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Sanitation and Solid Waste Management Practices Among Compounds in South Dayi District Ghana

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Abstract

Background

South Dayi District, Volta Region, Ghana, lacked a systematic, geo-referenced, community-level dataset on household sanitation and solid waste management practices sufficient to guide the preparation of its District Environmental Sanitation Strategy and Action Plan (DESSAP). This study presents findings from a baseline environmental sanitation survey undertaken to address this gap.

Methods

A cross-sectional survey was administered using the KoboCollect mobile data collection platform across a defined set of communities in South Dayi District. Data were collected at the level of the house or compound, with the landlord or a designated representative reporting on behalf of the compound, including in cases of multiple resident households. The instrument covered solid waste management, excreta and liquid waste management, stormwater drainage, and environmental sanitation education. Following a structured data cleaning process, analysis was based on 1,806 valid compound-level records.

Results

Applying the WHO/UNICEF Joint Monitoring Programme sanitation ladder, 45.8% of compounds achieved Basic service level, 32.9% were classified as Limited, 15.9% practised open defecation, and 4.3% relied on unimproved facilities; no compound met the Safely Managed criteria. Open defecation was geographically concentrated, ranging from under 2% in some communities to 51.8% in Tsatee and 30.4% in Adzokoe. Solid waste disposal was dominated by uncontrolled burning (57.7%), with formal collection reaching only 2.1% of compounds despite 36.9% of respondents expressing willingness to pay for improved collection, against only 3.2% currently paying. The majority of household greywater (57.2% combined open ground and no-system disposal) was managed without engineered drainage. Exposure to hygiene education was high (88.1%), and access to piped drinking water was widespread (89.5%).

Conclusions

Environmental sanitation conditions in the surveyed communities of South Dayi District fall below national policy targets, with open defecation concentrated in specific localities and solid waste management characterised by an infrastructure gap rather than a lack of demand for services. These findings provide an evidence base to inform the geographic targeting, financing strategy, and implementation priorities of the District's Environmental Sanitation Strategy and Action Plan, while

underscoring the need to complete data collection across the District and to address identified data collection instrument issues in future survey rounds.

1.0 INTRODUCTION

1.1 Background

Environmental sanitation remains a persistent development challenge in many rural and peri-urban districts of Ghana, with implications for public health, environmental quality, and local economic development [1, 2]. The Government of Ghana's Revised Environmental Sanitation Policy (2009) and the National Environmental Sanitation Strategy and Action Plan (NESSAP) provide the overarching national framework within which District Assemblies are required to prepare District Environmental Sanitation Strategies and Action Plans (DESSAPs) [4, 5]. These district-level plans translate national policy objectives into locally appropriate strategies for solid waste management, excreta and liquid waste management, stormwater drainage, environmental sanitation education, and the management of healthcare and other special wastes.

South Dayi District, located in the Volta Region of Ghana with its administrative capital at Kpeve, is undertaking the preparation of its DESSAP for the period aligned with the 2026–2029 Medium-Term Development Plan (MTDP). As a foundational step in this process, the District Planning Coordinating Unit (DPCU), working with Environmental Health Officers of the Assembly, conducted a baseline data collection exercise intended to establish the current status of environmental sanitation across the District's communities.

1.2 Problem Statement

Reliable, locally generated baseline data on household and community-level sanitation practices is a prerequisite for evidence-based district planning. However, environmental sanitation data available to District Assemblies in Ghana is frequently derived from national surveys (such as the Population and Housing Census or the Demographic and Health Survey) that are not disaggregated to a resolution useful for district-level intervention planning, or from administrative records that capture service provision but not household-level practice. South Dayi District, prior to this exercise, lacked a systematic, geo-referenced, community-level dataset on solid waste and sanitation practices sufficient to guide the DESSAP's strategy formulation, costing, and implementation planning.

This study addresses that gap by presenting and analysing data from a structured field survey conducted at the level of the house or compound, in which a single respondent — typically the landlord or a person designated to represent the household(s) resident in that compound — reported on sanitation and waste management conditions and practices.

1.3 Objectives of the Study

The broad objective of this study is to document environmental sanitation and solid waste management conditions in surveyed communities of South Dayi District. The specific objectives are to:

- Describe the current solid waste storage, collection, and disposal practices among surveyed compounds;
- Assess excreta and liquid waste management practices, including toilet facility type, sharing arrangements, and open defecation prevalence;
- Examine stormwater drainage and sullage (greywater) disposal practices;
- Assess the reach of environmental sanitation education and household awareness of sanitation bye-laws;
- Discuss the methodological implications of compound-level, landlord-reported data collection for the interpretation of household-level sanitation indicators; and
- Provide recommendations to inform the District Environmental Sanitation Strategy and Action Plan.

1.4 Research Questions

- What are the predominant solid waste storage and disposal practices among compounds in the surveyed communities of South Dayi District?
- What proportion of surveyed compounds have access to improved sanitation facilities, and what proportion rely on shared, public, or no facilities?
- How are stormwater drainage and household greywater managed across the surveyed communities?
- What is the level of household exposure to environmental sanitation education, and awareness of relevant District bye-laws?
- What are the implications of the compound-level reporting approach for the interpretation and generalisability of the findings, particularly in compounds housing multiple households?

1.5 Significance of the Study

The findings of this study are expected to directly inform Chapter Three (Current State of Environmental Sanitation) of the South Dayi DESSAP, providing the evidence base for the strategy formulation, costing, and implementation planning contained in subsequent chapters. Beyond its immediate planning function, the study contributes to the limited body of district-level, geo-referenced sanitation research in Ghana, and its explicit treatment of compound-level versus household-level reporting offers a methodological contribution relevant to similar data collection exercises in other Ghanaian districts characterised by multi-household compound housing arrangements.

2.0 METHODOLOGY

2.1 Study Area

South Dayi District is one of the administrative districts of the Volta Region of Ghana, with its capital at Kpeve. The District comprises 21 electoral areas organised under two sub-district structures, the Tongor-Kpali Area Council and the Peki Town Council, and has an estimated population of 61,057. The District's terrain includes urban and peri-urban settlements concentrated around Kpeve, lakeside communities along the Volta Lake such as Dzemeni, and rural farming communities extending into areas such as Peki, Tongor, Wegbe, and Lolobi.

2.2 Research Design

The study adopts a cross-sectional survey design, employing a structured questionnaire administered through the KoboCollect mobile data collection application. Data collection combined quantitative closed-ended questions with a limited number of enumerator observation items (e.g., direct assessment of household cleanliness and evidence of open defecation), GPS geolocation of each surveyed compound, and photographic evidence for selected observation questions.

2.3 Unit of Analysis and Respondent Selection

A critical methodological feature of this study is that the unit of data collection was the house or compound, rather than the individual household. In compounds occupied by a single household, the respondent was the head of that household. In compounds occupied by multiple households — a common housing arrangement in the District — a single respondent, preferably the landlord or a person designated to represent the compound, was interviewed on behalf of the compound as a whole. The number of separate households residing within each compound was recorded as a supplementary variable, allowing the shared nature of sanitation facilities to be taken into account in the analysis of facility-sharing indicators.

This approach was adopted to enable broader compound-level coverage within the available fieldwork period, but it carries specific methodological implications that are discussed in Section 2.7 (Limitations). In particular, responses reported by a landlord or compound representative may not fully capture variation in practices, awareness, or access experienced by individual tenant households within a shared compound, particularly for behavioural indicators such as handwashing practice or recent child illness.

2.4 Data Collection Instrument

The survey instrument comprised five sections: (i) compound identification and demographic characteristics of the respondent's household; (ii) solid waste storage, collection, and disposal practices; (iii) excreta and liquid waste management, including toilet facility type, functionality, sharing arrangements, and faecal sludge emptying practices; (iv) stormwater drainage and greywater (sullage) disposal; and (v) environmental sanitation education, hygiene practice, and water supply. The instrument incorporated skip logic to route respondents through relevant question sequences based on prior

responses (for example, toilet-type questions were bypassed for compounds reporting open defecation), and a subset of items required direct enumerator observation rather than respondent self-report.

2.5 Data Collection Procedure

Data collection was conducted by trained Environmental Health Officers of the South Dayi District Assembly, following a one-day orientation covering the survey instrument, use of the KoboCollect application, research ethics and informed consent procedures, interview technique, and field logistics. Enumerators obtained verbal informed consent from each respondent prior to administering the questionnaire, and were instructed to record global positioning system (GPS) coordinates and, for selected items, photographic evidence at each compound visited. Data collected in the field was synchronised to a central KoboToolbox server, from which the dataset used in this study was subsequently exported for cleaning and analysis.

2.6 Coverage and Sample Composition

Following data cleaning (Section 2.8), the dataset comprised 1,806 valid compound-level records. These records originate from a defined set of communities within South Dayi District rather than from the District's full complement of communities; data collection was ongoing at the time of this analysis, and enumerator coverage across communities was uneven over the data collection period. Accordingly, this study should be understood as a large-scale compound-level survey of the communities reached during the data collection period, and not as a district-wide census. The specific communities represented in the dataset, together with the number of compounds surveyed in each, are presented in Section 3.1.

2.7 Ethical Considerations

The data analysed in this study were collected by the South Dayi District Assembly (SDDA) between July and August 2026, under the Assembly’s administrative authorization and statutory planning mandate, as part of the baseline exercise for its District Environmental Sanitation Strategy and Action Plan. The fieldwork did not undergo ethics committee review before it began. Verbal informed consent was obtained from each respondent prior to the interview, and participation was voluntary, with respondents free to decline or discontinue at any point without consequence. No person under 18 years of age was interviewed as a primary respondent.

Ethical clearance for the analysis and publication of the resulting data was subsequently granted by the University of Health and Allied Sciences (UHAS) Fred Binka School of Public Health Research Ethics Committee, which approved the research proposal at its meeting held on 1 October 2026 (protocol identification number UHAS/FNBSPH/PG/063/25–26). This clearance was therefore obtained after the data analysed in this study had been collected, and it does not constitute prospective review of the fieldwork. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. The dataset retains respondent contact information and GPS coordinates for verification and follow-up; these are not reported, and findings are presented in aggregate form such that no individual compound or respondent is identifiable in this report.

2.8 Data Cleaning and Quality Assurance

Prior to analysis, the raw dataset exported from KoboToolbox was subjected to a structured cleaning process. This process included: separation of records by data collection instrument (household/compound-level, community-level, and institutional-level instruments were administered as distinct forms); standardisation of free-text community name entries, which had been recorded with substantial spelling and formatting inconsistency in the field (for example, multiple renderings of a single community name), into a consolidated list of standardised community names; flagging of records with Global Positioning System precision readings poorer than 50 metres, which were retained in the dataset but excluded from spatial/mapping analysis; identification and flagging of duplicate or apparently re-submitted records sharing identical respondent contact information, community, and enumerator identity; and identification of two survey fields — date of survey and total number of persons resident in the compound — that were found to be uniformly unpopulated across the entire dataset, indicating a form-level rather than a respondent-level data collection issue. These two fields are therefore excluded from the substantive analysis presented in this study.

No records were deleted during the cleaning process; all corrections and quality flags were appended as additional variables, preserving the original recorded values for verification and audit purposes.

2.9 Limitations

- Compound-level, single-respondent reporting: because one respondent reported on behalf of the entire compound, indicators for compounds housing multiple households may not reflect the full range of conditions or practices experienced by individual tenant households, particularly for behavioural and health-related indicators.
- Partial geographic coverage: the dataset reflects a defined subset of the District's communities reached during the data collection period, rather than the full complement of communities in South Dayi District; findings should not be generalised as district-wide without appropriate caveats.
- Uneven enumerator coverage over time: data collection activity varied across enumerators and over the data collection period, which may have introduced uneven representation across electoral areas.
- Missing structural fields: the date of survey and compound occupancy size fields were unpopulated across the dataset due to an identified form-level issue, precluding time-trend and household-size-adjusted analyses within this dataset.
- Self-reported data: with the exception of a limited number of enumerator-observed items, most indicators are based on respondent self-report and are subject to the customary limitations of self-reported survey data, including social desirability bias.

3.0 RESULTS

3.1 Coverage and Respondent Characteristics

Following data cleaning, the analysis draws on 1,806 valid compound-level records. Records originate from a defined set of communities within South Dayi District, dominated in volume by Kpeve Newtown (194 records, 10.7% of the sample), Todome (163, 9.0%), Avetile (154, 8.5%), Blengo (138, 7.6%), Tsatee (137, 7.6%), Adzokoe (125, 6.9%), Wudome (116, 6.4%), Tongor (112, 6.2%), Peki (unspecified locality within Peki Town Council, 100, 5.5%), and Dzogbati (78, 4.3%), together accounting for approximately 71% of all records. The remaining records are distributed across a further set of smaller communities, as detailed in the accompanying dataset.

Of respondents, 1,016 (56.3%) were female and 790 (43.7%) were male, reflecting the frequent role of women as compound representatives or landladies in the surveyed communities. Two hundred and eight compounds (11.5%) reported at least one person with a disability resident. The predominant reported occupation of the respondent was farming (682, 37.8%), followed by trading/commerce (461, 25.5%), unemployed (269, 14.9%), and public/civil service and artisan/craft occupations (168 each, 9.3%). Household income was predominantly low: of 1,695 respondents who answered the income question, 823 (48.6%) reported a monthly household income below GH₵500, 235 (13.9%) reported GH₵500–1,000, 119 (7.0%) reported GH₵1,001–2,000, and 103 (6.1%) reported above GH₵2,000; 415 respondents (23.1% of those answering, or 23% of the full sample) either refused to answer or did not know.

3.2 Excreta and Sanitation Facility Access

Table 1 presents household(s) defecation practices as reported by compound respondents. The majority of compounds (1,069, 59.2%) reported access to their own household toilet. However, a substantial minority relied on facilities outside the compound or had no facility at all: 238 compounds (13.2%) used a public or communal toilet, 151 (8.4%) used a neighbour's toilet, and 37 (2.0%) shared a toilet within the compound. Two hundred and eighty-seven compounds (15.9%) reported practising open defecation.

Table 1
Household(s) Defecation Practice (n = 1,806)

Defecation Practice	n	%
Own household toilet	1,069	59.2
Public/communal toilet	238	13.2
Neighbour's toilet	151	8.4
Shared toilet in compound	37	2.0
Open defecation	287	15.9
Other	24	1.3

Among the 1,506 compounds for which toilet type was recorded by direct enumerator observation, the most common facility types were water closet (WC) systems (510, 33.9%), KVIP double-vault facilities (331, 22.0%), VIP single-pit latrines (282, 18.7%), improved pit latrines with slab (180, 12.0%), and traditional pit latrines without slab (151, 10.0%); bucket/pan latrines were rare (1 case). Of 1,405

compounds for which sharing status was recorded, 478 (34.0%) reported that their toilet facility was shared with other households, a figure with direct relevance to the classification of service level under the WHO/UNICEF Joint Monitoring Programme (JMP) sanitation ladder.

3.3 Sanitation Service Level (JMP Classification)

Applying the JMP service ladder framework to the combination of defecation practice, observed toilet type, and facility-sharing status yields the distribution presented in Table 2. Less than half of surveyed compounds (828, 45.8%) met the criteria for a Basic service level — an improved facility not shared with other households. A substantial proportion (594, 32.9%) fell into the Limited category, reflecting either a shared household facility or reliance on a public/communal or neighbour's facility. Open defecation accounted for 287 compounds (15.9%), and a further 78 compounds (4.3%) relied on unimproved facilities (traditional pit latrines without slab or bucket/pan latrines). No compounds in the dataset met the criteria for a Safely Managed service level, as this classification additionally requires evidence of safe on-site containment or treatment of excreta, which was not established for any facility type recorded.

Table 2
JMP Sanitation Service Ladder Classification (n = 1,806)

Service Level	n	%
Basic (improved, not shared)	828	45.8
Limited (shared or public/neighbour)	594	32.9
Open defecation	287	15.9
Unimproved	78	4.3
Unclassified/Other	19	1.1

Open defecation prevalence varied markedly across the ten highest-volume communities in the dataset (Table 3), ranging from below 2% in Avetile and Tongor to over half of surveyed compounds in Tsatee (51.8%), with Adzokoe (30.4%) and Todome (18.4%) also showing elevated rates relative to the district-wide figure. This variation indicates that open defecation in the surveyed area is not uniformly distributed but concentrated in specific communities, with implications for the geographic targeting of CLTS (Community-Led Total Sanitation) triggering and sanitation infrastructure investment discussed in Section 4.

Table 3
Open Defecation Rate by Community, Ten Highest-Volume Communities

Community	Compounds (n)	OD (n)	OD %
Tsatee	137	71	51.8
Adzokoe	125	38	30.4
Todome	163	30	18.4
Kpeve Newtown	194	16	8.2
Blengo	138	6	4.3
Wudome	116	4	3.4
Avetile	154	3	1.9
Peki (unspecified)	100	2	2.0
Dzogbati	78	1	1.3
Tongor	112	1	0.9

Among the 1,472 compounds for which pit/tank emptying history was recorded, 906 (61.5%) reported that the facility had never been emptied, 268 (18.2%) did not know, and 201 (13.7%) reported that it had been emptied; the remainder (97, 6.6%) indicated the question was not applicable. This pattern suggests limited faecal sludge management activity, with implications for the risk of pit failure, overflow, and unsafe manual emptying practices, discussed further in Section 4.

Direct enumerator observation found that 1,340 of 1,800 compounds assessed (74.4%) showed no visible evidence of human faeces in the surrounding environment, while 460 (25.6%) showed some evidence — a figure notably higher than the 15.9% of compounds self-reporting open defecation, suggesting either that open defecation is practised by household members beyond the responding household, that observed evidence originated from outside the immediate compound, or that self-reported open defecation may be undercounted relative to observed conditions.

3.4 Solid Waste Management

Solid waste storage practices prior to disposal were mixed: of 1,795 compounds responding, 529 (29.5%) used a dustbin without a lid, 523 (29.1%) stored refuse in an open pile in the yard, 322 (17.9%) used a sack or polythene bag, 220 (12.3%) used a dustbin with a lid, and 199 (11.1%) reported no designated storage method.

The dominant method of final solid waste disposal was burning, reported by 1,042 compounds (57.7%). Public dump sites were used by 559 compounds (31.0%), and communal containers by 155 (8.6%). Formal collection by the Assembly or a private contractor was reported by only 38 compounds (2.1%),

with burying (4, 0.2%), open ground disposal (3, 0.2%), and other methods (5, 0.3%) accounting for the remainder (Table 4).

Table 4
Primary Method of Solid Waste Disposal (n = 1,806)

Disposal Method	n	%
Burning	1,042	57.7
Public dump site	559	31.0
Communal container	155	8.6
Collected by Assembly/contractor	38	2.1
Burying	4	0.2
Thrown on open ground	3	0.2
Other	5	0.3

Burning as the primary disposal method was near-universal in some communities and comparatively rare in others: 93.3% of compounds in Todome and 84.8% in Tongor relied on burning, compared with 15.9% in Blengo and 19.0% in Peki (unspecified), reflecting differential availability of dump sites or communal containers across communities.

Formal waste collection services reached very few surveyed compounds: only 58 of 1,797 respondents (3.2%) reported paying for refuse collection. However, willingness to pay for improved refuse collection was considerably more widespread than current uptake: of 1,804 respondents, 666 (36.9%) indicated willingness to pay, 774 (42.9%) were not willing, and 364 (20.2%) did not know. This gap between low current service uptake (3.2% paying) and moderate stated willingness to pay (36.9%) indicates unmet demand for formal waste collection services that is not currently being served by existing infrastructure.

Direct enumerator observation of the immediate compound environment found that the large majority of compounds (1,716 of 1,803 assessed, 95.2%) showed no visible littering with refuse, with 87 (4.8%) assessed as littered.

3.5 Stormwater Drainage and Sullage (Greywater) Disposal

Household greywater (sullage) disposal practices were assessed for all 1,806 compounds. The most common practice was disposal onto open ground, reported by 853 compounds (47.2%), followed by disposal into a soak-away pit (595, 32.9%). One hundred and ninety-six compounds (10.9%) reported no specific disposal system, 140 (7.8%) disposed of sullage into a gutter or stream, and only 19 (1.1%) reported disposal into a properly constructed drain.

Direct observation found stagnant water pools around 108 of 1,789 assessed compounds (6.0%). Among the 1,402 compounds for which drain condition was recorded, 1,089 (77.7%) were assessed as

free-flowing, while 216 (15.4%) were broken or collapsed, 61 (4.4%) were partially blocked or silted, and 36 (2.6%) were fully blocked.

It is noted that the survey item on the presence of a drain serving the house (D02) returned no valid responses across the entire dataset (0 of 1,806), indicating a form-level data collection issue affecting this specific item; drain condition data (D03) was nonetheless captured for a subset of compounds, suggesting the item may have been answered independent of the intended skip logic. This is discussed further as a data limitation in Section 4.

3.6 Environmental Sanitation Education and Water Supply

The reach of environmental sanitation and hygiene education was substantial: of 1,801 respondents, 1,587 (88.1%) reported that at least one household member had received hygiene or sanitation education in the preceding 12 months, with 214 (11.9%) reporting no such exposure.

Drinking water access was predominantly from improved sources. Of all 1,806 compounds, 951 (52.7%) reported in-house pipe-borne water as their main source, and 665 (36.8%) relied on a public pipe-borne standpipe; together, these piped sources accounted for 89.5% of compounds. Borehole water was used by 96 compounds (5.3%), sachet or bottled water by 46 (2.5%), protected wells by 12 (0.7%), and river, stream, or lake water — an unimproved source — by 25 compounds (1.4%).

Of 658 compounds with a child under five years of age, 34 (5.2%) reported that a child had experienced diarrhoea in the two weeks preceding the survey, while 619 (94.1%) reported no such illness.

3.7 Summary of Key Findings

Across the surveyed compounds, sanitation and solid waste management conditions present a mixed picture. Water supply access is comparatively strong, with the substantial majority of compounds served by piped water, and exposure to hygiene education is high. However, sanitation service levels remain below the Basic threshold for over half of surveyed compounds when the JMP ladder is applied, open defecation persists at meaningful levels with strong geographic concentration in specific communities, and solid waste management is dominated by uncontrolled burning in the near-total absence of formal collection services, despite evidence of latent willingness to pay for improved service. Drainage infrastructure is limited, with the majority of household greywater disposed of directly onto open ground rather than through constructed drainage or soak-away systems.

4.0 DISCUSSION

4.1 Sanitation Service Levels Against National and Policy Targets

The finding that only 45.8% of surveyed compounds met the Basic service level on the WHO/UNICEF Joint Monitoring Programme (JMP) sanitation ladder, with a further 15.9% practising open defecation,

situates South Dayi District's surveyed communities below the aspirations of Ghana's Revised Environmental Sanitation Policy (2009) and the National Environmental Sanitation Strategy and Action Plan (NESSAP), both of which set the elimination of open defecation and universal access to improved sanitation as core national objectives [4, 5]. That no compound in the dataset met the criteria for the Safely Managed tier — the highest rung of the JMP ladder, requiring verified safe containment or treatment of excreta in addition to improved, unshared access [1, 2] — indicates that even among the 45.8% of compounds classified as Basic, the ultimate fate of contained faecal sludge remains largely unmanaged. This is corroborated by the finding that 61.5% of compounds with an on-site facility reported that the pit or tank had never been emptied, and a further 18.2% did not know whether it had. Taken together, these findings suggest that the District's sanitation challenge extends beyond facility construction to encompass the equally pressing issue of faecal sludge management — an area frequently underemphasised relative to toilet construction in district-level sanitation programming in Ghana.

4.2 The Geographic Concentration of Open Defecation

A central finding of this study is that open defecation is not evenly distributed across the surveyed communities but is instead heavily concentrated in a small number of localities. Tsatee, with an open defecation rate of 51.8%, and Adzokoe, at 30.4%, considerably exceed both the district-wide average in this sample and the 32% rural open defecation prevalence reported nationally by Appiah-Effah et al. using Ghana Demographic and Health Survey data [3], and stand in sharp contrast to communities such as Avetile (1.9%), Tongor (0.9%), and Dzogbati (1.3%), despite all being surveyed within the same district and broadly comparable fieldwork period. This pattern has direct and practical implications for the District's Community-Led Total Sanitation (CLTS) programming, an approach with a well-documented evidence base for reducing open defecation in Ghana when properly facilitated and monitored [6, 7, 8, 9] and the sequencing of interventions under the forthcoming District Environmental Sanitation Strategy and Action Plan (DESSAP): rather than distributing sanitation investment uniformly across the District, the evidence here supports a targeted approach that prioritises CLTS triggering and toilet construction support in Tsatee and Adzokoe in particular, where the scale of the challenge is markedly greater than the district-wide average would suggest.

The observation that enumerator-assessed evidence of open defecation in the immediate environment (25.6% of compounds) exceeded the self-reported open defecation rate (15.9%) warrants caution in interpretation. This gap may reflect defecation by non-household members passing through the area, evidence originating from neighbouring, non-surveyed compounds, social desirability bias in self-reporting of a practice that is both stigmatised and, in many Ghanaian districts, subject to bye-law enforcement, or some combination of these factors. Regardless of the precise explanation, the divergence between reported and observed indicators reinforces the value of retaining direct observation items within household sanitation surveys rather than relying on self-report alone, and suggests that the true prevalence of open defecation in the surveyed communities may be closer to, or between, the two figures reported here.

4.3 Solid Waste Management: A Service Gap Rather Than a Demand Gap

The finding that only 2.1% of surveyed compounds are served by formal Assembly or contractor waste collection, against a backdrop of 57.7% relying on uncontrolled burning, points to a fundamental gap in solid waste service infrastructure across the surveyed communities. Critically, this appears to be a supply-side rather than a demand-side gap: while only 3.2% of compounds currently pay for any waste collection service, 36.9% indicated willingness to pay for improved collection were it available. This finding is consistent with comparable studies in other Ghanaian districts and municipalities, which similarly report low current willingness to pay alongside demand for improved services [10, 12, 13], and with the broader pattern observed in many Ghanaian districts, where formal waste collection services are concentrated in district capitals and larger urban centres, leaving peri-urban and rural communities to rely on self-managed disposal, predominantly burning — a practice associated with air quality degradation and the release of harmful pollutants [11], and one that runs contrary to the objectives of the NESSAP's solid waste management focus area [5].

The pronounced variation in burning rates across communities, from 93.3% in Todome to 15.9% in Blengo, likely reflects differential proximity to public dump sites or communal collection points rather than differences in household preference, and should be verified against the community-level infrastructure data collected under the companion Community Assessment instrument before being used to guide site selection for new waste infrastructure.

4.4 Drainage and the Limits of the Present Dataset

Findings on stormwater drainage and household greywater (sullage) management should be interpreted with particular caution. While 47.2% of compounds reported disposing of sullage directly onto open ground, and stagnant water was observed at 6.0% of compounds, the item intended to establish whether a drain served each compound (D02) returned no valid data across the entire dataset, a form-level anomaly discussed in Section 4.6. Because this item was intended to govern the skip logic for subsequent drainage-condition questions, the fact that drain condition data (D03) was nonetheless captured for 1,402 compounds suggests either that the skip logic did not function as designed or that enumerators answered condition-related items independent of the compromised lead question. Findings on drain condition (77.7% assessed as free-flowing) should accordingly be treated as indicative rather than definitive pending resolution of this data quality issue, and are presented in this study primarily to inform the correction of the survey instrument for subsequent rounds of data collection rather than as a firm basis for drainage infrastructure planning.

4.5 Education Reach Alongside Persistent Practice Gaps

The finding that 88.1% of respondents reported household exposure to hygiene or sanitation education in the preceding twelve months, set against the sanitation and waste management practice gaps documented in Sections 3.2 to 3.4, illustrates a well-established pattern in environmental health

literature: information exposure alone is frequently insufficient to shift practice in the absence of accompanying infrastructure, affordability, and enabling conditions. High reported exposure to education did not correspond to correspondingly high rates of improved sanitation access or formal waste collection uptake in this sample, suggesting that the District's environmental sanitation education efforts, while apparently reaching the large majority of surveyed compounds, may need to be more closely integrated with concurrent investment in physical infrastructure and enforcement of environmental sanitation bye-laws to translate awareness into practice change.

4.6 Data Quality and Methodological Considerations

This study identified two categories of data quality issue during the cleaning process that merit discussion. First, two survey items — date of survey (A01) and total number of persons resident in the compound (A12) — returned no valid data across the entire dataset of 1,806 records, and a third, the presence of a drain serving the compound (D02), showed the same pattern. Because these are uniform, complete failures rather than sporadic missingness, they are best explained as form-level configuration issues within the KoboCollect data collection instrument rather than as enumerator error or respondent non-response, and are recommended for priority correction before further rounds of data collection are undertaken. Their absence precludes time-trend analysis and household-size-adjusted indicators within the present dataset.

Second, and more fundamentally, this study's compound-level, single-respondent data collection approach — in which a landlord or designated compound representative reported on behalf of the compound as a whole, including in cases of multiple resident households — should be borne in mind when interpreting all indicators presented here, and particularly behavioural or health-specific indicators such as child diarrhoea prevalence, which may not equally reflect the experience of all households within a shared compound. Future rounds of data collection may consider either supplementing landlord-level reporting with a sub-sample of individual tenant household interviews within multi-household compounds, or explicitly weighting analysis by the number of households represented per compound (captured in this survey under item A06b), to strengthen the household-level generalisability of future findings.

Finally, as detailed in Section 2.6, the dataset analysed here reflects a defined set of communities reached during the data collection period rather than the full complement of communities in South Dayi District, and enumerator activity varied over the data collection period. Findings should accordingly be interpreted as characteristic of the surveyed communities and used to inform, rather than definitively conclude, district-wide sanitation planning, pending completion of data collection in communities not yet reached at the time of this analysis.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study presented findings from a compound-level environmental sanitation survey conducted across a defined set of communities in South Dayi District, Ghana, drawing on 1,806 valid records collected as part of the baseline exercise for the District's Environmental Sanitation Strategy and Action Plan (DESSAP). The findings indicate that, while access to improved drinking water and exposure to hygiene education are comparatively widespread among surveyed compounds, sanitation service levels remain below the Basic threshold of the WHO/UNICEF Joint Monitoring Programme ladder for over half of compounds, open defecation persists at a district-wide rate of 15.9% with pronounced concentration in specific communities (most notably Tsatee and Adzokoe), faecal sludge management is minimal, and solid waste management is dominated by uncontrolled burning in the near-total absence of formal collection services. A notable gap exists between low current uptake of paid waste collection (3.2%) and considerably higher stated willingness to pay for improved services (36.9%), indicating unmet demand rather than an absence of demand for formal solid waste management. These findings, while derived from a partial rather than a complete enumeration of the District's communities, provide a substantive evidence base to inform the strategic priorities, geographic targeting, and financing approach of the DESSAP.

5.2 Recommendations

Based on the findings of this study, the following recommendations are proposed for the South Dayi District Assembly:

- Prioritise Community-Led Total Sanitation (CLTS) triggering and household toilet construction support in Tsatee and Adzokoe, where open defecation rates substantially exceed the district-wide average, before extending equivalent investment uniformly across all communities.
- Develop a faecal sludge management strategy, given that the majority of compounds with an existing toilet facility reported that the pit or tank had never been emptied; this should include exploration of low-cost emptying services and safe disposal or treatment options appropriate to the District's infrastructure capacity.
- Pilot a fee-based solid waste collection service in one or two communities with demonstrated willingness to pay, using the results to inform a phased, revenue-supported expansion of formal waste collection rather than relying solely on Assembly-funded provision.
- Investigate the drivers of the marked variation in solid waste burning rates across communities (from 15.9% to 93.3%), particularly the role of proximity to public dump sites and communal containers, to inform the siting of new waste infrastructure.
- Correct the identified form-level data collection issues in the KoboCollect survey instrument — specifically the non-functioning date of survey (A01), household size (A12), and drain presence (D02) items — before further rounds of data collection are undertaken.
- Complete data collection in communities not yet reached at the time of this analysis, to move from a partial to a more complete district-wide evidence base for the DESSAP.

- Consider integrating environmental sanitation education more closely with infrastructure investment and bye-law enforcement, given that high reported exposure to hygiene education did not correspond to correspondingly high levels of improved sanitation or waste management practice in this sample.
- In future rounds of data collection, consider supplementing compound-level, landlord-reported data with a sub-sample of individual tenant household interviews within multi-household compounds, to strengthen the household-level generalizability of findings, particularly for behavioral and health-related indicators.

Declarations

Ethics approval and consent to participate

Ethical clearance for the study and the data reported in this manuscript was granted by the University of Health and Allied Sciences (UHAS) Fred Binka School of Public Health Research Ethics Committee, which approved the research proposal (protocol identification number UHAS/FNBSPH/PG/063/25–26; Principal Investigator: Leticia Emefa Obobi) at its meeting held in September 15th 2025.

The data analysed in this manuscript were collected between July and August 2026 by Environmental Health Officers of the South Dayi District Assembly (SDDA), under the Assembly's administrative authorization and statutory planning mandate, in preparation of its District Environmental Sanitation Strategy and Action Plan. The fieldwork did not undergo ethics committee review before it began; the clearance described above was therefore granted after the data analysed in this manuscript had been collected and is not a prospective review of the fieldwork. Verbal informed consent was obtained from each respondent prior to the administration of the questionnaire. Participation was voluntary, and respondents were informed of their right to decline or discontinue participation at any point without consequence. No participant under 18 years of age was interviewed as a primary respondent. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. A letter from the District Coordinating Director of the SDDA confirming the Assembly's administrative authorization of the data collection is available from the corresponding author on request.

Consent for publication

Not applicable. This manuscript does not contain any individual person's data in any form (including individual details, images, or videos).

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

F.A.O. conceived the study, coordinated data collection at the South Dayi District Assembly, cleaned and analysed the data, and wrote the first draft of the manuscript. L.E.O. was Principal Investigator on the ethics protocol, study design input, supervision of fieldwork, interpretation of findings, and critically reviewed the manuscript. Y.C contributed to data collection oversight, literature review, interpretation of findings, and critically reviewed the manuscript. All authors read and approved the final manuscript.

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Data Availability

The cleaned dataset generated and analysed during the current study is available from the corresponding author on reasonable request. The dataset contains geolocation and contact information for surveyed compounds and is therefore not deposited in a fully open public repository at this stage, in order to protect respondent confidentiality and location privacy; a de-identified version suitable for public sharing may be made available following completion of the full District-wide data collection exercise.

References

1. World Health Organization, United Nations Children's Fund. Progress on household drinking water, sanitation and hygiene 2000–2020: five years into the SDGs. Geneva: WHO and UNICEF; 2021.
2. WHO/UNICEF Joint Monitoring Programme for Water Supply. Sanitation and Hygiene (JMP). JMP methodology: 2021 update and SDG baselines. Geneva: WHO and UNICEF; 2021.
3. Appiah-Effah E, Boakye K, Salihu T, Duku GA, Fenteng JO-D, Boateng G, et al. Determinants of open defecation among rural women in Ghana: analysis of Demographic and Health Surveys. Environ Health Insights. 2024;18. 10.1177/11786302241226774.

4. Government of Ghana, Ministry of Local Government and Rural Development. Revised Environmental Sanitation Policy. Accra: Ministry of Local Government and Rural Development; 2010.
5. Government of Ghana, Ministry of Local Government and Rural Development. National Environmental Sanitation Strategy and Action Plan (NESSAP) 2010–2015. Accra: Ministry of Local Government and Rural Development; 2010.
6. Crocker J, Saywell D, Bartram J. Sustainability of community-led total sanitation outcomes: evidence from Ethiopia and Ghana. Int J Hyg Environ Health. 2017;220(3):551–7. 10.1016/j.ijheh.2017.02.011.
7. Venkataramanan V, Crocker J, Karon A, Bartram J. Community-led total sanitation: a mixed-methods systematic review of evidence and its quality. Environ Health Perspect. 2018;126(2):026001.
8. Zoma Ramanou B, et al. How does Community-Led Total Sanitation (CLTS) promote latrine construction, and can it be improved? A cluster-randomized controlled trial in Ghana. Soc Sci Med. 2020;247:112807. 10.1016/j.socscimed.2020.112807.
9. Crocker J, Abodoo E, Asamani D, Domapielle W, Gyapong B, Bartram J. Impact evaluation of training natural leaders in a community-led total sanitation program: a cluster-randomized controlled trial in Ghana. Environ Sci Technol. 2016;50(16):8867–75.
10. Seth K, Cobbina SJ, Asare W, Duwiejuah AB. Household demand and willingness to pay for solid waste management service in Tuobodom in the Techiman-North District, Ghana. Am J Environ Prot. 2014;2(4):74–8. 10.12691/env-2-4-3.
11. Miezah K, Obiri-Danso K, Kádár Z, Fei-Baffoe B, Mensah MY. Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana. Waste Manag. 2015;46:15–27.
12. Abankwa V, et al. Household willingness-to-pay for improved solid waste management services in four major metropolitan cities in Ghana. J Environ Public Health. 2019;2019:1–9. 10.1155/2019/9878602.
13. Kwakye S. Willingness to pay for solid waste collection in semi-rural Ghana: a logit estimation. J Environ Manage Sustain. 2021.
14. Belay DG, Asratie MH, Aragaw FM, Tsega NT, Endalew M, Gashaw M. Open defecation practice and its determinants among households in sub-Saharan Africa: pooled prevalence and multilevel analysis of 33 sub-Saharan Africa countries Demographic and Health Survey. Trop Med Health. 2022;50(1):28. 10.1186/s41182-022-00416-5.
15. South Dayi District Assembly. 2026–2029 Medium Term Development Plan. Kpeve: District Planning Coordinating Unit, South Dayi District Assembly; 2026.
16. South Dayi District Assembly. South Dayi District 2024 Monitoring and Evaluation Report. Kpeve: District Planning Coordinating Unit, South Dayi District Assembly; 2024.