0.4	0.3	0.5	0.6***
Number of hours spent to Do homework / study (in neighbourhood)	523	0.1	0	0.1	360	0	0	0	163	0.1	0	0.2	-0.1**
Number of hours spent to Do household chores	523	0.1	0.1	0.1	360	0.1	0.1	0.1	163	0.1	0	0.1	0
Number of hours spent to Wash clothes	523	0.1	0.1	0.1	360	0.1	0.1	0.1	163	0.1	0.1	0.2	0
Number of hours spent to Fetch water	523	0.3	0.2	0.3	360	0.4	0.3	0.4	163	0.1	0.1	0.2	0.2***
Number of hours spent to Collect firewood	523	0.1	0.1	0.2	360	0.1	0.1	0.2	163	0.1	0	0.1	0.1***
Number of hours spent to Buy household goods	523	0	0	0	360	0	0	0	163	0			0
Number of hours spent to Go to the farm / work on a plot	523	0	0	0	360	0	0	0	163	0	0	0	0.0**
Number of hours spent to Take care / feed animals	523	0.3	0.2	0.3	360	0.4	0.3	0.5	163	0	0	0	0.4***
Number of hours spent to Caring for siblings, sick, elderly, disabled	523	0	0	0	360	0	0	0	163	0			0
Number of hours spent to Go to/from work	523	0	0	0	360	0	0	0	163	0			0
Number of hours spent to Help with the household business	523	0	0	0	360	0	0	0	163	0			0
Number of hours spent to Selling anything at market/ street/ mobile	523	0			360	0			163	0			0
Number of hours spent to Other work	523	0			360	0			163	0			0
Number of hours spent to Take a walk	523	0	0	0	360	0	0	0	163	0			0
Number of hours spent to Listen to radio	523	0			360	0			163	0			0
Number of hours spent to Watch television	523	0			360	0			163	0			0
Number of hours spent to Read	523	0	0	0	360	0	0	0	163	0			0.0*
Number of hours spent to Rest	523	0.8	0.7	0.8	360	0.7	0.7	0.8	163	0.9	0.8	1	-0.1**
Number of hours spent to Religious activities	523	0.1	0	0.1	360	0	0	0	163	0.2	0.1	0.3	-0.2***
Number of hours spent to Attend some entertainment	523	0	0	0	360	0	0	0	163	0.1	0	0.1	-0.1***
Number of hours spent to Play (at homestead)	523	0.8	0.6	0.9	360	1	0.8	1.1	163	0.3	0.2	0.4	0.7***
Number of hours spent to Play (outside the homestead)	523	0.2	0.1	0.2	360	0.2	0.1	0.3	163	0.1	0.1	0.2	0.1*
Number of hours spent to Other activities	523	0	0	0	360	0			163	0	0	0.1	0.0***
Number of hours spent on leisure activities. [One selected child per HH]	523	1.8	1.6	1.9	360	1.9	1.7	2.1	163	1.5	1.3	1.7	0.4***
Number of hours spent on leisure-daylight. [One selected child per HH]	523	1	0.9	1.1	360	1.2	1.1	1.4	163	0.6	0.5	0.7	0.6***

Number of hours spent on chores. [One selected child per HH]	523	0.9	0.8	1	360	1.1	1	1.2	163	0.4	0.3	0.5	0.7***
Number of hours spent on chores-daylight. [One selected child per HH]	523	0.7	0.7	0.8	360	0.9	0.8	1.1	163	0.3	0.2	0.4	0.7***
Number of hours on religious edu-daylight. [One selected child per HH]	523	0.7	0.6	0.7	360	0	0	0	163	2.1	1.8	2.3	-2.0***
Number of hours spent on other activities	523	2.2	2.1	2.3	360	2.2	2.2	2.3	163	2.1	2	2.2	0.2**
Number of hours spent studying (school & homework)	523	9	8.8	9.2	360	9.5	9.3	9.7	163	8	7.7	8.3	1.5***
Number of hours spent studying-daylight. [One selected child per HH]	523	7.8	7.7	8	360	8.1	7.9	8.3	163	7.2	6.9	7.5	0.9***
Number of hours spent studying outside school. [One selected child per HH]	523	0.9	0.8	0.9	360	1	1	1.1	163	0.5	0.4	0.6	0.5***
Child does homework outside school. [One selected child per HH]	523	72.3	68.7	75.9	360	81.9	78	85.9	163	50.9	43.2	58.6	31.0***
Number of hours spent studying at home in daylight. [One selected child per HH]	523	0.1	0.1	0.1	360	0.2	0.1	0.2	163	0	0	0	0.1***
Number of hours spent studying at home during darkness. [One selected child per HH]	523	0.7	0.7	0.8	360	0.8	0.8	0.9	163	0.4	0.3	0.5	0.4***
Hours spent studying at home in darkness using light[Children studying at night]	325	1	0.9	1.1	260	1	0.9	1.1	65	1	0.9	1.1	0
Child uses light for studying in the dark.[Child studies in the dark]	325	89.5	86.3	92.8	260	87.7	83.8	91.6	65	96.9	92.7	101.2	-9.2***
Kerosene lamps used for studying at night[Children studying at night]	325	6.8	4.1	9.4	260	8.1	4.8	11.3	65	1.5	-1.5	4.6	6.5***
Drycell battery torch used for studying at night[Children studying at night]	325	9.8	6.8	12.9	260	5	2.4	7.6	65	29.2	18	40.5	-24.2***
Solar lantern used for studying at night[Children studying at night]	325	9.2	6.2	12.3	260	11.2	7.4	14.9	65	1.5	-1.5	4.6	9.6***
Solar home system used for studying at night[Children studying at night]	325	55.4	50.1	60.7	260	58.8	52.9	64.8	65	41.5	29.5	53.6	17.3**
Solar torch used for studying at night[Children studying at night]	325	0			260	0			65	0			0
Child uses SL/SHS/ST for studying.[One selected child per HH]	523	42.3	38.4	46.2	360	53.3	48.3	58.4	163	17.8	12	23.5	35.5***

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 34: Child time use at endline (Household level indicators) – continued

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Number of hours awake. [One selected child per HH]	219	14.7	14.6	14.9	304	14.7	14.6	14.8	0	256	14.7	14.6	14.8	245	14.8	14.6	14.9	-0.1

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Number of hours awake - daylight. [One selected child per HH]	219	11			304	11			0	256	11			245	11			0
Number of hours awake in the dark. [One selected child per HH]	219	3.7	3.6	3.9	304	3.7	3.6	3.8	0	256	3.7	3.6	3.8	245	3.8	3.6	3.9	-0.1
Number of hours spent sleeping. [One selected child per HH]	219	9.3	9.1	9.4	304	9.3	9.2	9.4	0	256	9.3	9.2	9.4	245	9.2	9.1	9.4	0.1
Number of hours spent sleeping -daylight. [One selected child per HH]	219	0			304	0			0	256	0			245	0			0
Number of hours spent sleeping in the dark. [One selected child per HH]	219	9.3	9.1	9.4	304	9.3	9.2	9.4	0	256	9.3	9.2	9.4	245	9.2	9.1	9.4	0.1
Number of hours spent to Get ready	219	0.6	0.5	0.6	304	0.6	0.5	0.6	0	256	0.5	0.5	0.6	245	0.6	0.5	0.6	0.0*
Number of hours spent to Prepare/eat a meal	219	1.6	1.5	1.7	304	1.6	1.6	1.7	0	256	1.6	1.5	1.7	245	1.6	1.6	1.7	0
Number of hours spent to Go to school	219	8.2	7.9	8.5	304	8.1	7.9	8.4	0	256	8.2	8	8.5	245	8	7.8	8.3	0.2
Number of hours spent to Go to duksi/madrassa/other religious education	219	0.9	0.8	1.1	304	0.7	0.6	0.8	0.2	256	0.9	0.7	1	245	0.7	0.6	0.9	0.1
Number of hours spent to Do homework / study (at home)	219	0.8	0.7	0.9	304	0.8	0.8	0.9	0	256	0.9	0.8	1	245	0.8	0.7	0.9	0.1
Number of hours spent to Do homework / study (in neighbourhood)	219	0	0	0.1	304	0.1	0	0.1	0	256	0.1	0	0.1	245	0	0	0.1	0
Number of hours spent to Do household chores	219	0.1	0.1	0.1	304	0.1	0.1	0.1	0	256	0.1	0	0.1	245	0.1	0.1	0.2	-0.1*
Number of hours spent to Wash clothes	219	0.1	0	0.1	304	0.1	0.1	0.2	-0.1**	256	0.1	0.1	0.2	245	0.1	0.1	0.1	0
Number of hours spent to Fetch water	219	0.2	0.2	0.3	304	0.3	0.3	0.4	-0.1*	256	0.3	0.2	0.3	245	0.3	0.2	0.3	0
Number of hours spent to Collect firewood	219	0.1	0	0.1	304	0.1	0.1	0.2	-0.1	256	0.1	0.1	0.2	245	0.1	0.1	0.2	0
Number of hours spent to Buy household goods	219	0			304	0	0	0	0	256	0	0	0	245	0			0
Number of hours spent to Go to the farm / work on a plot	219	0	0	0	304	0	0	0	0	256	0	0	0.1	245	0	0	0	0
Number of hours spent to Take care / feed animals	219	0.3	0.1	0.4	304	0.3	0.2	0.4	0	256	0.2	0.1	0.3	245	0.3	0.2	0.5	-0.1**
Number of hours spent to Caring for siblings, sick, elderly, disabled	219	0	0	0	304	0	0	0	0	256	0	0	0	245	0	0	0	0

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Number of hours spent to Go to/from work	219	0	0	0	304	0			0	256	0	0	0	245	0			0
Number of hours spent to Help with the household business	219	0			304	0	0	0	0	256	0	0	0	245	0			0
Number of hours spent to Selling anything at market/ street/ mobile	219	0			304	0			0	256	0			245	0			0
Number of hours spent to Other work	219	0			304	0			0	256	0			245	0			0
Number of hours spent to Take a walk	219	0			304	0	0	0	0	256	0			245	0	0	0	0
Number of hours spent to Listen to radio	219	0			304	0			0	256	0			245	0			0
Number of hours spent to Watch television	219	0			304	0			0	256	0			245	0			0
Number of hours spent to Read	219	0	0	0	304	0	0	0	0	256	0	0	0	245	0	0	0	0
Number of hours spent to Rest	219	0.8	0.7	0.9	304	0.8	0.7	0.8	0.1	256	0.7	0.7	0.8	245	0.8	0.7	0.9	-0.1
Number of hours spent to Religious activities	219	0.1	0	0.1	304	0.1	0	0.1	0	256	0.1	0	0.1	245	0.1	0	0.1	0
Number of hours spent to Attend some entertainment	219	0	0	0	304	0	0	0	0	256	0	0	0	245	0	0	0	0
Number of hours spent to Play (at homestead)	219	0.8	0.6	1	304	0.7	0.6	0.9	0.1	256	0.7	0.5	0.8	245	0.8	0.7	1	-0.1
Number of hours spent to Play (outside the homestead)	219	0.2	0.1	0.2	304	0.2	0.1	0.2	0	256	0.1	0.1	0.2	245	0.2	0.1	0.3	0
Number of hours spent to Other activities	219	0	0	0	304	0	0	0	0	256	0	0	0	245	0	0	0	0
Number of hours spent on leisure activities. [One selected child per HH]	219	1.8	1.6	2.1	304	1.7	1.6	1.9	0.1	256	1.7	1.5	1.9	245	1.9	1.7	2.1	-0.2
Number of hours spent on leisure-daylight. [One selected child per HH]	219	1	0.9	1.2	304	1	0.9	1.2	0	256	0.9	0.8	1.1	245	1.1	0.9	1.3	-0.2
Number of hours spent on chores. [One selected child per HH]	219	0.8	0.6	0.9	304	1	0.9	1.1	- 0.2**	256	0.8	0.7	0.9	245	1	0.9	1.2	-0.2*
Number of hours spent on chores-daylight. [One selected child per HH]	219	0.6	0.5	0.8	304	0.8	0.7	0.9	-0.2*	256	0.7	0.6	0.8	245	0.8	0.7	1	-0.2*
Number of hours on religious edu-daylight. [One selected child per HH]	219	0.8	0.6	0.9	304	0.6	0.5	0.7	0.1	256	0.7	0.6	0.8	245	0.6	0.5	0.7	0.1

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Number of hours spent on other activities	219	2.2	2.1	2.3	304	2.2	2.1	2.3	0	256	2.2	2.1	2.2	245	2.2	2.2	2.3	-0.1
Number of hours spent studying (school & homework)	219	9	8.7	9.3	304	9	8.8	9.3	0	256	9.2	8.9	9.4	245	8.9	8.6	9.2	0.3
Number of hours spent studying-daylight. [One selected child per HH]	219	7.9	7.6	8.1	304	7.8	7.6	8	0.1	256	7.9	7.7	8.1	245	7.7	7.5	8	0.2
Number of hours spent studying outside school. [One selected child per HH]	219	0.8	0.7	1	304	0.9	0.8	1	-0.1	256	0.9	0.9	1	245	0.8	0.7	0.9	0.1
Child does homework outside school. [One selected child per HH]	219	67.6	61.6	73.5	304	75.7	71	80.3	- 8.1**	256	77	72	81.9	245	68.6	63	74.1	8.4**
Number of hours spent studying at home in daylight. [One selected child per HH]	219	0.2	0.1	0.2	304	0.1	0.1	0.1	0.1*	256	0.1	0.1	0.2	245	0.1	0.1	0.2	0
Number of hours spent studying at home during darkness. [One selected child per HH]	219	0.7	0.6	0.7	304	0.7	0.7	0.8	-0.1	256	0.8	0.7	0.8	245	0.7	0.6	0.8	0.1
Hours spent studying at home in darkness using light[Children studying at night]	125	1	0.9	1.1	200	1	0.9	1.1	0	166	1	0.9	1.1	147	1	0.9	1.1	0.1
Child uses light for studying in the dark.[Child studies in the dark]	125	86.4	80.6	92.2	200	91.5	87.7	95.3	-5.1	166	91.6	87.3	95.8	147	87.1	81.9	92.2	4.5
Kerosene lamps used for studying at night[Children studying at night]	125	5.6	1.6	9.6	200	7.5	3.9	11.1	-1.9	166	5.4	2	8.8	147	7.5	3.3	11.7	-2.1
Drycell battery torch used for studying at night[Children studying at night]	125	12.8	7	18.6	200	8	4.3	11.7	4.8	166	7.2	3.3	11.1	147	11.6	6.6	16.6	-4.3
Solar lantern used for studying at night[Children studying at night]	125	8	3.3	12.7	200	10	6	14	-2	166	6	2.4	9.6	147	12.9	7.7	18.1	- 6.9**
Solar home system used for studying at night[Children studying at night]	125	53.6	44.8	62.4	200	56.5	49.8	63.2	-2.9	166	61.4	54.2	68.7	147	50.3	42.3	58.4	11.1 **
Solar torch used for studying at night[Children studying at night]	125	0			200	0			0	166	0			147	0			0

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Child uses SL/SHS/ST for studying.[One selected child per HH]	219	37	30.8	43.1	304	46.1	40.8	51.3	- 9.1**	256	46.9	41.1	52.7	245	39.2	33.4	44.9	7.7*

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 35: Child time use at endline (Household level indicators) – continued

Indicator	Male Child				Female Child				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Number of hours awake. [One selected child per HH]	258	14.7	14.6	14.8	265	14.7	14.6	14.8	0
Number of hours awake -daylight. [One selected child per HH]	258	11			265	11			0
Number of hours awake in the dark. [One selected child per HH]	258	3.7	3.6	3.8	265	3.7	3.6	3.8	0
Number of hours spent sleeping. [One selected child per HH]	258	9.3	9.2	9.4	265	9.3	9.2	9.4	0
Number of hours spent sleeping -daylight. [One selected child per HH]	258	0			265	0			0
Number of hours spent sleeping in the dark. [One selected child per HH]	258	9.3	9.2	9.4	265	9.3	9.2	9.4	0
Number of hours spent to Get ready	258	0.6	0.5	0.6	265	0.5	0.5	0.6	0
Number of hours spent to Prepare/eat a meal	258	1.6	1.5	1.6	265	1.7	1.6	1.8	-0.1**
Number of hours spent to Go to school	258	8.2	7.9	8.4	265	8.1	7.9	8.4	0.1
Number of hours spent to Go to duksi/madrassa/other religious education	258	0.9	0.8	1.1	265	0.7	0.5	0.8	0.2*
Number of hours spent to Do homework / study (at home)	258	0.9	0.8	0.9	265	0.8	0.7	0.9	0.1
Number of hours spent to Do homework / study (in neighbourhood)	258	0.1	0	0.1	265	0	0	0.1	0
Number of hours spent to Do household chores	258	0	0	0	265	0.1	0.1	0.2	-0.1***
Number of hours spent to Wash clothes	258	0.1	0	0.1	265	0.2	0.1	0.2	-0.1***
Number of hours spent to Fetch water	258	0.2	0.1	0.2	265	0.4	0.3	0.4	-0.2***
Number of hours spent to Collect firewood	258	0	0	0	265	0.2	0.2	0.3	-0.2***
Number of hours spent to Buy household goods	258	0	0	0	265	0			0
Number of hours spent to Go to the farm / work on a plot	258	0	0	0.1	265	0	0	0	0.0*
Number of hours spent to Take care / feed animals	258	0.4	0.3	0.5	265	0.1	0	0.2	0.3***
Number of hours spent to Caring for siblings, sick, elderly, disabled	258	0			265	0	0	0	0
Number of hours spent to Go to/from work	258	0	0	0	265	0			0
Number of hours spent to Help with the household business	258	0			265	0	0	0	0
Number of hours spent to Selling anything at market/ street/ mobile	258	0			265	0			0
Number of hours spent to Other work	258	0			265	0			0
Number of hours spent to Take a walk	258	0	0	0	265	0			0
Number of hours spent to Listen to radio	258	0			265	0			0
Number of hours spent to Watch television	258	0			265	0			0
Number of hours spent to Read	258	0	0	0	265	0	0	0	0
Number of hours spent to Rest	258	0.8	0.7	0.9	265	0.7	0.7	0.8	0.1
Number of hours spent to Religious activities	258	0.1	0	0.1	265	0	0	0.1	0.0*
Number of hours spent to Attend some entertainment	258	0	0	0	265	0	0	0	0.0*
Number of hours spent to Play (at homestead)	258	0.7	0.6	0.9	265	0.8	0.6	0.9	0
Number of hours spent to Play (outside the homestead)	258	0.2	0.1	0.3	265	0.1	0	0.2	0.1
Number of hours spent to Other activities	258	0	0	0	265	0	0	0	0
Number of hours spent on leisure activities. [One selected child per HH]	258	1.8	1.6	2	265	1.7	1.5	1.9	0.1
Number of hours spent on leisure-daylight. [One selected child per HH]	258	1	0.9	1.2	265	1	0.8	1.2	0
Number of hours spent on chores. [One selected child per HH]	258	0.7	0.6	0.9	265	1.1	0.9	1.2	-0.3***

Indicator	Male Child				Female Child				Diff
Number of hours spent on chores-daylight. [One selected child per HH]	258	0.6	0.5	0.8	265	0.8	0.7	1	-0.2**
Number of hours on religious edu-daylight. [One selected child per HH]	258	0.8	0.6	0.9	265	0.6	0.4	0.7	0.2*
Number of hours spent on other activities	258	2.1	2	2.2	265	2.3	2.2	2.3	-0.1*
Number of hours spent studying (school & homework)	258	9.1	8.8	9.4	265	9	8.7	9.3	0.1
Number of hours spent studying-daylight. [One selected child per HH]	258	7.8	7.6	8.1	265	7.8	7.6	8	0
Number of hours spent studying outside school. [One selected child per HH]	258	0.9	0.8	1	265	0.9	0.8	0.9	0.1
Child does homework outside school. [One selected child per HH]	258	74.4	69.4	79.5	265	70.2	64.8	75.6	4.2
Number of hours spent studying at home in daylight. [One selected child per HH]	219	0.2	0.1	0.2	304	0.1	0.1	0.1	0.1*
Number of hours spent studying at home during darkness. [One selected child per HH]	219	0.7	0.6	0.7	304	0.7	0.7	0.8	-0.1
Hours spent studying at home in darkness using light[Children studying at night]	125	1	0.9	1.1	200	1	0.9	1.1	0
Child uses light for studying in the dark.[Child studies in the dark]	125	86.4	80.6	92.2	200	91.5	87.7	95.3	-5.1
Kerosene lamps used for studying at night[Children studying at night]	125	5.6	1.6	9.6	200	7.5	3.9	11.1	-1.9
Drycell battery torch used for studying at night[Children studying at night]	125	12.8	7	18.6	200	8	4.3	11.7	4.8
Solar lantern used for studying at night[Children studying at night]	125	8	3.3	12.7	200	10	6	14	-2
Solar home system used for studying at night[Children studying at night]	125	53.6	44.8	62.4	200	56.5	49.8	63.2	-2.9
Solar torch used for studying at night[Children studying at night]	125	0			200	0			0
Child uses SL/SHS/ST for studying.[One selected child per HH]	219	37	30.8	43.1	304	46.1	40.8	51.3	-9.1**

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 36: Education expenditure at household level at endline (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Education expenses: Tuition fees	566	67.5	63.7	71.2	378	67.5	62.8	72.1	188	67.6	61.3	73.8	-0.1
Education expenses: Books & other materials	566	82.7	79.6	85.8	378	80.7	76.7	84.6	188	86.7	81.9	91.5	-6.0*
Education expenses: Uniform including other clothing	566	56.9	52.9	60.8	378	64.8	60.1	69.6	188	41	34	48	23.9***
Education expenses: Boarding fees	566	7.2	5.2	9.3	378	8.5	5.7	11.2	188	4.8	1.8	7.8	3.7*
Education expenses: Contribution for school building or maintenance	566	32.5	28.9	36.1	378	42.9	37.9	47.8	188	11.7	7.1	16.3	31.2***
Education expenses: Transport costs	566	9.2	6.8	11.5	378	10.1	7.1	13	188	7.4	3.7	11.2	2.6
Education expenses: Extra tuition fees	566	32	28.3	35.7	378	39.2	34.3	44	188	17.6	12.1	23	21.6***
Education expenses: PTA & other related fees	566	77.6	74.2	80.9	378	77.8	73.7	81.9	188	77.1	71.2	83.1	0.7
Education expenses: Examination fees	566	86.4	83.7	89.1	378	93.1	90.6	95.6	188	72.9	66.4	79.3	20.2***
Education expenses: Pocket Money & Shopping	566	13.3	10.5	16	378	16.9	13.2	20.6	188	5.9	2.6	9.1	11.1***
Education expenses: Fees for extra-curricular activities	566	28.1	24.6	31.5	378	38.6	33.8	43.4	188	6.9	3.2	10.6	31.7***
Education expenses: Masks/face coverings for COVID-19	566	54.2	50.4	58.1	378	64	59.3	68.7	188	34.6	27.7	41.4	29.4***
Education expenses: Food/feeding programme/water	566	0.2	-0.2	0.5	378	0.3	-0.2	0.8	188	0			0.3

Education expenses: Madrassa	566	1.2	0.4	2.1	378	0			188	3.7	1.1	6.3	-3.7***
Education expenses: Other Expenses	566	0.9	0.1	1.6	378	1.3	0.2	2.5	188	0			1.3**
Total household expenditure on education from Jan-Mar 2021 (KES)	541	4970.6	4439.2	5501.9	355	5446.5	4719.5	6173.5	186	4062.3	3381.7	4742.8	1384.2***

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 37: Education expenditure at household level at endline (Household level indicators) – continued

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Education expenses: Tuition fees	241	66.8	61	72.6	325	68	63	73	-1.2	271	68.6	63.2	74	268	67.2	61.6	72.7	1.5
Education expenses: Books & other materials	241	80.5	75.5	85.4	325	84.3	80.4	88.2	-3.8	271	83.4	79	87.7	268	83.2	78.7	87.7	0.2
Education expenses: Uniform including other clothing	241	55.2	49	61.4	325	58.2	52.9	63.4	-3	271	57.9	52.3	63.6	268	56	50.2	61.8	2
Education expenses: Boarding fees	241	7.1	3.9	10.2	325	7.4	4.6	10.2	-0.3	271	8.5	5.2	11.8	268	6.3	3.5	9.2	2.1
Education expenses: Contribution for school building or maintenance	241	29	23.5	34.6	325	35.1	30.1	40	-6	271	35.8	30.4	41.1	268	29.1	23.9	34.4	6.7*
Education expenses: Transport costs	241	7.9	4.5	11.3	325	10.2	6.9	13.4	-2.3	271	10.7	7.1	14.3	268	7.8	4.7	11	2.9
Education expenses: Extra tuition fees	241	34.4	28.6	40.3	325	30.2	25.3	35	4.3	271	31	25.6	36.4	268	34.7	29.1	40.3	-3.7
Education expenses: PTA & other related fees	241	78.4	73.3	83.5	325	76.9	72.4	81.4	1.5	271	82.7	78.3	87	268	73.1	67.9	78.4	9.5***
Education expenses: Examination fees	241	84.2	79.7	88.8	325	88	84.6	91.4	-3.8	271	88.6	85	92.2	268	85.1	81	89.2	3.5
Education expenses: Pocket Money & Shopping	241	10.8	7	14.6	325	15.1	11.2	18.9	-4.3	271	17.7	13.3	22.2	268	9.3	5.9	12.7	8.4***
Education expenses: Fees for extra-curricular activities	241	27.4	22.1	32.7	325	28.6	23.9	33.3	-1.2	271	30.3	25.2	35.4	268	27.6	22.5	32.7	2.6
Education expenses: Masks/face coverings for COVID-19	241	47.7	41.6	53.9	325	59.1	53.9	64.2	-11.4***	271	57.9	52.4	63.5	268	51.1	45.4	56.8	6.8*
Education expenses: Food/feeding programme/water	241	0.4	-0.4	1.2	325	0			0.4	271	0			268	0.4	-0.3	1.1	-0.4
Education expenses: Madrassa	241	2.1	0.3	3.9	325	0.6	-0.2	1.4	1.5	271	1.5	0.1	2.9	268	1.1	-0.1	2.4	0.4
Education expenses: Other Expenses	241	0			325	1.5	0.2	2.9	-1.5**	271	1.5	0.1	2.9	268	0.4	-0.4	1.1	1.1
Total household expenditure on education from Jan-Mar 2021 (KES)	229	4325.6	3773.4	4877.8	312	5443.9	4615.7	6272.2	-1118.3**	260	4941.2	4062.3	5820.1	254	5095.9	4405	5786.7	-154.7

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 38: Education outcomes of children at endline (Member level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Currently attending school (aged 3-18)	2241	81.8	80.6	83	1541	89.2	88	90.5	700	65.6	62.8	68.3	23.7***
Currently attending school (aged 6-15)	1543	89.3	88.2	90.4	1050	96.7	95.8	97.5	493	73.6	70.6	76.7	23.0***

Attended school in 2020 (pre-covid) (aged 3-18)	2217	74.6	73.2	76	1531	80.7	79.2	82.3	686	60.8	57.9	63.7	19.9***
Attended school in 2020 (pre-covid) (aged 6-15)	1577	80.8	79.4	82.3	1067	86.4	84.8	88	510	69.2	66.1	72.4	17.2***
No school/dropping reasons - still too young to attend school	630	30.6	27.8	33.4	343	31.8	28	35.6	287	29.3	25.2	33.4	2.5
No school/dropping reasons - no money for school costs	630	25.6	22.9	28.2	343	32.9	29.1	36.8	287	16.7	13.3	20.1	16.2***
No school/dropping reasons - poor quality of schools	630	0.2	-0.1	0.4	343	0			287	0.3	-0.2	0.9	-0.3
No school/dropping reasons - own illness/disability	630	4.3	3	5.5	343	4.4	2.7	6.1	287	4.2	2.4	6	0.2
No school/dropping reasons - family illness/disability	630	0.5	0	0.9	343	0.3	-0.2	0.7	287	0.7	-0.1	1.5	-0.4
No school/dropping reasons - not interested, lazy	630	6.5	5	8	343	8.7	6.4	11.1	287	3.8	2.1	5.6	4.9***
No school/dropping reasons - parents did not want the child to attend	630	3.5	2.4	4.6	343	0.6	-0.1	1.2	287	7	4.7	9.3	-6.4***
No school/dropping reasons - had to work or help at home	630	2.9	1.8	3.9	343	1.2	0.3	2.1	287	4.9	2.9	6.9	-3.7***
No school/dropping reasons - school too far from home	630	0.6	0.1	1.1	343	1.2	0.3	2.1	287	0			1.2**
No school/dropping reasons - school conflict with beliefs	630	0			343	0			287	0			0
No school/dropping reasons - not able to study and do homework at home	630	0			343	0			287	0			0
No school/dropping reasons - household member got married	630	2.5	1.6	3.5	343	3.8	2.2	5.4	287	1	0.1	2	2.7***
No school/dropping reasons - have enough education	630	1.6	0.8	2.4	343	2.3	1.1	3.6	287	0.7	-0.1	1.5	1.6**
No school/dropping reasons - school closed because of covid-19	630	0.5	0	0.9	343	0.9	0.1	1.7	287	0			0.9**
No school/dropping reasons - worried about exposure to covid-19	630	0			343	0			287	0			0
No school/dropping reasons - schools open but no teachers because of covid-19	630	0			343	0			287	0			0
No school/dropping reasons - transport was disrupted because of covid-19	630	0			343	0			287	0			0
No school/dropping reasons - left during/after pregnancy	630	2.1	1.2	2.9	343	3.8	2.2	5.4	287	0			3.8***
No school/dropping reasons - child beyond school age	630	4	2.8	5.2	343	5.5	3.6	7.5	287	2.1	0.8	3.4	3.4***
No school/dropping reasons - attending madrassa	630	14.6	12.6	16.6	343	2.3	1.1	3.6	287	29.3	25.1	33.4	-26.9***
No school/dropping reasons - Other	630	0.2	-0.1	0.4	343	0.3	-0.2	0.7	287	0			0.3
Regularly attending school (aged 3-18)	2241	78	76.7	79.3	1541	84.7	83.3	86.1	700	63.3	60.5	66.1	21.4***
Regularly attending school (aged 6-15)	1543	85.5	84.1	86.8	1050	92.3	91	93.6	493	71	67.8	74.2	21.3***

Temporary withdrawal reason - No Money	106	55.7	48.6	62.7	90	60	52.2	67.8	16	31.3	15.2	47.3	28.8***
Temporary withdrawal reason - Poor quality of schools	106	0			90	0			16	0			0
Temporary withdrawal reason - Own illness/disability	106	32.1	25.2	39	90	28.9	21.3	36.5	16	50	33.7	66.3	-21.1**
Temporary withdrawal reason - Family illness/disability	106	0.9	-0.5	2.4	90	1.1	-0.6	2.9	16	0			1.1
Temporary withdrawal reason - Not interested	106	0			90	0			16	0			0
Temporary withdrawal reason - Had to work or help at home	106	6.6	2.8	10.4	90	4.4	1.1	7.8	16	18.8	2.5	35	-14.3*
Temporary withdrawal reason - Distance from school	106	0			90	0			16	0			0
Temporary withdrawal reason- school conflict with beliefs	106	0			90	0			16	0			0
Temporary withdrawal reason- not able to study and do homework at home	106	0			90	0			16	0			0
Temporary withdrawal reason- household member got married	106	0			90	0			16	0			0
Temporary withdrawal reason- school closed temporarily because of covid-19	106	1.9	-0.1	3.8	90	2.2	-0.1	4.5	16	0			2.2*
Temporary withdrawal reason- worried about exposure to covid-19	106	0			90	0			16	0			0
Temporary withdrawal reason- had symptoms/was infected with covid-19	106	0			90	0			16	0			0
Temporary withdrawal reason- transport was disrupted because of covid-19	106	0			90	0			16	0			0
Temporary withdrawal reason- teachers did not attend because of covid-19	106	0.9	-0.5	2.4	90	1.1	-0.6	2.9	16	0			1.1
Temporary withdrawal reason- household member got pregnant/had a baby	106	0.9	-0.5	2.4	90	1.1	-0.6	2.9	16	0			1.1
Temporary withdrawal reason - Other	106	0.9	-0.5	2.4	90	1.1	-0.6	2.9	16	0			1.1
Child promoted to the next grade since last academic year (aged 3-18)	1675	92	91	93	1256	90.3	89	91.6	419	97.1	95.9	98.4	-6.8***
Child promoted to the next grade since last academic year (aged 6-15)	1299	91.8	90.7	93	967	90.1	88.6	91.6	332	97	95.5	98.4	-6.9***

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 39: Education outcomes of children at endline (Member level indicators) – continued

Indicator	Male member				Female member				Diff	CT-OVC				OP-CT				Diff
	N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI		N	%	Lower CI	Upper CI	N	%	Lower CI	Upper CI	
Currently attending school (aged 3-18)	1112	82.6	80.8	84.3	1129	81.1	79.4	82.9	1.4	1053	82.1	80.4	83.9	1068	82.7	80.9	84.4	-0.5

Indicator	Male member				Female member				Diff	CT-OVC				OP-CT				Diff
Currently attending school (aged 6-15)	768	88.7	87	90.4	775	89.9	88.3	91.6	-1.3	718	89.7	88	91.4	743	89.9	88.3	91.5	-0.2
Attended school in 2020 (pre-covid) (aged 3-18)	1102	74.6	72.6	76.6	1115	74.5	72.6	76.5	0.1	1041	76.4	74.4	78.3	1056	75.4	73.4	77.4	1
Attended school in 2020 (pre-covid) (aged 6-15)	776	80.4	78.2	82.6	801	81.3	79.2	83.4	-0.9	756	82.8	80.7	84.9	736	80.8	78.6	83	2
No school/dropping reasons - still too young to attend school	304	26	22.1	29.9	326	35	30.9	39.1	-9.0** *	295	28.5	24.5	32.5	291	33.3	29.1	37.6	-4.9
No school/dropping reasons - no money for school costs	304	28.9	25	32.9	326	22.4	18.8	26	6.6**	295	27.5	23.5	31.4	291	23.4	19.6	27.1	4.1
No school/dropping reasons - poor quality of schools	304	0.3	-0.2	0.8	326	0			0.3	295	0.3	-0.2	0.9	291	0			0.3
No school/dropping reasons - own illness/disability	304	4.6	2.7	6.5	326	4	2.3	5.7	0.6	295	3.4	1.8	5	291	5.2	3.1	7.2	-1.8
No school/dropping reasons - family illness/disability	304	0.7	-0.1	1.4	326	0.3	-0.2	0.8	0.4	295	0			291	1	0.1	2	-1.0**
No school/dropping reasons - not interested, lazy	304	8.9	6.4	11.4	326	4.3	2.6	6	4.6** *	295	6.8	4.5	9	291	5.5	3.4	7.6	1.3
No school/dropping reasons - parents did not want the child to attend	304	3.9	2.3	5.6	326	3.1	1.6	4.5	0.9	295	2.4	1	3.7	291	4.1	2.4	5.8	-1.8
No school/dropping reasons - had to work or help at home	304	4.3	2.5	6.1	326	1.5	0.5	2.6	2.7**	295	4.1	2.3	5.8	291	2.1	0.8	3.4	2.0*
No school/dropping reasons - school too far from home	304	1.3	0.3	2.3	326	0			1.3**	295	0.7	-0.1	1.4	291	0.7	-0.1	1.4	0
No school/dropping reasons - school conflict with beliefs	304	0			326	0			0	295	0			291	0			0
No school/dropping reasons - not able to study and do homework at home	304	0			326	0			0	295	0			291	0			0
No school/dropping reasons - household member got married	304	0			326	4.9	3	6.8	-4.9** *	295	3.1	1.5	4.6	291	1.7	0.6	2.9	1.3
No school/dropping reasons - have enough education	304	1.3	0.3	2.3	326	1.8	0.7	3	-0.5	295	2.4	1	3.7	291	1	0.1	2	1.3
No school/dropping reasons - school closed because of covid-19	304	0.3	-0.2	0.8	326	0.6	-0.1	1.3	-0.3	295	0.7	-0.1	1.4	291	0.3	-0.2	0.9	0.3

Indicator	Male member				Female member				Diff	CT-OVC				OP-CT				Diff
No school/dropping reasons - worried about exposure to covid-19	304	0			326	0			0	295	0			291	0			0
No school/dropping reasons - schools open but no teachers because of covid-19	304	0			326	0			0	295	0			291	0			0
No school/dropping reasons - transport was disrupted because of covid-19	304	0			326	0			0	295	0			291	0			0
No school/dropping reasons - left during/after pregnancy	304	0			326	4	2.3	5.7	-4.0** *	295	2.7	1.2	4.2	291	1.7	0.5	2.9	1
No school/dropping reasons - child beyond school age	304	3.6	2	5.3	326	4.3	2.5	6	-0.7	295	2.7	1.3	4.2	291	5.8	3.7	8	-3.1**
No school/dropping reasons - attending madrassa	304	15.8	12.7	18.8	326	13.5	10.6	16.4	2.3	295	14.9	11.9	17.9	291	13.7	10.9	16.6	1.2
No school/dropping reasons - Other	304	0			326	0.3	-0.2	0.8	-0.3	295	0			291	0.3	-0.2	0.9	-0.3
Regularly attending school (aged 3-18)	1112	78.8	76.9	80.7	1129	77.2	75.3	79.1	1.5	1053	77.5	75.6	79.4	1068	79.4	77.5	81.3	-1.9
Regularly attending school (aged 6-15)	768	84.6	82.7	86.6	775	86.3	84.5	88.2	-1.7	718	85.2	83.3	87.2	743	86.4	84.5	88.3	-1.2
Temporary withdrawal reason - No Money	52	53.8	42.8	64.9	54	57.4	47.7	67.1	-3.6	55	43.6	34.3	52.9	48	66.7	56	77.3	-23.0***
Temporary withdrawal reason - Poor quality of schools	52	0			54	0			0	55	0			48	0			0
Temporary withdrawal reason - Own illness/disability	52	32.7	22.1	43.2	54	31.5	22.2	40.8	1.2	55	41.8	32.1	51.5	48	22.9	13	32.8	18.9***
Temporary withdrawal reason - Family illness/disability	52	1.9	-1.1	4.9	54	0			1.9	55	1.8	-1	4.7	48	0			1.8
Temporary withdrawal reason - Not interested	52	0			54	0			0	55	0			48	0			0
Temporary withdrawal reason - Had to work or help at home	52	7.7	1.9	13.5	54	5.6	0.7	10.4	2.1	55	3.6	-0.1	7.4	48	10.4	3.3	17.5	-6.8*
Temporary withdrawal reason - Distance from school	52	0			54	0			0	55	0			48	0			0

Indicator	Male member				Female member				Diff	CT-OVC				OP-CT				Diff
Temporary withdrawal reason- school conflict with beliefs	52	0			54	0			0	55	0			48	0			0
Temporary withdrawal reason- not able to study and do homework at home	52	0			54	0			0	55	0			48	0			0
Temporary withdrawal reason- household member got married	52	0			54	0			0	55	0			48	0			0
Temporary withdrawal reason- school closed temporarily because of covid-19	52	1.9	-1.1	4.9	54	1.9	-1.1	4.8	0.1	55	3.6	-0.1	7.4	48	0			3.6*
Temporary withdrawal reason- worried about exposure to covid-19	52	0			54	0			0	55	0			48	0			0
Temporary withdrawal reason- had symptoms/was infected with covid-19	52	0			54	0			0	55	0			48	0			0
Temporary withdrawal reason- transport was disrupted because of covid-19	52	0			54	0			0	55	0			48	0			0
Temporary withdrawal reason- teachers did not attend because of covid-19	52	0			54	1.9	-1.1	4.8	-1.9	55	1.8	-1	4.7	48	0			1.8
Temporary withdrawal reason- household member got pregnant/had a baby	52	0			54	1.9	-1	4.8	-1.9	55	1.8	-1	4.7	48	0			1.8
Temporary withdrawal reason - Other	52	1.9	-1.1	4.9	54	0			1.9	55	1.8	-1	4.7	48	0			1.8
Child promoted to the next grade since last academic year (aged 3-18)	836	91	89.5	92.6	839	93	91.6	94.3	-1.9*	801	93.4	92	94.7	796	90.8	89.2	92.4	2.6**
Child promoted to the next grade since last academic year (aged 6-15)	640	90.6	88.8	92.4	659	93	91.5	94.6	-2.4**	614	94	92.5	95.5	625	90.1	88.2	91.9	3.9** *

Source: OPM Mwangaza Mashinani Endline Survey (2021). **Note:** Asterisks indicate statistically significant differences between the two groups: * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

ANNEX J CALCULATING ACCESS TO TIER 1 LIGHTING SERVICES

The three core benchmarks of lighting service are 0, 100, and 1,000 lumen-hours per day. The relationship for estimating the energy access level based on brightness begins at the “zero” point: access for 0 persons at 0 lumen-hours. Even very small amounts of modern light are counted. From 0 to 100 lumen-hours, there are increasing levels of access for additional light, reflecting increased utility as the quantity approaches levels that are typically available from fuel-based lighting (roughly 25 lumens for 4 hours a day or 100 lumen-hours). Based on user self-reported expectations for brightness and run-time, combined with the fact that low-level lighting is an individual service, a second benchmark is placed at 100 lumen-hours for meeting the needs of one person. Multiple people using the same light source simultaneously can often reduce the utility of lighting because it can be difficult optically to spatially distribute light where it is needed for meeting joint needs. Thus, there are declining access returns on additional light as more people are served, up to a full (typical/average size) household of five being served by 1,000 lumen-hours. This represents the third benchmark for lighting.

Two different mathematical functions are used to link the benchmarks (see Figure 47). The first, from 0 to 100 lumen-hours per day, has increasing returns on additional light and takes a logistic form. The logistic function is defined so it passes through the benchmarks and a “tuning” benchmark of 1/100th of a person at a light level equivalent to half the service from a candle (20 lumen-hours per day). Above 100 lumen-hours per day, a logarithm (base 10) that reflects the declining returns to lighting is used. It passes through the benchmarks at 100 and 1,000 lumen-hours per day. At levels above 1,000 lumen-hours per day from a particular source, additional persons can be served following the logarithmic function.

Figure 47: Equations linking benchmarks

For devices from 0–100 lmhr/day	For devices from 100–1,000 lmhr/day	Total number of persons served in the household
<i>A logistic function</i>	<i>A logarithmic function</i>	<i>A summation function</i>
$P_i = d \left(1 - \frac{1}{1 + \left(\frac{L}{e}\right)^f} \right)$ <p>where: P_i = number of persons served with lighting service by the device L = quantity of available light (lmhr/day) $d = 2$ $e = 100$ $f = 3.3$</p>	$P_i = 0 < h_{\max} \times \log_{10} \left(\frac{L}{a} + b \right) - c < h$ <p>where: P_i = number of persons served with lighting service by the device L = quantity of available light (lmhr/day) $a = 95$ $b = 0.732$ $c = 0.0515$ $h_{\max} = 5$ h = household size</p>	<p>Sum for all the light sources in a household:</p> $P_{\text{tot}} = \max \left(\sum_i P_{i,j}, h \right)$ $T_j = \frac{P_{i,j}}{h}$ <p>where: $P_{i,j}$ = number of persons served with lighting service in total h = household size T_j = effective tier for lighting</p>

The number of persons who are served with Tier 1 access by a set of lighting systems is the sum of the number of persons whose needs are served by each independent light source, subject to a maximum of the household size itself.

ANNEX K ETHICAL PROCEDURES AND APPROVAL

This Annex contains three letters containing the outcome of the ethical review process for the:

- Quantitative impact evaluation based on two rounds of in-person data collection and a quasi-experimental design (see K.1);
- Qualitative research at the household- and community-level (see K.2);
- Adjustment to the design of the quantitative impact evaluation in light of COVID-19 to include a mobile phone survey (see K.3).

In Section K.4, we include a consent form from the qualitative research at the household level and the consent form from the baseline household survey. Consent forms from the midline and endline surveys are very similar and available upon request.

K.1 Ethical review committee outcome – quantitative approach



Ethical Review Committee (ERC)

Ref: ERC-A2995

15 January 2019

Alexandra Doyle
Consultant
Poverty and Social Protection

Subject: Ethical approval of Evaluation of the Energy for the Poor pilot project

Dear Alexandra,

Thank you for your application for the approval of the Ethical Review Committee of OPM on the study titled Evaluation of the Energy for the Poor pilot project. The Committee has reviewed your application.

Based on this review, I am pleased to confirm that the Ethical Review Committee has approved your application.

You are requested to follow the following terms and conditions for this approval:

- As the Project Manager of this project, you will be primarily responsible for ensuring ethical compliance of this research project as outlined in the research proposal and in the ERC application.
- You shall conduct the research according to the technical proposal approved by the ERC. You will have to submit an application for amendment, if there is change in the overall methodology and technical approach.
- You will have to inform the Ethical Review Committee (ERC) in case of any adverse event during implementing the research.
- If required, you will have to obtain ethical approval from local ethics committee.
- Please notify the ERC after the completion of the study.

The Ethical Research Committee wishes you success in carrying out the project.

A handwritten signature in blue ink, appearing to read "Hugh Annett".

Professor Hugh Annett
Chair
Ethical Review Committee

Oxford Policy Management Limited

Registered in England: 3122495

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52 Cornmarket Street
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United Kingdom

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Website: www.opml.co.uk

K.2 Ethical review committee outcome – qualitative approach



Ethical Review Committee (ERC)

Ref: ERC-A2995

30th December 2019

Mehjabeen Jagmag & Alexandra Doyle

Subject: Ethical approval of Evaluation of the Mwangaza Mashinani pilot project

Dear Mehjabeen and Alexandra,

Thank you for your application for the approval of the Ethical Review Committee of OPM on the study titled Evaluation of the Mwangaza Mashinani pilot project. The Committee has reviewed your application.

Based on this review, I am pleased to confirm that the Ethical Review Committee has approved your application.

You are requested to follow the following terms and conditions for this approval:

- As the Project Manager of this project, you will be primarily responsible for ensuring ethical compliance of this research project as outlined in the research proposal and in the ERC application.
- You shall conduct the research according to the technical proposal approved by the ERC. You will have to submit an application for amendment, if there is change in the overall methodology and technical approach.
- You will have to inform the Ethical Review Committee (ERC) in case of any adverse event during implementing the research.
- If required, you will have to obtain ethical approval from local ethics committee.
- Please notify the ERC after the completion of the study.

The Ethical Research Committee wishes you success in carrying out the project.

A handwritten signature in blue ink, appearing to read "Hugh Annett".

Professor Hugh Annett
Chair
Ethical Review Committee

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K.3 Ethical review committee outcome – evaluation redesign



Ethical Review Committee (ERC)

Ref: ERC-A2995

14th July 2020

Alexandra Doyle

SPP

Subject: Ethical approval of Evaluation of the Energy for the Poor (Mwangaza Mashinani) pilot project

Dear Alexandra,

Thank you for your amended application for the approval of the Ethical Review Committee of OPM on the study titled Evaluation of the Energy for the Poor (Mwangaza Mashinani) pilot project. The Committee has reviewed your application

Based on this review, I am pleased to confirm that the Ethical Review Committee has approved your application.

You are requested to follow the following terms and conditions for this approval:

- As the Project Manager of this project, you will be primarily responsible for ensuring ethical compliance of this research project as outlined in the research proposal and in the ERC application.
- You shall conduct the research according to the technical proposal approved by the ERC. You will have to submit an application for amendment, if there is change in the overall methodology and technical approach.
- You will have to inform the Ethical Review Committee (ERC) in case of any adverse event during implementing the research.
- If required, you will have to obtain ethical approval from local ethics committee.
- Please notify the ERC after the completion of the study.

The Ethical Research Committee wishes you success in carrying out the project.

A handwritten signature in dark ink, appearing to be "Jo Boyden", written over a light blue horizontal line.

Professor Jo Boyden
Chair
Ethical Review Committee

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K.4 Consent form

Consent form – qualitative research

Good morning/ Good evening Madam,

My name is _____ and my colleague's name is _____. We are from a company called Research Guide Africa (RGA). We are from a research based consultancy which has been providing rigorous analysis and policy advice to national government, aid agencies and other public sector organizations. I am interviewing you as part of a UNICEF-funded study which RGA is conducting to evaluate the impact of Mwangaza Mashinani (solar project) project implemented in some sub-counties in Kilifi and Garissa..

The findings from this study will be used by UNICEF to develop and improve programmes in Kenya. You are invited to take part in this research because you live in one of the communities selected for the present study. You may remember that some of our colleagues visited you or a member of your family early last year to ask you questions about your use of energy, the health and education in your family. Today, my colleague and I are here to ask you a few follow-up questions.

In terms of benefits, you will get to share your views and experiences, and there might be collective benefits if UNICEF and other organisations are able to use these findings to develop better and more relevant programmes. You will not be paid for participating in this study. There are no obvious risks to the participants of this study, but if you want to follow up or make a complaint, you can contact the research team at the Research Guide Africa office at [number retracted].

We would like to ask your views on a range of questions. We would like to ask you questions about the solar home systems that you have received, and whether it is useful and how you are using it. In addition, we would also like to interview a male member of the household. The answers that you give us will be completely confidential, and will not be linked to you. We are asking these questions in different communities in Kilifi and Garissa to understand and assess the progress of the Mwangaza Mashinani project. Your personal contributions and views will not be shared with anyone else in a way that identifies you. Therefore, nobody – in this community, in the district, or the partner organisations – will know what you tell us. This information is not being collected to assess you, your community or institution, or district but to understand the wider situation, so please feel free to share your thoughts without any reservations. The honesty of your answers is very important.

Before we begin, we would like to ask for your explicit oral informed consent. Please note that this interview is voluntary and you are under no obligation to answer any or all of our questions, although it would help us if you did. You are welcome to ask us any question during or after the interview. If you agree to this interview, you can still ask not to answer any question during the interview, or to terminate the interview at any time. If you do not wish to answer any of the questions, you may skip them and move on to the next question. Our discussion should take an hour of your time. If you choose not to participate, that is ok as well, and there will be no consequences to you. Your decision will not result in any penalty or loss of benefits to which you are entitled.

Before we start, could I also ask if you would be ok with us recording this interview, in case we are unable to note everything down when we talk? We would then go back and transcribe the interview for missing information, but nobody else except the researchers will have access to this. *(If the researchers sense any discomfort or uncertainty from the respondents, assure them again that only you will have access to this recording, and also that you can either not record in particular places or not record at all if they are uncomfortable with it.)*

Do you have anything you want to ask us?

Do we have your permission to conduct this research?

Do we have your permission to record?

Consent form – quantitative research

Good morning/ Good evening Madam/Sir,

My Name is _____ and I work for Oxford Policy Management Limited. We are a research based consultancy which has been providing rigorous analysis and policy advice to national government, aid agencies and other public sector organizations.

We are conducting a study, funded by UNICEF, to evaluate the impact of the Energy for the Poor project implemented in some sub-counties in Kilifi and Garissa.

You are invited to take part in this survey because you live in one of the communities selected for the present study and your house was randomly selected for this study.

If you choose to take part, we would like to ask you questions about your education, health, livelihoods and energy access -- especially about the children of the family. We would like to INTERVIEW the head of the household, a randomly selected female household member and the primary caregiver of the children in the household.

There is very little risk in taking part in this project. It is possible that you may feel uncomfortable answering some of the questions. You may refuse to answer any questions asked of you.

We hope to have a better understanding about current government services designed to improve community and household wellbeing through your participation in the study. However, there may be no other direct personal benefits for you from this research.

You will not be paid for participating in this study.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission.

The study will focus on the average answer within your community and not on individual answers. No one will be able to trace your answers back to you. The honesty of your answers is very important.

Your participation in this study is voluntary. You may decide not to participate or you may leave the study at any time.

Before we begin it is very important to know that you are not obliged to participate in this research and can leave anytime you want to. If you do not wish to answer any of the questions, you may skip them and move on to the next question. Your decision will not result in any penalty or loss of benefits to which you are entitled.

If you have any questions, please feel free to ask the interviewer at any time during the interview.

Do you have any question before we begin?

Do I have your permission to conduct this research?

[Enumerator selects Yes or No]

ANNEX L TERMS OF REFERENCE

**LRFP AGAINST UNICEF GLOBAL LTA
TERMS OF REFERENCE AND TECHNICAL EVALUATION CRITERIA**

Consultancy for Energy and Cash Plus project impact evaluation (Baseline and Endline)

PART I		
Purpose of Assignment	Consultancy for Energy and Cash Plus project impact evaluation (Baseline and Endline)	
Estimated level of the assignment	<i>Institutional</i>	
Location of Assignment	<i>Garissa and Kilifi</i>	
Duration of contract	20 Months	
Start date	From: 15th June 2018	To: 15th January 2020
Reporting to:	Social Protection Specialist, UNICEF Kenya	

Background and Justification

The Government of Kenya's ambition is to achieve universal energy access by the year 2020 and they have recently set-out to develop a National Electrification Strategy to facilitate this goal. Achievement will require expansion across multiple modalities of electrification including densification of current Kenya Power grid services, expansion of the grid to areas where it is economically possible and provision of off-grid electrification through mini-grids and standalone solar home systems.

Kenya has one of the most vibrant solar markets in the world, driven by private sector companies that operate across different parts of the value chain: plug-and-play Solar Home System (SHS) providers, established component suppliers and SHS distributors.

A recent national survey conducted on behalf of Power Africa indicates that customer affordability is still the largest barrier to SHS ownership. The survey conducted in underserved areas showed households at the lowest quintile, 29 percent took an offer of SHS offered at \$9; 37 percent took up the offer of \$7 and 69 percent took up the offer at the rate of \$4. Furthermore, recent surveys of kerosene expenditure indicate that the average rural household spends 350-400 KES per month, far below the monthly fees of the majority of SHS on the market today, which are in the range of 1,200-1,500 KES per month.¹

The Solar Light 2016 report indicates that the highest users of the SHS are children 79.5 percent followed by adults, 54 percent, this is used for homework, cooking, eating and talking in that order. The Acumen 2017 Study indicates that boys and girls are both in class for around 4-5 hours and do homework and personal studies for around 2.5 hours per day. Girls, however, get slightly less sleep than boys (0.6 hours) and they spend one hour more on household chores. Additionally, a study conducted 2016 in Zambia by Acumen showed that girls 55 percent did their homework at home after household chores where 69 percent of the sampled households used torches for study and were willing to access a solar lantern for use.

Given the importance of access to energy to several child deprivation dimensions such as education and health, there is a need to improve the situation of poor families and to provide them and their children an environment where they can develop and build their full potential. Access to modern energy can help alleviate poverty, improve incomes and enhance living conditions.

¹ Economic Impact of solar lighting in Kenya 2016

Poverty is complex and has multiple facets across the life cycle that need to be addressed in a holistic manner. Over the last decade social protection and cash transfers in particular have been recognized as one of the most efficient tools to address poverty in its multiple dimensions. In Kenya the National Safety Net Programme (NSNP) has reached over 835,000 households across 47 counties according in 2017. The three main Programmes under the NSNP are the Cash Transfer for Orphans and Vulnerable Children (CT-OVC), the Older persons cash transfer (OP-CT) and Persons with Severe Disabilities Cash Transfer (PWSD-CT), which operate under same rules and processes delivering KES 4,000 every two months using banks as payment service providers.

Over the next five years, the Government of Kenya has prioritized a new agenda known as “Cash plus Agenda”, under the recognition that benefits received by families and children are bigger, faster and more reliable if cash transfers are complemented and linked with other interventions and programmes that promote better income, nutrition, school attendance, and better hygiene and health practices and livelihood interventions. The cash plus approach enables the poor population, particularly the beneficiaries of social protection programmes, to have the opportunity to diversify their income but also improve their access to more essential services which are important for their wellbeing. This creates the condition to accelerate graduation of beneficiaries by reducing extreme poverty.

UNICEF supports the comprehensive social protection program (“Cash Plus”) agenda through the implementation of the national social protection policy 2012. The modeling of the energy for the poor programme aims to enhance access to energy to the most vulnerable segment of the population develop markets and increase penetration to households in the lowest quintile in the pyramid. More specifically, the pilot programme intends to determine how social cash transfer impacts a recipient’s sense of ownership, repayment rates and quality of life indicators such as quality of learning for children and the quality of health of recipient households. The target group will be the households in the lowest quintile already enrolled in the National Social safety nets programmes (CT-OVC and OP-CT beneficiaries) that have no or limited access to energy and connect them to off grid energy solutions.

This model will contribute to generate evidence supporting the cash plus agenda to be scaled-up. The pilot results will build on successes of the MTEF II and UNDAF with the support of SIDA under which UNICEF strengthened evidence on the effectiveness and impact of transfers on children’s rights.

This ToR outlines the objectives, design, methods, timetable, instruments and suggested indicators for the evaluation of the Energy for the Poor programme in counties in Kenya. These terms of reference should be looked at in conjunction with the project proposal document drafted in October 2017.

The overall purpose of the evaluation is to provide the State Department of Social Protection (SDSP), the Ministry of Energy, Kilifi County Government and Garissa County Government with the information they need to take decisions regarding programme implementation, eventual modifications and to provide information they will need to facilitate a discussion with the involved departments and other development partners regarding possible scale-up of this approach. The implementation modalities of the cash plus agenda in Kenya will also be informed.

Purpose of these Terms of Reference

These Terms of Reference are for a Research study to provide scientifically robust research on impacts of the “Energy for the Poor” programme. If the programme has impact then we hope that the existing Kenyan social protection National schemes will incorporate and invest in the Energy for the Poor methodology.

SCOPE OF WORK

The scope of this ToR is a three-part research study as follows:

- 1) Impact evaluation to examine impacts of cash + energy on participant households, especially impact on children and women. This objective will be accomplished through robust research methods to demonstrate any causal links between the Energy for the Poor programme interventions in Kilifi and Garissa, Kenya and the expected outcomes and results of the Energy for the Poor programme which are described below:
- 2) Qualitative analysis informed by key informant interviews and focus group discussions to assess questions related to relevance, scalability, operational and coordination performance of the implementation; and
- 3) Cost analysis including costs broken down by capital and recurrent costs as well as identifying and addressing cross cutting issues like gender, and how they change in set-up and maintenance phase.

Outcome

- Outcome 1: 1,500 poor and beneficiary of the CT-OVC and OP-CT beneficiary households with children have accessed an off-grid solar home system and solar lanterns to improve their wellbeing.

Outputs:

- Output 1.1. 1500 targeted CT-OVC and OP-CT beneficiary households supported with a bimonthly top-up of KES 1500 are able to access a Solar Home System (SHS) and or Solar Lanterns (SL) and regularly repay it.
- Output 1.2. 1500 beneficiaries and their communities are provided with skills and knowledge to own and manage their SHS and SL and improve the learning performance and health of their children.
- Output 1.3. Policy and decision makers and private sector at national and county levels informed with the project outcomes and impacts, and lesson learnt for scale up.

The Energy for the Poor programme will operate as part of the already existing and mature National Safety Net cash transfer Programme in selected sub counties in Kilifi and Garissa. Another institutional contract will be awarded to a firm/NGO to technically support the implementation of the programme for two years. The programme will be a new addition to the already existing national schemes. The successful research firm of this RFP will need to work closely with the implementing agency, the two county governments and the national social protection stakeholders (Social Protection Secretariat, Department of Children Services, Department of Social Development, Social Assistance Unit, Ministry of Energy, UNICEF and Power Africa.

The model therefore aims to provide a clear indication of how linking cash transfers can enhance access to energy for the poorest segment and vulnerable population in the lowest quintile while increasing their wellbeing. The pilot will also test the perception change of current and prospective owners as it relates to the value of the product and Solar Home Systems (SHS) provider.

The purpose of this research is to determine effects and look for causal links between cash transfers, additional cash top ups, awareness creation and linkages with off grid solutions and the learning and health outcomes of children in the benefiting households. The research design will establish a baseline and measure any changes from the interventions over the programme period (12 months later). The study will compare the impacts on three different research arms:

- 1) The treatment group receiving cash plus the SHS or SLs called the "the cash plus group"
- 2) A comparison group receiving only the cash transfers but not the SHS or SL to isolate the effect of the "plus" called "the cash group"
- 3) A second comparison group not receiving any cash but showing similar poverty and vulnerability characteristics as the cash transfer beneficiaries to assess the effect of the entire package "the control group".

The objectives of the research are to:

Describe the causal pathways through which cash, increased accessibility to and awareness of off grid energy solutions may result in improved educational, learning outputs for children living in beneficiary households

Assess whether and how access to SHS and SL has improved the quality of life for children including positive education outcomes with potential improvement in academic performances

Assess whether and how access to SHS and SL has improved the quality of life for children in health and reduction of respiratory/ocular disease occurrence

Assess whether and how access of SHS and SL has improved the quality of life and the income of beneficiary families by increasing their livelihood opportunities

Assess whether and how the access of SHS and SL has decreased the cost of energy provision in the beneficiary households

Assess whether and how cash transfer recipients feel a sense of ownership towards their SHS, maintain repayments and continue the use

Assess to what extent the poorest segment can be attractive to the private sector and how the SHS providers will not perceive a diminishment in value of their existing product

METHODOLOGY

The research design will use mixed methods combining and integrating both quantitative and qualitative data collection tools to complement each other. The quantitative part of the study will assess the impact of the intervention and will be complemented by qualitative interview techniques to answer more complex questions and provide tacit and comprehensive knowledge. The research will begin with an Inception Phase including an assessment of the programme document of the Energy for the Poor Programme and the proposal of potential research designs. This will be done in close consultation with the Implementation firm who are being commissioned under a separate ToR. Relevant stakeholders including Kilifi and Garissa County Governments officials, UNICEF and Power Africa must be involved early in the research design process and given the opportunity to contribute to research design, including by identifying issues to be addressed, potential research questions to be answered, outcomes to be assessed, and providing feedback on proposed research instruments.

The inception phase will also include a literature review of existing research internationally and nationally on cash transfer programmes and off grid energy solutions and their potential impacts on educational and health outcomes of children and livelihood opportunities of beneficiary households.

As it will not be possible to select the beneficiaries and the communities randomly, the research will use a quasi-experimental methodology (using either propensity score matching or regression discontinuity design), to identify causal impacts. The 1500 beneficiaries will be distributed equally across the two counties and the will be selected based on a number of criteria that will be defined jointly by the county government and the implementing partner. The detailed research design should be proposed as the expert research firm judges feasible, given logistics of roll-out. Justification for the selected design and techniques for data collection and analyses should be included in the proposal. Implications for policy, programs and future research will be considered and described as well.

The impact evaluation (quantitative part) questions will address the OECD-DAC effectiveness criteria. Other evolution criteria like sustainability and relevance will be assessed through qualitative key informant interviews. The overall objective of the evaluation is to answer the following main questions, which have been detailed in the programme document:

- What is the extent of impact on men and women participants attributable to the pilot programme?

- Has the Energy for the poor programme had a substantial impact on members of male and female HH's welfare?
- Have welfare improvements in education and health if any, been in proportion with the investments made, or the value for money of the programme?
- Has the coordination and operational modalities between the national and county government, i.e. DCS, DSD, county departments of energy, education, health, social affairs involved in the implementation been efficient and effective to reach the targeted beneficiaries? (through key informant interviews and focus group discussions)
- If the programme is to be scaled up, which aspects of its operation and coordination mechanism must be modified or strengthened for it to operate effectively at a county/national level?
- Which aspects of good practice should remain the same and be replicated in the NSNP?

Main outcomes of interest to be assessed in the impact evaluation will include the following:

- Knowledge of SHS/SL
- Awareness raising on existence and use of SHS/SL and behaviour
- Purchase and repayment of SHS/SL
- Expenditures
- Child and adult time use (chores, studying, sleep, productive activities, etc.)
- School attendance
- Health impacts
- Control of cash transfer + top-up and decision-making around its usage

The impact evaluation methodology will propose a consistent timeframe for assessing impacts, including a baseline prior to the first top-up and sensitization on SHS/SL and a follow-up survey at approximately 12 months. Seasonal changes also need to be considered in the design.

Other questions above related to scale-up, sustainability, and good practice shall be assessed via qualitative, key informant interviews with government, implementing partners, SHS/SL providers, UNICEF personnel and other relevant personnel.

Suggested set of Indicators

Indicator category	Indicator
Demographics	Household size (e.g., number of adults, single headed households, number of men / women)
	Gender
	Household income
	Primary income sources
	Variability / seasonality of income
	Mobile phone usage (e.g., number of phones per household, number of minutes used, average top-up)
	Mobile money usage (e.g., average number of transactions, typical transaction size)
	Value of assets
	Types of assets
	Level of savings
	Level of female employment

Cultural indicators	Financial priorities (e.g., aspirational purchases)
	Reason for saving
Energy use	Monthly Energy expenditure on kerosene, battery expenditure etc.
	Types of energy used at home
	Frequency of energy purchase
	Primary uses of energy (e.g., percent of households who only use energy for cooking and lighting, percent of households who use energy for mobile phone charging or entertainment)
	Perceived energy needs (e.g., percent of households who need energy for mobile phone charging or entertainment)
Availability / knowledge of solar	Level of knowledge of solar / SHS (e.g., percent of households who are aware of solar / SHS, where households first heard about solar / SHS)
	Current availability of solar / SHS (e.g., distance to nearest place where you can buy a SHS, frequency of sales agent visits)
	Level of SHS / solar understanding (e.g., percent of households who understand the educational benefits of SHS)
	Perceived value of solar / SHS (e.g., percent of households who understand the cost savings of SHS, household willingness to pay for SHS)
Relationship to the grid	Distance / relation to grid (e.g., perceived distance to the grid)
	Expected time to grid connection
	Willingness to wait for grid (e.g., percent of households willing to wait for a grid connection)
	Willingness to pay for grid (e.g., percent of households willing to pay for a grid connection)
Educational indicators	Improved school enrollment for boys and girls
	increased school attendance
	Increased number of girls reporting better results
Health Indicators	Reduction of upper respiratory infections and chronic obstructive pulmonary disease
	Reduction of burns related from lighting fuel
	Reduction of complaints of eye problems for school going children
Emission	Liters of Kerosene use avoided after the introduction of the SHS / SL
	Greenhouse gas emission offsets

The Research will be carried out over a period of 18 months with these operational phases and an overall final report covering all phases:

Inception

- Rapid literature review of existing national and international literature around education, health and welfare outcomes, impacts and cash transfers
- Work with the Implementing partner to understand the Energy for the poor programme and advise on targeting and sampling and roll-out

- Propose research designs to the technical working committee / steering committee which can be used for baselines and assessing impact (experimental or quasi experimental)
- Design of study instruments (household quantitative questionnaires), key informant interviews, costing questionnaires.
- Apply for Ethics permission of protocol and manage approvals

Implementation

- Implement data collection including managing data collection in Kilifi and Garissa and analysis through relevant software package with primary data collection
- Data analysis

Reporting

- Produce a baseline research report (including abstract) with findings for the Steering Committee to be modified based on feedback
- Produce an endline research report (including abstract) with findings for the Steering Committee to be modified based on feedback

Policy brief and dissemination

- Draft policy brief with summary of findings
- Dissemination of research findings internally to UNICEF and externally as guided by UNICEF

The final product delivery phase will involve drafting, review and finalization of the project deliverables including the research report covering all phases and power point presentation. The report of preliminary findings should be developed and shared with UNICEF, Implementing Partners and government partners, and the Steering Committee which will provide the implementers an opportunity to provide additional information and feedback to the research team. Subsequent to that, the final research report will be completed.

Energy for the poor RESEARCH WORKPLAN

Expected results and deliverables

A detailed evidence-based mixed-methods methodology for the research (overall protocol with country-specific work plans, as applicable), research design matrix and timeline will be outlined in an Inception Report to be approved by both UNICEF and Energy for the poor, through the Steering Committee. The inception report should also include:

- Literature review
- Proposed research designs with preferred options
- Plans for stakeholder involvement
- Detailed research protocol for the preferred research design and analysis plan
- Data collection instruments
- Plans for compilation and collection of data by phase, with stated software
- Plans for Ethics permission, in line with national policy
- Plans to assure ethical research standards

Maintain ongoing communication with UNICEF Kenya Social Protections team and Power Africa team based in Nairobi to provide input on the proposed research implementation once the research design has been approved and the ethics approval secured.

Draft and finalize tools for primary data collection activities by phase. Collect data and analyse for each phase. Record routines devised and executed for data collection, data processing, quality assessment, data analysis

and other activities, if requested. Draft research reports summarizing the research methodology and findings for all Phases, including management of consent and study drop outs.

The research reports should also include lessons learned (for example, on what worked and what did not work, and the challenges and successes, and how well UNICEF mitigated risks and what the overall challenges were) and recommendations for improved programming, as well as an assessment of the extent to which resources were appropriately allocated and utilized.

Validity

All implementation research reports will present:

- Abstract
- Background & object of research,
- Purpose,
- Objectives and scope,
- Methodology,
- Results,
- Discussion,
- Conclusions,
- Recommendations and
- Lessons Learned

Findings will be expected to flow logically from the analysis of the data, showing a clear line of evidence to support the conclusions. Conclusions should be substantiated by findings and analysis. Recommendations and lessons learned should follow logically from the conclusions. Any assumption underlying the analysis should be made explicit.

Revised final research reports based on feedback received for Phase 1, interim research reports, and then final overall report for all Phases.

Dissemination Plan

Applications will include a research dissemination plan which will follow the format below. The dissemination plan will include a presentation to the advisory group and a launch of the published research to a wider group of stakeholders.

EXPECTED DELIVERABLES & ESTIMATED TIMELINE

Outputs/ Deliverables	Est Date Due	Payment Schedule
Inception Phase: Approved inception treport including the following	May 2018	30 % of payment
Rapid Literature review and development of theory of change conceptual framework		
Detailed evidence-based methodology for the research design and timeline		
Following feedback, modify and finalize the work plan, protocol, and timeline		
Ethics permission approval		
Development of tools for primary data collection		
Basline survey / Final Baseline report	June 2018	30% of payment
Data collection baseline – raw and cleaned data and documentation submitted to		

UNICEF		
Draft baseline report including methods, limitations, findings, discussion and implications		
Validation workshop of preliminary findings		
Final Baseline report based on feedback received on initial report		
Endline Survey/ Final Endline report	July 2019	30% of payment
Data collection Endline		
Analysis of Endline survey		
Draft Endline report including methods, limitations, findings, discussion and implications		
Validation workshop of preliminary findings		
Final evaluation and implementation research report on Phases based on feedback received on draft report		
Policy brief and dissemination	September 2019	10% of payment
Draft policy brief with summary of findings		
Submit dissemination plan		

Payment Schedule (as detailed above)

Payment is on satisfactory completion of deliverables duly authorized by the Supervisor of contract.

Work relationships

The consultancy firm will work under UNICEF supervision and will engage with the Social Protection Secretariat at Ministry of East Africa Community, Labour & Social Protection, Ministry of Energy, County Government of Garissa and Kilifi. The firm will also work closely with the SL and SHS suppliers, Power Africa and the research firm and ensure seamless operations.

For this purpose, the Ministry of Energy, co-chaired with the Ministry of Labour will constitute a Technical Working Group of stakeholders that will provide oversight and guidance and will endorse outputs and final deliverables

KEY SKILLS, TECHNICAL BACKGROUND, EXPERIENCE REQUIRED

UNICEF is looking for an experienced firm or academic institution with a track record of producing scientifically robust research which can be peer reviewed and hopefully published and who are knowledgeable and have documented experience in conducting research of cash transfer programmes in Kenya and or in the region.

The research team will preferably be based at either a university or a research organization and should adequately demonstrate the availability of high caliber expert/s in the evaluation of large-scale child health programs in developing countries. The consultant team should have skills in social cash transfers, nutrition expertise and research.

Key skills required of the lead consultant include:

Mandatory

- Masters (required) or Advanced Degree (Ph.D. desirable) in monitoring and evaluation, epidemiology, statistics, public health or demography at least 10 years of progressively responsible professional work experience at national and international levels in conceptualizing, designing and implementing evaluations and/or research of large-scale child education and/or health or off grid energy-related programs in developing countries, ideally including experience with both quantitative and qualitative research methods.
- Experience leading impact evaluations using quantitative, longitudinal methods; experience overseeing and analysing data from household surveys.
- Experience in social protection and strong or proven (at least 5 to 8 years) experience with child health and education / off grid energy programs in low and middle income countries proven publication record, preferably in peer reviewed journals demonstrated ability to produce high quality evaluation and/or analytical research reports
- Strongly Desired
- familiarity with UNICEF's work and Kenya
- excellent spoken and written fluency in English proficiency in various MS Office applications (Excel, Word and Powerpoint, statistical package such as SPSS or SAS).

Key skills of the research team members:

Mandatory

- Post-graduate qualification or current registration for post-graduate study in monitoring and evaluation, economics, public policy, epidemiology, statistics, or demography

Strongly Desired

- familiarity with UNICEF's work and/or the countries included in the evaluation
- excellent spoken and written fluency in English proficiency in various MS Office applications (Excel, Word and PowerPoint) and with statistical package such as SPSS or SAS.

All applicants matching the eligibility criteria are welcome, however as these are very specific terms of reference, international applications are expected.

The UNEG Norms and Standards² will be applied in the course of this evaluation.

The institution will be responsible for the administrative management of the evaluators taking part in field work. UNICEF will have no liabilities in terms of provision of transport or insurance.

² <http://www.uneval.org/docs/ACFFC9F.pdf>

Evaluation criteria

The evaluation procedure will focus on both technical and financial suitability. The weights of 80% and 20% shall be applied for technical and financial compliance respectively.

	Technical evaluation
Main Criteria	Sub Criteria
Relevant evaluation capabilities and quality of evaluation outputs	Evidence of in-depth knowledge of the key issues and concepts underpinning this evaluation and demonstrated thorough understanding of the ToR and deliverables, with explanation of a fully tailored and innovative approach for this evaluation
	Credible overall approach to the evaluation, particularly the 'impact/outcome and output statement' definition, detailing use of quantitative and qualitative methods
	Evidence of use of integrated and multidisciplinary evaluation approaches and methods
	Total 20points
Suitable methodology for responding to the programme requirements	Quality of the proposed approach and methodology
	Quality of proposed implementation plan, i.e how the bidder will undertake each task
	Risk assessment - recognition of the risks/peripheral problems and methods to prevent and manage risks/peripheral problems in the next 3 years.
	Total 40 points
Appropriate personnel and networks to deliver results	Skills and capacity of Director and key implementing staff members to deliver an effective evaluation programme including expertise of evaluation methodologies, evaluation synthesis
	Expertise in conducting evaluation in social protection sector
	Expertise in conducting quantitative analysis and impact evaluation
	Total 20points

Only firms scoring at least 70% of the maximum score during technical evaluation will be considered for financial evaluation.

Weights: *Indicate 70% Technical vs. 20 % Financial Offer*

Only proposals which receive a minimum of [70] points in the technical proposals will proceed to the next stage of financial and be considered further. Please note also,

- a) Apart from the above criteria the comprehensiveness and quality of the proposals and appropriateness of the organisations and consultants will be assessed against the specific TORs.
 - b) References will also be followed up on for each bidder and UNICEF records for previous assignments with UNICEF, if available, will also be consulted.
 - c) Only at this stage will the Financial Proposal be considered. The price/cost of each of the technically compliant proposals shall be considered using the same methodology. The proposers should ensure that all pricing information is provided in accordance with the Financial Proposal.
 - d) The most-favoured proposal shall be selected on the basis of the best overall value to UNICEF in terms of both technical score/merit and price.
- a) **Price Proposal evaluation criteria – 20%.**
- **The price/cost of each of the technically compliant proposals shall be considered only upon evaluation of the above technical criteria.**

Award/Adjudication of proposals

The institutional contract will be awarded to most responsive evaluated proposal and whose services are commercially, technically acceptable, and whose Proposal is in compliance with all instructions, notes, and Terms and Conditions contained in the RFPS, providing the Proposal is reasonable and it is in the interest of UNICEF to accept it.

UNICEF reserves the right to make multiple arrangements for any item(s)/services where, in the opinion of UNICEF, the most responsive evaluated Bidder cannot fully meet the requirements or if it is deemed to be in UNICEF's best interest to do so. Any arrangement under this condition will be made on the basis of the most responsive, second most responsive and third most responsive, etc. evaluated proposal which meets all the requirements stated in the RFPS document.

In case of an award, Bidders who have not previously received Institutional/Corporate Contracts from UNICEF may receive an Institutional/Corporate Contract for a limited service / period until satisfactory performance is established.

LRFP Terms and Conditions

This LRFP, along with any responses there to, shall be considered the property of UNICEF and the responses will not be returned to their originators.

In submitting this proposal the proposer agrees that he will accept the decision of UNICEF as to whether his proposal meets the requirements stated in this LRFP.

UNICEF reserves the right to:

- a) Contact any or all references supplied by the proposer
- b) Request additional supporting or supplementary data (from the proposer).

- c) Arrange interviews with the proposed Contractor (Project Team/Consultants)
- d) Reject any or all proposals submitted
- e) Accept any proposals in whole or in part
- f) Negotiate with the most favourable proposers

UNICEF will treat in confidence those parts of the LRFP proposal that are marked "confidential". Proposals must be valid for a minimum of **ninety (90)** days from the date of closing of this LRFP and must be signed by an authorised representative of the companies in question. UNICEF shall not be held responsible for any costs incurred by the proposers in the preparation of their proposal in response to this RFP.

Company Profile

The proposer must provide the following background information about the company:

- Date and country of incorporation
- Summary of corporate structure and business area
- Corporate directions and experience
- Location of offices or agents relevant to UNICEF
- Summary of relevant experience and examples of previous work similar assignments
- CVs of the institution's team that will participate in this assignment, clearly identifying the team leader/lead consultant

Expertise and Experience

The proposer shall provide a minimum of three (3) references to clients for whom the proposer has carried out similar scope of project. UNICEF may contact references for feedback on consultants / services provided by your firm to support similar projects. As part of the evaluation process, UNICEF may ask to meet the real people proposed for the assignment

- Name and description of client company/organisation
- Names of senior individuals in the client companies who were involved in the Project (referred to) who are knowledgeable
- Scope and scale of Projects

Financial Proposal

The Currency of the proposal shall be in **US Dollars**.

The financial proposal should be realistic. **Prices should be itemized in detail by activities to be undertaken, and clearly reflect the professional charges (fees) to be paid to different levels of professionals per day as stated above.** The financial proposal should be prepared and enclosed in a separate envelope clearly labelled with LRFP reference and bidder's name. The Financial Proposal should have a detailed breakdown including budget notes for the assignment.

For the full duration of the consultancy, bidders are therefore expected to propose an Action Plan/Timeline of their activities together with the Financial Proposal, clearly indicating how soon and for what duration the institution will undertake this assignment. Final start & end-dates, and duration of assignment, will be agreed with selected proposer.

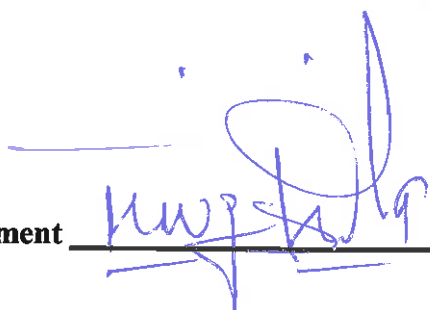
Note that the Financial Proposals will only be opened and considered after Technical Proposal has been evaluated and qualified under the Technical Evaluation Criteria in as above.

IMPORTANT NOTE: CLARIFICATIONS AND QUESTIONS:

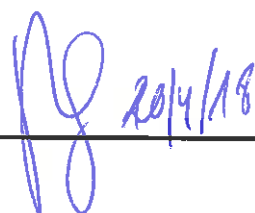
To provide for ample time to compile and prepare answers to questions and clarifications the DATELINE FOR ASKING QUESTIONS OR SEEK CLARIFICATION is by COB 04/05/2018. Any query or issues of clarification received after this date will not be responded to.

Sign.

Timothy Wasilwa
Supply and Procurement



Pedro Gonzalez
Supply and Procurement Manager



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