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**“NOW WE’VE ALL TURNED TO EATING PROCESSED FOODS”: A
PHOTOVOICE STUDY OF THE FOOD AND NUTRITION SECURITY
IMPLICATIONS OF ‘GALAMSEY’ IN GHANA**

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ABSTRACT

Galamsey, a popular name for small-scale mining in Ghana, is an important livelihood for many rural Ghanaians. Although concerns have been raised in the popular media about the adverse effects of *galamsey* on the environment, human health, and livelihoods, there is a representational paucity of evidence regarding its links with local food systems, particularly, from the perspective of affected mining communities. The current study explored community perceptions and experiences of *galamsey* and its perceived effects on food security and livelihoods in the East Akim Municipality in the Eastern region of Ghana. Primary data was collected in the East Akim Municipality of Ghana, using a photovoice method. Thirty-six male and female adults were purposively selected with the help of a community focal persons and advertisements in the study communities. Respondents participated in a one-day photography training and thereafter, were deployed to take at least fifteen photos that portray the effect of *galamsey* on food security and health. Subsequently, each participant was asked to select five of the photographs they have taken and explain why they captured that image. A photo exhibition was held to facilitate community conversation and perspectives on the effects of *galamsey* on food and nutrition security. *Galamsey* has resulted in degradation of, otherwise, fertile agricultural land, and contamination of freshwater sources. As a consequence, there is reduced cultivable land, reduced crop production, shortage of essential staple foods, increase in food price, and increased consumption of ultra-processed foods. There is also perception of increased exposure to heavy metals like mercury in locally-produced food. Given the adverse health consequences of both food and nutrition insecurity, and increased consumption of processed foods, it is important that public and policy discussions to minimize the effects of *galamsey* in Ghana should include considerations about food and nutrition insecurity in mining communities.

Key words: mining, *galamsey*, food security, health, agriculture, land degradation, food system



INTRODUCTION

Small scale indigenous mining, popularly known in Ghana as 'galamsey', is a common rural livelihood activity that has been practiced in Ghana prior to arrival of colonial explorers on the Gold Coast [1]. Due to the often crude methods employed, galamsey has been linked, notably, with adverse environmental and health impacts [2, 3]. Its damaging effects on water bodies, agricultural land, risk of death from collapsed mine shafts, and unprotected exposure of gold exploration hirelings to heavy metals have always been a political issue for past governments in Ghana. For instance, previous studies have shown the pollution of Ghana's freshwater bodies as a result of illegal small scale mining [2, 4]. Similarly, mercury is often poorly handled, misused, and improperly disposed in galamsey operating sites [5].

Within current literature, a number of factors have been identified to drive galamsey in Ghana. 'Because I need money', 'Because I am hungry' or similar sentiments, are the commonest reasons individuals give for engaging in galamsey [6]. This observation typically follows ideas underlying the desire-satisfaction theory of welfare [7], which suggests that an individual's life goes well to the extent that one's desires are satisfied. In "Digging for Survival and/or Justice? The Drivers of Illegal Mining Activities in Western Ghana", the argument is made that galamsey activities are a manifestation of the poor socioeconomic status and the sense of entitlement to the land of community members [8].

These reasons, nonetheless, galamsey in Ghana has attracted significant negative media attention in recent years, precisely, because of its adverse effects on fresh water supply and destruction of ecosystems in mineral-rich communities [9]. Because galamsey activities are growing in many parts of the country, the impacts on the environment and on people's lives, and livelihoods have increased to a level where it can no longer be ignored by politicians [10, 11]. In 2017, the Government of Ghana and other stakeholders, including the Media Coalition Against Galamsey, issued statements declaring a 'War on galamsey' [9, 12].

One dimension of the impact of galamsey that remains inadequately explored is the impact it has on household livelihoods and food security. The potential impacts of galamsey on household and community food and nutrition security can be viewed through multiple perspectives [13]. On one hand, miners and mineral explorers anticipate that by participating in galamsey, they will increase their income earning opportunities, establish/maintain a livelihood, and be able to afford nutritious food, sanitation, and healthcare for their households. Further, they



anticipate that with improved income, access to these services can contribute to improved nutrition security.

On the other hand, galamsey can exert adverse effects on household food and nutrition security through multiple pathways [14, 15]. First, time spent away from agricultural activities by significant numbers of farmers can reduce agricultural productivity. When women, who are typically primary caregivers in most homes in Ghana, are involved heavily in galamsey, their young children can become exposed to sub-optimal childcare and feeding. Apart from infants and young children, involvement of women in mining can also lead to sub-optimal care and food provisioning for other family members who are dependent on income earners who are actively engaged in galamsey. Second, galamsey explorers lure landowners with up-front money to sell their farmlands through long-duration lease agreements [16]. Sale of agricultural lands has the appeal of providing ready cash in the immediate term, but has adverse effects on household livelihoods and food security in the longer term. Third, small-scale mining is known to particularly damage agricultural lands because of uncontrolled excavation and degrading of fertile topsoil [2]. In the process, water bodies are also destroyed through silting or rendered unwholesome for domestic and agricultural use through chemical (for example cyanide) contamination or pollution.

While many previous studies have focused on economic, socio-legal, and environmental consequences of galamsey in Ghana, there is currently limited evidence on the effects of galamsey on households and communities' food and nutrition security. A few existing studies have reported a link between small-scale mining and reduced food production [17, 18], but none has examined community perceptions about, and experiences of, how galamsey affects food systems, and diets, and food and nutrition security. The purpose of the current study was to explore community perceptions and experiences of galamsey and its effects on food and nutrition security in the East Akyem Municipality in the Eastern region of Ghana.

MATERIALS AND METHODS

Study Location

The study was conducted in the East Akim Municipality in Ghana's Eastern Region [19]. The East Akim Municipality covers an area of 725 km², with a population of 167,896 residents. It lies within the moist semi-deciduous forest ecological zone in Ghana, with more than half of the population (65%) engaged in



smallholder agriculture [20]. Dominant crops in the area include cocoa, coffee, cassava, maize, plantain, oil palm, banana, and all kinds of vegetables.

The Eastern region in general, and the East Akim Municipality in particular, have long histories of artisanal mining activities [21]. This is partly because the Municipality is heavily endowed with mineral deposits, including gold, diamond, bauxite, and kaolin [22, 23]. As a result, galamsey has been practiced over several decades. However, galamsey in the area has become a 'menace' since 2015[23]. This history and characteristic of the municipality makes it a suitable context for examining how galamsey activities are linked to food and nutrition security. Within East Akim Municipality, data were collected in five communities, with populations ranging from 950 to 3000 residents. These communities are located approximately 10 km from Kibi, the biggest urban settlement in the Municipality. These five communities were purposively selected: they are places where galamsey is both ubiquitous and widely practiced.

Study Design

The data used in this study came from a large qualitative photovoice project exploring the public health implications of galamsey in Ghana. Photovoice offers many advantages over other existing qualitative methods of data collection [24]. In this, relatively, new participatory method, community members take photographs with the objective of sharing their perspectives on a topic under consideration. The method values the knowledge put forth by people as a vital source of expertise. It also turns the camera lens toward the eyes and experiences of people that may not be heard otherwise. Specific methods related to the current analysis are described below.

Participants

Participants comprised a total of 36 adult (18+ years) males and females who had lived in the respective study communities for a period of at least 5 years. Community elders and opinion leaders, district health managers, district agricultural officers, small-scale miners, subsistent food crop farmers, market women, local food vendors, and ordinary community members were the target respondents. A combination of purposive and snowball sampling strategies was used for participant recruitment. For instance, those who could easily operate a digital camera with basic training and guidance were more likely to be recruited into the study. The recruitment techniques included contacting community elders and chiefs, small-scale miners, as well as advertisements placed in community information centres.



Data Collection

Following a four-step process, photovoice data were collected over a period of two months (December 2017 to January 2018). To begin with, participants received a one-day training workshop on how to use a phone with an inbuilt digital camera, effective photo-taking techniques, as well as ethical concerns in participatory photography. A professional photographer led this part of the training session. The session also included an overview of the study objectives, as well as an introduction and discussion of the photovoice process. The photovoice workshop was held in a hotel conference room located in Kibi, the administrative capital of the East Akim Municipality. All workshop participants were given a 4GB data storage device and an it7100 mobile phone brand with a built-in 1.3 Mega Pixels digital camera for data collection. The it7100 is a basic mobile telephone with a 3.2-inch display and an LCD screen with a resolution of 360x480 pixels.

After the training workshop, study participants were given ten days to take a set of fifteen photographs that best portray the study topic, that is, whether and how 'galamsey' (positively or negatively) affects food security, nutrition, and health. The cameras were collected after the ten days and all photos printed. Thereafter, participants were given copies of all their photos, and were asked to select the five most meaningful photos to them for in-depth discussion (photo-stories). These follow-up interviews were participant-driven. During the discussion, participants were asked several questions, including what prompted them to take each of their "most meaningful" photos. An interview guide was used, following a six-step inductive questioning protocol termed "SHOWED" [25]. Specifically, participants were asked:

- i. What do you See in the photograph?
- ii. What is Happening in the photograph?
- iii. How does the activity/idea in the photograph relate to Our lives, especially food availability/access/safety?
- iv. Why do these issues exist?
- v. How can community members be Empowered to address the stories you are sharing with this photograph; and
- vi. What can we Do to address all these issues you have raised?

Three of the authors conducted the interviews, with the help of a trained research assistant. On average, the interviews lasted 50 minutes. All interviews were audio-recorded with permission and professionally transcribed for analysis.



Data Analysis

All interviews were analyzed using thematic content analysis. The entire research team worked together to organize codes into themes and discussed discrepancies until a consensus was reached. Each transcript was coded line-by-line, based upon the meanings, perspectives, and actions they represented. Through this process, the aim was to identify the “big ideas” or “themes” that are grounded in the data [26]. Data coding continued until saturation was reached, that is, at the point where no new themes emerged from successive coding of the data. To ensure reliability and external validity of the coded themes, the research team organized a photovoice exhibition where preliminary results were shared, and the photos and photo-stories were further discussed. This exhibition was held on 2nd February 2018, in a conference room of the East Akim Municipality District Assembly in Kibi. A total of 152 people attended the exhibition, including health professionals, farmers, the study participants, community leaders, government officials, politicians, leaders of galamsey groups, and journalists from media organizations in Ghana. Detailed notes from the exhibition workshop also formed additional data coded to enrich the results presented below.

Ethics

The study received ethical approval from the Noguchi Memorial Institute for Medical Research, University of Ghana (Protocol# 048/17-18). All participants provided informed written consent before taking part in data collection. Confidentiality and anonymity of all participants were ensured during individual interviews. At the end of the study, participants were given their respective it7100 mobile phones to keep in appreciation for their time.

RESULTS

The study sample included 19 women and 17 men, with an average age of 38 years. All of them had lived in the study area for 15 years or more. The participant with the longest residence time had lived in the area for 45 years. All the 36 participants took photographs and provided accompanying photo-stories. Overall, 607 photos were taken by the participants, with a range of 15 to 30. Out of these photos, 175 were discussed in the follow-up in-depth interviews or photo-stories. One photo-story recording was unsuccessful. Thus, the findings here are based on 35 in-depth interviews or photo-stories.

The results were organized around the top three most recurring themes that emerged from the interviews. First, a description of how galamsey degrades agricultural lands and affects food production is provided. Second, there is a



demonstration of how galamsey contaminates water sources, and, in places where agriculture is possible, how food is also contaminated. The third part of the findings illustrates dietary changes due to contaminated food and water sources.

Land Degradation and Food Production

Throughout the study, participants consistently showed how farmlands have been degraded due to galamsey. They also revealed associated impacts on agriculture and food production. Participants were particularly concerned about how previously mined, galamsey pits have been completely abandoned without any attempts at reclamation. Others described how farmlands have been degraded to a point where both reclamation and intensive fertilizer application are required to restore soil fertility:

The first and major problem is land management after galamsey has been completed. I took this photo [Image 1] to show an abandoned mine site. Without reclamation and fertilizer application, nothing can be cultivated on this land. The miners didn't fill the pits and the land can't support food production.

Image 1



Although most farmers were keenly aware of the socio-ecological impacts of fertilizer application, they said using these synthetic farm inputs was the only way to make the land productive again:

And because of the mining activities, all the farmlands have been destroyed. That has affected the food we cultivate here. I took this photo [Image 2] to show how we're increasingly using synthetic chemicals to cultivate food. Myself and the other farmers here, we all know the dangers of using farm chemicals, but this is the only way to make the land productive again.

Image 2

Another prominent concern was how some galamsey pits were dug either inside existing subsistence farms, or near residential units, sometimes without the consent of landowners. These abandoned pits did not only serve as death traps, but were also said to compromise food security:

This photo [Image 3] is a mining pit dug right behind my house. It is deep. People keep falling into the pit every day. At least I've seen five dead bodies, both adults and children, retrieved from this pit. But I took this photo particularly to provide evidence of how a large part of my subsistence farmland has been degraded by the miners.

Image 3

The majority of galamsey pits were left uncovered after gold mining was over. The research team identified many of such abandoned, uncovered pits, based on observations made in the communities and during interactions with participants in their homes and farms. Among farmers who attempt to reclaim and cultivate food crops on degraded and abandoned galamsey sites, they described extreme difficulties associated with crop growth and productivity, including difficulties related

to cyanide and mercury contamination. Many farmers described food security consequences in discussing photographs associated with these abandoned galamsey pits:

This photo [Image 4] shows a vegetable farm on a covered galamsey pit. The vegetables begin to rot even before they are fully matured. The result is that it's now very hard to get fresh vegetables for our food [...]. The land has lost its fertility. The top layer, which contains rich nutrients, was turned upside down during the pit covering process, making the land useless for farming. No matter what is done, a lot of fertilizers would have to be applied to get the land fertile again.

Image 4



Overall, findings from the interviews demonstrated that there was a serious need for land reclamation in order to prevent ever-increasing agricultural productivity decline, as well as food insecurity. While most of the concerns under this theme were linked to food availability as one component of food security, there were other photo-stories related to food accessibility and quality, as described in the following sub-sections.

Food and water contamination

Food and water contamination from galamsey was the second most prominent theme in the interviews. Mercury is one of the main chemicals used in artisanal gold mining in Ghana. Many study participants described the dangerous manner in which mercury is discarded once it has been used for gold extraction:

When the miners are done washing the gold, they throw the mercury and the black gold dust into the water and on the farmlands. We need you to help carry out a soil test to ascertain the concentration of chemicals in the soil.

There was a very strong perception from the interviews and the photo exhibition that mercury deposits on farmlands cause food and water contamination. For example, many participants took photos and shared stories related to food contamination or poisoning, as a result of mercury deposits:

Mercury is used for the mining and it spreads quickly when it falls on the land. I know because I have done galamsey before. Cassava harvested from a land with mercury residue tends to be reddish inside, instead of the usual white color. Such cassava cannot be used for preparing food. Recently, some neighbors ate food from such affected cassava, got ill and were taken to the hospital. It was a family of six people. At the hospital, they were all diagnosed of food poison. We had to announce this case in the town so that people are cautious of harvesting contaminated cassava.

Another study participant shared two photos with a story that reinforced the above perception that root tuber crops are being contaminated due to mercury deposits in soils:

I took these two photos [Image 5A and 5B] to tell my story. The cassava was planted on the galamsey covered pits and did not grow well. We harvested the tubers and processed it into cassava powder for 'kokonte' [thick cassava gruel]. When cooked, the kokonte looks very black, all because of the mercury deposits in the land. When eaten, the cassava powder causes stomach upset and diarrhea, so we don't use the cassava anymore.

Image 5 (A)



Image 5 (B)



In addition to food-related issues, water contamination was also repeatedly highlighted in the photo-stories. There were several stories about village residents

who have experienced blood in their urine, a health condition perceived to be the result of mercury deposits in water bodies:

Some people are still mining in the forest closer to the source of the Brim River. When they wash the gold, the dirt flows downstream, as shown in this photo [Figure 6]. Last year, the primary school children in the town became infected from the river and had blood in their urine. They drank the water and bathed in the river. With the help of one medical doctor in town, and some medical students from Johns Hopkins University in the USA, all the school children were treated. So, the doctor advised the school children not to drink from this Brim River. However, not everyone has money to buy bottled water.

Image 6



In addition to contaminating water and rendering them unpotable, galamsey was also said to affect fisheries and aquaculture, with severe implications for food security. Many participants described fish farming projects that have been collapsed due to mercury pollution:

This photo here [Image 7] used to be a fishpond that produced fresh fish for the community. The galamsey miners pumped contaminated mercury water into the pond and killed all the fishes. We now travel elsewhere to buy fresh fish like tilapia. It's now very expensive to access fresh fish here in town. There used to be about 30 acres of land at both sides of the fishpond. That land has also been destroyed.

Image 7



During the photovoice exhibition, other stakeholders, including health professionals, shared many similar stories, confirming a growing incidence of illnesses linked to food and water contamination, as well as food insecurity in the study area.

Dietary Changes and Overreliance on Processed Foods

The issue of dietary changes was the third most prominent theme that emerged from this research. Participants stressed that there has been an increasing trend towards unhealthy eating habits, perceived to be linked to galamsey. All the 36 participants took photos or shared stories showing a general difficulty in accessing food. In these stories, the scarcity and increasing cost of food was consistently emphasized and contrasted with experiences in the past:

Food is now scarce in this town due to the galamsey mining. There are no good food in the markets and the few farmers have raised their food prices. It wasn't like that at first because about 90% of the people were farming.

Other participants described the growing predominance of ultra-processed foods with refined ingredients, artificial flavours, and little nutritional value. Of these processed foods, one that was repeatedly mentioned was indomine, an instant noodle imported from Indonesia and marketed throughout Ghana. Study participants bemoaned the proliferation of indomine sale outlets even in the most rural galamsey sites in Ghana. They further emphasized that this food now constituted the main evening meal consumed by most households in sites affected by the environmental impacts of galamsey:

Because galamsey has destroyed foods and farmlands, now indomine is sold all over in this area. In the evenings, indomie is usually the food available to most families. There are about fifteen indomie shops in a community of less than 900 people.

Throughout the photo-stories, participants described the challenging times they find themselves in. Although fresh fruits and vegetables are known to be relatively cheaper in rural Ghanaian markets where they are often abundant, participants said that this situation has changed in their communities. They noted that in recent times, fresh fruits and vegetables have become not only incredibly expensive, but also risky to consume, mainly due to perceived mercury contamination. There were several photos taken to contrast food prices, food quality, and food variety, mainly between fresh fruits and vegetables and processed food options:

With galamsey and its impacts on smallholder farming, we're in an interesting time. We've entered a time where fresh fruits and vegetables are highly expensive than processed food options. So, most sellers now give you the option – either you pay more if you want fresh tomatoes, or you pay less if you want the processed, canned equivalent. This photo [Image 8], which I took from our local market, illustrates these options. One other contradiction is that it is even risky to eat the fresh farm produce due to the mercury deposits on the land. So now we've all turned to eating processed foods.

Image 8



Almost all study participants began their photo-stories with the phrase “our diets have changed.” This dietary change was explained in reference to the growing prevalence of processed foods, including instant noodles (indomie), canned fish, canned fruits, and canned vegetables. Others were packed sachets of hot cereals and beverages such as cocoa and coffee drinks. The way study participants described these processed foods was also noteworthy: reference was often made to the fact that these food options were “very new” to rural settings, and that galamsey miners were partly responsible both in creating shortages of traditional staple foods, and for facilitating the sale and consumption of ultra-processed foods:

Due to galamsey mining and the difficulty in growing food, our diets have changed. Now there are instant noodles, cowbell coffee sachets, and many

canned foods like tomatoes, fish, and other vegetables. I took this photo [Image 9] to illustrate these foods. These processed foods are very, very new to our community. They are now eaten by both adults and children.

Image 9



Some study participants worried that if their children grew accustomed to these processed and imported foods, they may no longer appreciate cultural values around local foods and eating habits.

DISCUSSION

The current study used photovoice to examine community perception and experiences of how small-scale mining affects farming, food security and dietary practices. The study identified that galamsey activities exacerbated community and household food insecurity on all fronts – availability, affordability, accessibility and safety. In one sense, galamsey is inflicting significant environmental costs on different community members by causing degradation of agricultural lands. Further, it is also reducing the quality and fertility of the land, as well as exposing consumers to potential food poisoning as reported in other settings [27-29], with several implications for dietary intake as well as for population health.

While destruction of farmlands and potential contamination of the soil with heavy metals have been previously reported [15], the most interesting finding in this study relates to how community members linked galamsey to food shortages and the increasing consumption of processed foods. As many participants reported, the destruction of farmlands by galamsey operations have led to low production of food and food price spikes. Food prices in these situations are driven primarily by the relatively fewer arable lands, thus limiting the quantities of crops produced and farmers being overly dependent on inorganic fertilizer on reclaimed land for farming. Sudden increase in food prices, particularly among the poor, has been reported to lead to shifts toward unhealthy diet in addition to limiting food security. While increase in food prices may profit some local farmers, the same occurrence

could drive others further into poverty. Given that the population in the current study are predominantly farmers, destruction of their farmlands by galamsey could drive them further into poverty since they cannot cash-in on the increase in food prices due to loss of arable lands.

Taken together, the findings in relation to how galamsey has contributed to shortages of staple food sources and increased consumption of processed food provide an important point for reflection. Current public health literature shows that processed foods are linked with increased risk of unhealthy diets and non-communicable diseases. In low-income settings, including Ghana, much of the literature link behaviours associated with consumption of processed foods to urban settings, and to some extent, to affluence or high socio-economic status[30]. It is therefore interesting to observe that a shift in livelihoods in a largely rural setting could also contribute to increased propensity to consume processed foods. Thus, the findings here suggest that lack of food security in rural contexts, affected by galamsey, could drive community members towards increased consumption of processed food. Given the adverse health consequences of both food/ nutrition insecurity and increased consumption of processed foods, it is important that public and policy discussions around minimising the effects of galamsey in Ghana should include considerations about food and nutrition insecurity in communities heavily impacted by galamsey.

Finally, the use of photovoice in this study was empowering to participants as it enabled them to throw light on a wide range of factors that have potential links across environmental pollution, agriculture, food value chains, and human health. As reported in other photovoice studies and in the exhibition linked to the study, it allowed participants to tell stories that they have not been able to voice from their own perspective. It was also interesting to see how within the same setting, participants were able to identify diverse issues of interest to them. This said, the findings should be interpreted with certain limitations in mind. As is the case with all qualitative studies, the limitations of the non-random sampling approach used is acknowledged. For example, the study excluded people with disabilities that prevented them from operating a digital camera. Also, the study covered only 36 participants spread across five communities within one district. While this sample size was adequate to permit in-depth exploration of the issues, the limitations of generalizing the results are acknowledged. This is all the more so given that galamsey is practiced in many other parts of Ghana.



CONCLUSION

The operations of Small-Scale Mining require a governance framework that does not only address the environmental pollution but also diet and health aspects. Based on the findings of this study and others with similar findings, interventions that are aimed only at addressing the environmental aspects without a focus on nutrition and health outcomes will be unjustified. Such interventions should adopt an ecological approach that aim to not only address the effects of polluted water bodies and degraded farming lands. It should also address fractured and unsustainable livelihoods, distorted dietary patterns resulting from an unhealthy food value chain, and promote shifts in dietary preference from energy-dense processed foods, to nutrient-rich, locally cultivated foods. In this regard, studies are needed to confirm whether the fears about contaminated foods owing to leaching of heavy metals into the soil and food system, are justified. The findings of such studies should then be used for evidence-based mitigation interventions that may include behaviour change communication as well as reclamation and detoxification of agricultural land where possible. Alternative livelihood interventions may also be helpful for ensuring that miners will be able to earn income in a socially and environmentally sustainable manner.

Ethics Approval and consent to participate

The Noguchi Memorial Institute for Medical Research, Institutional Review Board assessed and approved the study protocol (ethical clearance number 048/17-18). Before enrolment, each participant was informed about the purpose and procedures of the study and informed consent was obtained. Only consented participants were enrolled in both surveys.

Consent for publication

Consent statement agreed by participants also included consent to publish the photographs taken as part of the photovoice activity.

Availability of Data

The data for this study are available from the Corresponding Author upon request.

Competing interest

The authors declare no competing interests



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