**Methods**

**Grant number:** ES/T008121

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**Project title:** Water & Waste: Expanding safe water and waste management services access to off-grid urban populations in Africa

**Data set:** Survey of Disposable Diaper Use Among Children’s Carers Attending Health Facilities in Greater Accra, Ghana and Kisumu, Kenya

**Version** 1, completed Dec 2023

## ****Objectives****

The main aim of this study was to quantity patterns of child faeces disposal in Greater Accra, Ghana, and Kisumu, Kenya, with a particular focus on the use and disposal of disposable diapers. The study also aimed to assess the robustness of assumptions (e.g. that used diapers are disposed of via the main method of household waste disposal) underpinning a secondary data analysis of household diaper consumption and waste disposal (Thomas-Possee et al. In revision). The survey was designed to answer the following research questions:

1. What is the frequency of single-use disposable nappy use by socio-economic status among parents/carers/guardians in Greater Accra, Ghana, and Kisumu, Kenya?
2. How do parents/carers/guardians purchase nappies and then dispose of the used nappies?

We hypothesised that women in low-income households ration disposable nappy use, sometimes reusing nappies after urination. We hypothesised that their use is widespread in this group, that low-income households often buy single diapers to smooth their expenditure, and that such households face particular challenges with the safe disposal of used nappies.

## ****Study site****

Fieldwork took place in Greater Accra and Kisumu in Ghana and Kenya, respectively, because of their contrasting policies regulating domestic plastic waste generation. Ghana has an extensive sachet (bagged) water industry (Stoler 2012) and raises excise duty on semi-finished and raw plastics but has not banned single-use plastics (Adam et al. 2020). In contrast, Kenya has banned single-use plastic bags since 2017 (Behuria 2021). Kisumu is Kenya's third largest city, with a population of over 500,000, and is located by Lake Victoria. Over 60% of its population lives in informal settlements, typically densely populated and lacking adequate access to electricity, water and sanitation services (Sibanda et al. 2017). In 2015, its population generated an estimated 200 to 450 tonnes/day of household solid waste, mainly organic waste (Gutberlet et al. 2016). Urban Greater Accra region's population was 5.0 million in 2021 (Ghana Statistical Services 2021), with 51% of its households having solid waste collected in 2010 (Ghana Statistical Services 2013). Slum mapping identified 78 slum communities within the city in 2000, though their distribution has subsequently changed (Engstrom et al. 2015). The city of Accra, within Greater Accra region, generates an estimated 0.74kg/person/day of solid domestic waste or 1552 tonnes/day in total (Miezah et al. 2015).

## Study and sample design

This sub-study is a cross-sectional quantitative questionnaire survey of children’s parents/ carers/ guardians attending a sample of health facilities for child health clinics. Participants were adult parents/carers/guardians or carers of children aged 1 to 36 months attending child health clinics at selected health facilities. 82.3% of children aged 12-23 months in Greater Accra had received all basic vaccinations and just 1.2% had received no vaccinations in 2014 (Ghana Statistical Services et al. 2015), whilst in Nyanza Province, Kenya (which contains Kisumu), the equivalent figures in 2014 were 77.2% and 1.0% respectively (Kenya National Bureau of et al. 2015). This health facility-based sampling strategy was therefore designed to capture disposable nappy use among most of the cities’ populations.

In Kisumu, we purposively selected two public and two private health facilities offering child vaccination clinics, with one of each pair of facilities serving populations of low or medium socio-economic status and high socio-economic status respectively. In Greater Accra, a private facility was purposively selected, alongside three public health facilities thought to serve low income, medium income or higher income catchment populations.

There is limited data on disposable nappy use among parents/carers/guardians in low and middle-income countries. However, market research data suggest that mean disposable daily nappy use per child in 2007-08 was 2.3 in the Philippines, and 0.3 in India (Dey et al. 2016). In the USA, disposable nappy use declined with age from 5.6 nappies/child/day in the youngest children to 4.1 in the oldest children surveyed, with standard deviations in the range 1.5 to 2.1 (Dey et al. 2016). Following team discussions and drawing on these contextual data, we assumed nappy use of 4 disposable nappies/child/day among high socio-economic status households, 2 nappies/child/day among medium socio-economic status households, and negligible use among low socio-economic status households. We assumed that these diaper use rates would be the same for children aged 0 to 11 months, 12-23 months, and 24-36 months. Assuming a standard deviation of 2 nappies/child/day in both high and medium socio-economic status groups, we conducted a power calculation to test for a difference in mean nappy use by socio-economic status within each age cohort. This suggests a sample size of 17 in each age cohort and each socio-economic group would enable us to detect such differences with 90% power. We rounded this to 20 to allow for incomplete questionnaire responses, giving a required sample of 20 children in each age cohort (0-11 months; 12-23 months; 24-36 months) in each health facility. With 20 children recruited from the three age cohorts at each of the four facilities, this gave a total sample of 240 children. However, in Ghana, recruiting older children (above 23 months) proved very time-consuming because few attended child health clinics given Ghana health Services’ required immunization schedule by age. Therefore, in Ghana only 40 children (10 per health facility) were recruited to the 24-36 month age cohort. We used quota sampling to fill the number of children in each age cohort shown above, thereby ensuring that the required sample for each age group was achieved.

Ethical approval

The study was approved by the Faculty of Environmental and Life Sciences Ethical Review Committee, University of Southampton, UK (Ref: 77654, approval date: 27 Oct 2022), by the Ethics Review Office of Jaramogi Oginga Odinga University of Science and Technology, Kenya (Ref no: ERC 34/11/22-07/03; approval date: 1st Nov 2022), and by the Institutional Review Board of the Noguchi Memorial Institute for Medical Research, University of Ghana (Ref: 003/20-21 amend. 2022; approval date: 9th Dec 2022). The study also received ethical approval from Ghana Health Services (Ref. no.GHS-ERC:022/05/23; approval date: 15th June, 2023) and from the Aga Khan ethical review board (Ref: ADM/007/911, 3rd Oct 2023), an ethical review board overseeing facility-based research within a major Kenyan private healthcare provider network.

Field team recruitment, training, and organisation

This section summarises the characteristics of the team members to facilitate data interpretation.

In Ghana, the team recruited to conduct the survey was generally experienced and variously had training in public health or business-related disciplines (Table 1). In Kenya, the team were also experienced and had training variously in public health, planning, applied statistics, education and environmental science (Table 2).

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| --- | --- | --- |
| **Enumerator ID** | **Qualification** | **Years of experience in field data collection** |
| 1 | Master of Public Health | 4 |
| 2 | Masters in Business Administration | 4 |
| 3 | Masters in Communication Studies | 2 |
| 4 | M.Phil in Health Management | 10 |
| 5 | Master of Public Health | 3 |
| 6 | B.Sc.in Information Tech Management | 4 |
| 7 | B.Tech Accounting | 4 |
| 8 | HND Accounting | 4 |

*Table 1: Field team characteristics in Greater Accra*

|  |  |  |  |
| --- | --- | --- | --- |
| **TEAM** | **CODE in SurveyCTO** | **QUALIFICATION** | **EXPERIENCE IN FIELD DATA COLLECTION IN RELATED FIELDS** |
| DATA ASSURANCE AND MANAGEMENT TEAM | | | |
| **Data Manager** | Master access | Bsc. (Applied Statistics with IT) | 5 Years |
| **Field Supervisor** | 6 | Diploma (community Mobilization and Animal health) | 20 yrs |
| **Asst. Field Supervisor** | 2 | Diploma (Environment and Community Development) | 15 yr |
| FIELD TEAMS | | | |
| **TEAM 1** | 1 | Form 4 (Certificate - Training in Community Development) | 4yrs |
| 9 | BSc. (Spatial Planning -JOOUST Student) | 2yrs |
| **TEAM 2** | 11 | Bsc. (Environmental Science) | 6yrs |
| 8 | BED. (Arts) | 1yrs |
| **TEAM 3** | 3 | BSc (Applied Statistics) | 5yrs |
| 4 | Bachelor of Arts (urban and Regional Planning) | 3yrs |

*Table 1: Field team characteristics in Kisumu*

In Kenya, a one-day training session was organized for the field team. An introductory presentation was made to the participants introducing them to the overall project objectives and the design of the survey. They were then trained on techniques and process of successful consenting, best field practices, especially in hospital and clinical environments. The final protocols which had been refined by the project research team and loaded onto the SurveyCTO software platform were downloaded into the tablets (Samsung TabA 2019 (T585)) and issued to the survey teams. Hardcopy prints of the questionnaires were also made for use during the training. The training was conducted by the Data Managers and Project Investigators. The entire team was taken through the questionnaires which were projected on a wall screen from the SurveyCTO platform comparing the hardcopy prints with the softcopy on the Survey CTO platform. A similar exercise took place in Greater Accra.

## Survey authorisation and approval-seeking

Additional permissions were sought for the survey, over and above ethical approval (as described above). In Greater Accra, permission to carry out the study was sought from the Administrators of the selected Health Facilities and their respective Municipal Directors of Health Services. For public health facilities, further permissions were sought from the Chief office for health in the County Government of Kisumu City and received via their letter dated Ref: GN 133 VOL XII/(566) of 2nd Feb, 2023. For the private health facilities, permission was additionally sought from the CEO of the institution.

## Pre-testing

## In Greater Accra, pre-testing of the study instruments was done at the University of Ghana Hospital and Madina Polyclinic on the 8th March 2023. In Kenya, two health facilities namely Kwoyo Health Centres in Manayatta area and Kowino Health Centre in Nyalenda area were selected for field pretesting of the Survey tools. The pretesting exercise was carried out on the 9th and 10th of February, 2023. The results of the field pretesting were reviewed and used to adjust the protocols before the actual field activities were commissioned.

## Field data management

All the finalized forms or questionnaires covering various aspects of the project were uploaded on to SurveyCTO platforms and downloaded into the Samsung TabA 2019 (T585) by the survey team. Each surveyor was given a unique identity Code to access and download the forms from the SurveyCTO platform and deploy for use in recording observations and short interviews with shoppers as guided by the protocols.

**Survey Implementation**

After seeking informed consent of participants, the survey team asked children’s carers about their age, level of education, housing characteristics and economic activity. They also asked for children’s age and sex. Interviews took place in Dholuo or English in Kisumu and Twi, Ga, Ewe, or English in Greater Accra, depending on the mother tongue of the respondent and interviewer. Interviewees were then asked about the child’s age and sex, the way that the child's stools were disposed of, frequency of diaper use, reason for facility attendance, and their disposal for the specific child attending the clinic. Interviews lasted approximately 15 minutes, with responses recorded using SurveyCTO software on a tablet (Dobility Inc. 2021).

## Protocol variations between countries and known data issues

There are minor differences in the detailed questionnaires implemented in the two cities, with a marginally larger sample size in Kisumu as noted above.

## Data management, processing, quality control, linkage and anonymisation

*Data management:* All the finalised forms or questionnaires covering various aspects of the project were uploaded onto SurveyCTO platforms and downloaded into the Samsung TabA 2019 (T585) by the surveyors.

*Quality control:* Quality control measures undertaken during and following data collection included the following:

* Range checks were coded into SurveyCTO data entry forms, e.g., preventing negative counts of waste items.
* Checks and skip patterns were coded in SurveyCTO forms to ensure all required information was filled appropriately.
* Constraints were coded into SurveyCTO forms to restrict entry of future dates for date variables.
* Restrictions were placed on the number of characters entered for text field e.g IDs to ensure consistency.
* Enumeration Area ID (EA ID) and respondent ID were entered twice, at the beginning and end of the questionnaire as a control check for accuracy.
* Field supervisors and CO-PIs routinely made random checks on the data collection process by following surveyors to the field and observing the process.
* Field supervisors reviewed data queries and error logs working hand in hand with the data manager and surveyors.
* Where relevant, duplicate records were flagged and removed from the data using unique IDs
* All obsolete test data, e.g pre-test data, was omitted from the final dataset.

*Calculated fields:* To aid analysis, the following fields have been automatically calculated:

* Survey start / end time, upload time, and interview / observation duration: Automatically captured via tablets used for data capture.

*Anonymisation:* Field team member names have been removed, and comments or other free text fields in the data file have been screened for inadvertent disclosure of personal data.

*Data structure, linkage & related data resources:* The data comprise two tables, one for each city, with each row representing the responses from a given children’s carer.

Unique IDs are formulated as follows:

* Ghana: There is a 2, 3 or 4 character code for the health facility, followed by a two digit code for the age cohort (ie. 11: 0-11 months; 23: 12-23 months; 36: 24-36 months) that the child belongs to. This is then followed by ‘M’ (for Mother) and two digits.
* Kenya: There is a 1 or 2 character code for the health facility, followed by a three digit code for the mother, unique within the health facility.

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