

Preliminary drivers associated with household food waste generation in South Africa

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Abstract

This study assessed the potential drivers of household food wastage in the City of Tshwane Metropolitan Municipality. A total of 210 participants were interviewed face-to-face using structured questionnaire. The acquired data were captured in Microsoft Excel, and analysed using the chi-square statistical test and SAS statistical software. The main reasons for household food wastage were identified as buying in excess, preparation of more food than would be consumed, poor storage, poor purchase planning and falling for special offers. The study found that there is a need for household awareness or education on food waste and better food management.

Keywords: *Food waste generation, Food waste driver, Households*

1. Introduction

Food waste is a growing global concern as it has major economic, social and environmental impacts, while contributing to food insecurity and climate change (European Commission, 2011). The growing number of scientific papers, journal articles and reports on household food waste is testimony to the global concern. Food production in support of global food security requires many resources including energy, water, land and fuel (Nahman *et al.*, 2012). When food is wasted, these resources are also wasted (Munesue *et al.*, 2015). Studies reported in the literature have found that households, especially in developed countries, are significant contributors to the overall food waste stream (Abeliotis *et al.*, 2014; Graham-Rowe *et al.*, 2014). In a study conducted by Ramukhwatho *et al.* (2014) it was found that households dispose an average of one 24 kg-bag of food waste per week. This finding suggests that households in South Africa may be wasting more food than expected.

Household food wastage in developing countries such as South Africa must be addressed to avoid a similar trend of increasing food waste as reported in developed countries. It is therefore important to understand the underlying reasons for household wastage in developing countries.

Food waste generation at household level is caused by a number of socio-demographic, behavioural and attitudinal factors (Koivupuro *et al.*, 2012; Stefan *et al.*, 2013; Graham-Rowe *et al.*, 2014; Porpino *et al.*, 2015 and Parizeau *et al.*, 2015). The way in which food is prepared or cooked influences the amount of food discarded. Households cook, prepare and serve more than what can be consumed during a single meal (Porpino *et al.*, 2015).

Inappropriate storage practices of food in homes also contribute to food waste at household level (Koivupuro *et al.*, 2012). Households in Mamelodi, a township in the City of Tshwane Metropolitan Municipality, South Africa, are reported to discard food that has passed its “best

before” date, special offers bought but not consumed before going off, meals prepared but not eaten and food residues (Ramukhwatho *et al.*, 2014).

Comparing the results reported by Oelofse and Marx-Pienaar (2016) and Ramukhwatho *et al.* (2014) for the City of Tshwane, consumers wasted 22.4% and 26% of food respectively because of buying special offers (e.g. “buy one get one free”) and 52% and 56.7% respectively as a result of expiry date labelling. Similar reasons for food wastage in South Africa are also reported for households in the United Kingdom (WRAP, 2013). Despite limited data on food waste in South Africa, food waste at household level is estimated to cost society approximately R21.7 billion per annum (Nahman *et al.*, 2012) in terms of food value loss and cost of disposal to landfill. Nevertheless, there remains little information on the reasons for food waste at household level in developing countries.

The amount of food waste generation has increased over time (Thyberg and Tonjes, 2015), yet understanding the reasons for this increase throughout the food supply chain are still limited (Betz *et al.*, 2015). Although the reasons for food wastage in South Africa have been investigated to some degree (Ramukhwatho *et al.*, 2014, Oelofse and Marx-Pienaar, 2016), there is still little insight into the possible drivers among South African households. Carried out in the City of Tshwane Metropolitan Municipality, this assessment of food waste generation sought to understand the drivers of such wastage at household level.

Reducing the amount of food wasted is very important to attain sustainable food production and consumption, especially as it has been estimated that by 2050 the global population would have increased to 9 billion people (Gustavsson *et al.*, 2011), putting food security at risk. If the amount of food wasted is not reduced, there will be a need to increase food production globally on already constrained land and water resources. However, to achieve a

reduction in food waste, reasons for such wastage at household level need to be understood if solutions are to be found.

Ganglbauer et al. (2013) indicated that there is a need to understand how to approach household food waste and develop innovative new ideas, so that communities can contribute in a meaningful way to reduce food wastage. This can only happen when the community is aware of and understands the drivers behind this wasteful practice. It is important to understand what food waste is and what the drivers of food waste are in order to generate ideas on how to intervene to reduce food waste. There is a need for studies that focus on connecting household food waste drivers and interventions that can be employed to reduce food waste (Thyberg and Tonjes, 2015). Hebrok and Boks (2017) list interventions obtained from a literature review that identifies different drivers of food waste including apparatus that will help the household to plan and keep an overview of stock, packaging and storing solutions that extend the shelf life of food, and information and awareness campaigns. However, innovative interventions are required in order to reduce food waste and increase food security.

2. Household food waste

2.1. Food waste definitions

Although there are numerous studies on food waste, there is no standard or internationally accepted definition of the concept, so that different authors define food waste differently (Lebersorger and Schneider, 2011 and FAO, 2013). Examples of some of the definitions found in the literature are the following. The FAO (2013) defines food waste as all the items purchased with the intention of being consumed but end up discarded, lost, degraded or consumed by pets at any stage of the food chain or generally at retail and consumption stage. Griffin et al. (2009) and the European Commission (2011) define food waste as unconsumed

or unwanted food materials which can be cooked or consumed raw, i.e. food waste generated during and after meal preparation in the household. It includes materials such as vegetable peelings, meat trimmings and spoiled or excess ingredients or prepared food as well as bones, carcasses and organs (the latter two generally do not occur in homes). According to WRAP (2007) and DEFRA (2010), food waste at household level represents “any food that is brought in the home that is not ingested by humans”.

The term food waste is used interchangeably in different studies to describe food loss or kitchen waste (Schneider, 2013), making it difficult to quantify the amount of food wasted (Buzby and Hyman, 2012). Food loss is defined as the food that spills, spoils, incurs an abnormal reduction in quality such as bruising or wilting, or otherwise gets lost before it reaches the consumer (Gustavsson *et al.*, 2011). It forms a part of food wasted, but not by the consumer. Developed countries experience food waste in the retail and consumer sectors, while developing countries encounter food loss in the production and processing sectors (Papargyropoulou *et al.*, 2014). For the purpose of this study, food waste is defined as edible and inedible food that is produced for human consumption but ends up being discarded by households.

2.2 Household food waste quantification

Although there are different methods used to quantify food waste, the varying definitions of food waste and lack of food waste policies makes it difficult to standardize quantification methods that will be reproducible (Lebersorger and Scheider, 2011). According to Zorpas and Lasaridi (2013), there are two main methods that can be used to quantify household food waste. One of these is to ask the consumers to self-weigh the food items that they discard and fill a diary during a certain period of time. The other is to search in the final depository of household food waste (e.g. Municipal garbage bins), and conduct a waste composition

analysis. In the study by Ramukhwatho et al. (2014), households were asked to keep their food waste for a specified period of time, after which the researcher would collect and weigh the waste produced.

3. Methodology

3.1 Study area and approach

The study was conducted in five areas of the City of Tshwane Metropolitan Municipality (CTMM) in the Gauteng Province of South Africa (Figure 1). This Metro was chosen for the study as it is home to the administrative capital city of South Africa (Pretoria), 92% of the population is urbanised and it was easily accessible for data collection. The topography of the study area is characterized by east-west trending valleys and ridges with an extensive built-up area. The population of the CTMM stood at ~2.9 million in 2011 (Statistics South Africa, 2011). Convenience sampling (a type of non-probability sampling method) was used to select the study area (Leedy & Ormrod, 2009). The specific areas within the city were chosen to ensure inclusion of different income groups across a range of residential areas spanning affluent proximal suburban and poorer distal township households.

Insert Figure 1.

3.2 Sampling method

The study was conducted according to UNISA's Policy on Research Ethics, in particular part 2 "Guidelines for research involving human participants" (UNISA, 2007). A total of 250 households were identified, appointments made and interviews conducted. The person(s) responsible for food preparation in each household were sourced for pertinent data and information. The convenience sampling method applied in the selection of participating households offered easy access to the respondents. According to Cooper and Schindler

(2006), convenience sampling is the purest form of probability sampling and is simple to apply. A quantitative, descriptive research design was chosen to give a descriptive analysis of the research that was carried out. Materials used in this study were structured questionnaires and a calibrated kitchen scale for weighing of the food waste.

3.3 Data collection

Although there are established questionnaires available that are used for similar studies in developed countries, the questionnaire used for this study was adapted to local conditions and approved by UNISA. The formulated questionnaire made it easy to minimise non-responses and maximise the quality of data collected, whilst the presence of the interviewer made it easier for respondents to either clarify the answers given or to ask for clarification of the questions without researcher bias (Cohen *et al.*, 2000).

Food waste data was collected from 210 of the 250 households due to unavailability of respondents or not meeting the required standard for storing three weeks of food waste. Structured questionnaires (Supplementary material) designed to take no longer than 30 minutes to complete were used to collect the information through a face-to-face interview approach. The questions were open-ended (no list of answers given to choose from) to establish the real reasons for households food wastage. The amount of food waste generated in each household was weighed on a weekly basis over a three week period. Food waste was collected using disposal plastic bags and weighed using a mechanical kitchen scale with a stainless steel bowl and measuring limit of 5 kg. The scale was calibrated using calibration weights to the nearest 100 grams.

3.4 Data analysis

Data analysis for this study included descriptive statistics using Microsoft Office Excel 2010 and the statistical software SAS. All the reasons given by the households were categorised into groups based on their similarities. The chi-square test was used to determine any statistically significant difference between the various categories.

4. Results and discussion

4.1 Demographic characteristics of participants

A description of the various categories of respondents is shown on Table 1. Respondents who agreed to participate in the present study were between the ages of 21 and 71 years. The majority of the respondents (43%) were aged 21 to 30 years. There were more female (58%) than male (42%) respondents. More than 90% of the respondents had some form of education (e.g. matric, diploma and degree), while only 1% were unschooled (no form of education, no certificates). The majority (74%) of participating households comprised two (28%), three (26%) or four (20%) family members,

Insert Table 1.

4.2 Amount of food wasted per capita

The amount of food wasted per capita per week is shown in Figure 2.

Insert Figure 2.

Households wasted an average of 6 kg of food per week. This is less than the amount reported in studies by WRAP (2009a) in the UK, where wastage exceeded 6 kg of food per week. Similarly Parizeau et al. (2015), in a study involving 68 households in Guelph, Ontario, indicated that 10.2 kg of food was wasted per week, and that households with 5, 7 and 8 members wasted less food (on average 1.3, 1.9 and 1.0 kg per capita per week

respectively). Similarly, 4-member households wasted less food per capita (1.4kg/capita/week) when compared to 1-, 2- and 3-member households with an average of 3.6 kg/capita/week. The WRAP (2009b) study indicates that approximately half the amount of food wasted per capita occurs in households with 4 members compared to single occupancy households.

The number of people in the household has a direct relation to the amount of food waste that is generated by the household. For example, the WRAP (2008) and Silvennoinen et al. (2014) studies show that the more members in a household, the more food waste is generated because more food will be prepared to cater for a larger number of people. This observation is based on a per household rather than a per capita calculation. This study is different because the amount of food waste were calculated per capita, families with one family members wasted more food per capita compared to families with many family members. Similarly, Parizeau et al. (2015) and Joerissen et al. (2015) found that single member households wasted more food, supporting the Silvennoinen et al. (2014:1063) observation that single occupant households wasted more food than households of more than two members on a per capita basis.

These results suggest that an increase in the number of people per household decreases the likelihood of wasting food. A possible explanation for this is that households with more family members tends to plan meals better and cook enough food that they can manage to finish, while one person households cook more food than they can finish, resulting in left overs. As a result, these households may generate more food waste especially because they do not plan their cooking menu and shopping (they end up buying food that they do not need, just because is on special). This concludes that single person households waste the most food per capita (Joerissen *et al.*, 2015:2702).

Household size is one of the factors that correlates with the amount of food waste produced (Katajajuuri *et al.*, 2014; WRAP, 2009b), with household size showing a positive correlation with the amount of food wasted by people. Koivupuro *et al.* (2012) also conclude that household size influences the amount of food waste generated, concluding that there is more food waste in households with fewer family members.

4.3 Reasons for households to waste food

The various reasons provided for the waste of food by households are given in Table 2. Only 18% of respondents were attracted by special offers, far exceeding the 2% of respondents in a study conducted by Parizeau *et al.* (2015) who reported that they wasted food that they bought on sale. A further 27% attributed food wastage to buying too much, compared to the 22% reported in a study by Lyndhurst (2007). The most common reason for food wastage, however, was attributed to preparing too much food for mealtimes, with 36% of respondents falling in this category. This was only slightly higher than the 31% reported in a study by WRAP (2008) for the same reason. Other reasons given by households for food waste generation in this study included poor purchase planning (15%) and poor storage (4%).

Insert Table 2.

The chi-square results in Table 2 show that there was a correlation between respondents' age and their reasons for wasting food. The statistical significant difference between respondents age and reasons for wasting food was ($p < 0.05$). The statistical significant difference between household size and the number of respondents per reason provided for household food waste generation was ($p < 0.05$). However, there was no statistically significant difference ($p > 0.05$) in the responses of these households regarding poor purchasing planning as a reason for household food waste generation.

The UK experience (WRAP, 2013) found that shopping frequency was to be blamed for some of the wasted food. In particular, households involved in one major shopping trip per week were identified as the biggest food wasters. In order to understand households' shopping frequency and thus food wastage, respondents were asked how often they went shopping for food. Figure 3 shows that 59% of respondents went to shops on a monthly basis for food and groceries, while 38% shopped on a weekly basis. The percentage households doing weekly shopping in this study is slightly lower than the 42% reported in a study by Stefan et al. (2013). According to Lyndhurst (2007), weekly shoppers tend to get involved in the diversification bias by seeking a greater variety of products instead of sticking to the most preferred ones, which results in consumers buying more food that ends up being wasted. Only 3% of respondents reported daily shopping. Inappropriate shopping habits e.g. too frequent shopping and excessive purchasing result in excessive food purchases, according to Exodus (2007).

Insert Figure 3.

5. Conclusions and recommendations

The results of this study indicate that although larger households may waste more food by volume, single person households waste more food per capita. Reasons provided by households for wasting food included: cooking too much, buying too much, purchasing special offers, lack of food purchase planning and poor storage. It was found that there was a statistical significant difference of ($p < 0.05$) between the different reasons for wasting food and the number of households' members. There was also a correlation of ($p < 0.05$) between respondents' age and their reasons for wasting food. Households wasted an average of 6 kg of food per week. The majority only do food shopping once a month.

It is recommended that households plan their trips before going shopping for groceries to avoid buying unnecessary food that will end up generating unnecessary waste. Further, that food be prepared only in the amounts needed and that can be entirely consumed by the household members. There may be various reasons for cooking more food than required, and therefore an in-depth study to determine the real reasons for preparing too much is required to inform appropriate interventions in this regard.

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