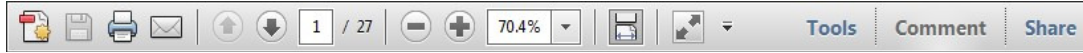
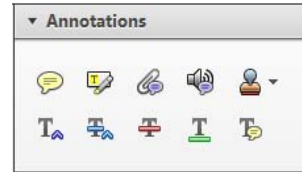


Once you have Acrobat Reader open on your computer, click on the [Comment](#) tab at the right of the toolbar:



This will open up a panel down the right side of the document. The majority of tools you will use for annotating your proof will be in the [Annotations](#) section, pictured opposite. We've picked out some of these tools below:



1. [Replace \(Ins\)](#) Tool – for replacing text.

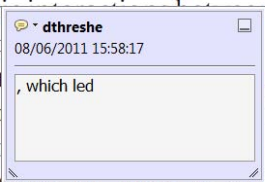


Strikes a line through text and opens up a text box where replacement text can be entered.

How to use it

- Highlight a word or sentence.
- Click on the [Replace \(Ins\)](#) icon in the Annotations section.
- Type the replacement text into the blue box that appears.

standard framework for the analysis of microeconomic activity. Nevertheless, it also led to the development of a new paradigm of strategic behavior. The number of competitors in the industry is that the structure of the industry is mainly composed of firms at the national level, are exogenous to the industry. An important work on entry by Gibrat (1931) henceforth) we open the 'black b



2. [Strikethrough \(Del\)](#) Tool – for deleting text.



Strikes a red line through text that is to be deleted.

How to use it

- Highlight a word or sentence.
- Click on the [Strikethrough \(Del\)](#) icon in the Annotations section.

there is no room for extra profits as mark-ups are zero and the number of firms (net) values are not determined by market structure. Blanchard ~~and Kiyotaki~~ (1987), in a model of perfect competition in general equilibrium, shows that the structure of aggregate demand and supply is determined by the classical framework assuming monopoly power. An exogenous number of firms

3. [Add note to text](#) Tool – for highlighting a section of text to be changed to bold or italic.



Highlights text in yellow and opens up a text box where comments can be entered.

How to use it

- Highlight the relevant section of text.
- Click on the [Add note to text](#) icon in the Annotations section.
- Type instruction on what should be changed regarding the text into the yellow box that appears.

dynamic responses of mark-ups are consistent with the VAR evidence

sation of the industry. The number of competitors in the industry is that the structure of the sector is mainly composed of firms at the national level, are exogenous to the industry. An important work on entry by Gibrat (1931) henceforth) we open the 'black b



4. [Add sticky note](#) Tool – for making notes at specific points in the text.

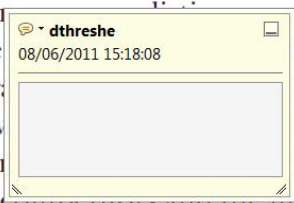


Marks a point in the proof where a comment needs to be highlighted.

How to use it

- Click on the [Add sticky note](#) icon in the Annotations section.
- Click at the point in the proof where the comment should be inserted.
- Type the comment into the yellow box that appears.

and supply shocks. Most of the time, the number of firms in the industry is that the structure of the sector is mainly composed of firms at the national level, are exogenous to the industry. An important work on entry by Gibrat (1931) henceforth) we open the 'black b



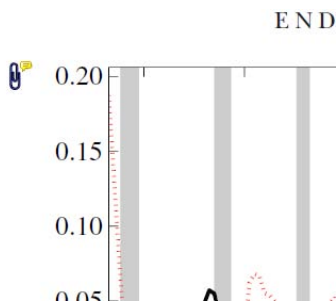
5. **Attach File** Tool – for inserting large amounts of text or replacement figures.



Inserts an icon linking to the attached file in the appropriate place in the text.

How to use it

- Click on the **Attach File** icon in the Annotations section.
- Click on the proof to where you'd like the attached file to be linked.
- Select the file to be attached from your computer or network.
- Select the colour and type of icon that will appear in the proof. Click OK.

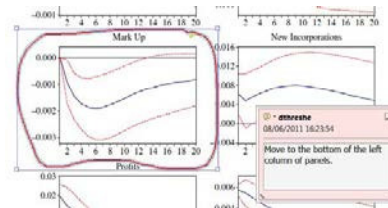


6. **Drawing Markups** Tools – for drawing shapes, lines and freeform annotations on proofs and commenting on these marks. Allows shapes, lines and freeform annotations to be drawn on proofs and for comment to be made on these marks.



How to use it

- Click on one of the shapes in the Drawing Markups section.
- Click on the proof at the relevant point and draw the selected shape with the cursor.
- To add a comment to the drawn shape, move the cursor over the shape until an arrowhead appears.
- Double click on the shape and type any text in the red box that appears.



1

2 Consumer awareness and willingness to pay for safety 3 of street foods in developing countries: a review

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18 Keywords

19 Street foods, hazards, health, consumer awareness, safety intervention, developing countries.

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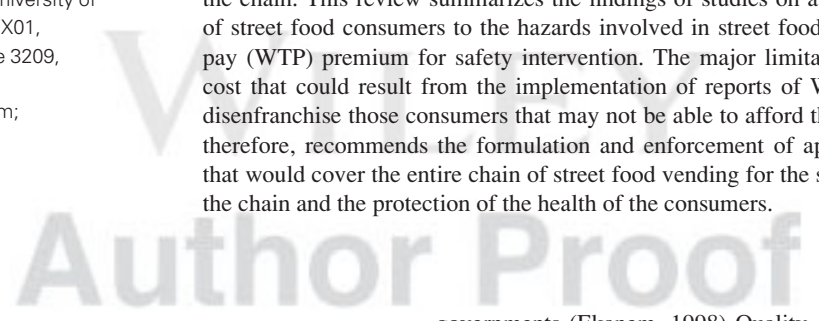
22 Introduction

23 The street food sector has witnessed significant expansion in
24 developing countries due to rapid urbanization and increasing
25 number of women being used outside the home. Its time-saving
26 and convenience availability makes it appeal to fast growing
27 and industrialized societies where dwellers have little or no
28 time for home cooking (Alimi *et al.*, 2014). Street food refers
29 to ready-to-eat foods eaten by mass consumers that are sold in
30 the streets and public places and normally consumed with mild
31 or no further processing (Ekanem, 1998). Street food vending
32 is prevalent in developing countries, most especially Latin
33 America, Asia and Africa. It belongs to an informal food supply
34 sector characterized with highly unregulated practices
35 (Akinbode *et al.*, 2011).

36 The global concern for the safety of the consumers of street-
37 vended foods has led to several research efforts to determine
38 the hygiene of the preparation and vending as well as the haz-
39 ards associated with consumption of street-vended foods (Bryan
40 *et al.*, 1988; Ekanem, 1998; Mensah *et al.*, 2002; WHO, 2002;
41 Muyanja *et al.*, 2011). Some of these studies had shown that
42 these foods and handlers were carriers of food-borne illnesses.
43 Food-borne illnesses were reported to result in substantial cost
44 to the individual and the economy of the country and, there-
45 fore, street food safety remains top priority for the public and

Abstract

Street food vending is still popular in developing countries despite the giant stride recorded in the areas of food processing and global food supply in the last century. Its contribution to the socio-economic development of the countries is evidenced by the volume of trade involved and provision of employment for significant portion of rural and urban populace. However, there has been persistent global concern on the risks of street food to the health of consumers because of the attitudes of practitioners throughout the chain. This review summarizes the findings of studies on awareness and perceptions of street food consumers to the hazards involved in street food, and their willingness to pay (WTP) premium for safety intervention. The major limitation to WTP is the extra cost that could result from the implementation of reports of WTP studies which could disenfranchise those consumers that may not be able to afford the premium. This review, therefore, recommends the formulation and enforcement of appropriate public policies that would cover the entire chain of street food vending for the safety of everybody along the chain and the protection of the health of the consumers.



46 governments (Ekanem, 1998) Quality of raw food, mishandling
47 of food and improper hygiene practices by the vendors were
48 implicated in the majority of the outbreak of illnesses related to
49 street foods (King *et al.*, 2000; Akinbode *et al.*, 2011).
50 Improper practices cited include microbial contamination due
51 to cross-contamination of cooked and uncooked foodstuffs,
52 inadequate cooking, improper use of additives presence of natu-
53 ral contaminants like mycotoxins, adulterants and environmen-
54 tal contaminants like dioxins, long holding period (especially
55 overnight) as well as storage and vending at inappropriate tem-
56 peratures. Muyanja *et al.* (2011) reported that vending is usu-
57 ally done in an unhygienic environment besides gutters and
58 large heap of wastes that provide harborage for insects, rodents
59 and domestic animals around the vending sites.

60 Street food vendors take their products to the consumers in
61 push-carts, stainless steel or plastic containers and usually dis-
62 play their products in open spaces or make-shift stalls
63 (Ekanem, 1998; Okoli *et al.*, 2005). Basic social facilities like
64 running water, washing facilities, toilets and organized sewage
65 disposal are not usually available at the retail sites (Muyanja,
66 2011). These factors put the health of the consumers at risk of
67 food borne illness (WHO, 2002).

68 Increasing patronage of street food despite the risks associ-
69 ated with it led to studies to assess the consumers' awareness

70 on the hazards of street food consumption and their willingness
 71 to pay (WTP) a premium for safety intervention that may be
 72 proposed to safeguard their health. The information available
 73 on WTP studies are mostly product (Akerlele *et al.*, 2010; Alimi
 74 *et al.*, 2015 or location biased (Akinbode *et al.*, 2011). There is
 75 no single document that provides a global summary of the vari-
 76 ous findings on consumers' awareness and willingness to pay
 77 premium for the safety of the street food. This is necessary to
 78 appreciate the significance of the street foods to global health
 79 system and perception of their consumers. The aims of this
 80 review were to analyse studies on consumers' knowledge of the
 81 safety of street-vended foods in developing countries and their
 82 willingness to pay a premium for the safety intervention pro-
 83 posed in the literature.

84 **Background**

85 **Prevalence of street food vending in developing**
 86 **countries and its contribution to the economy**

87 Growing urbanization and industrialization were attributed for
 88 the significant surge in street food vending in developing coun-
 89 tries (Ekanem, 1998). Street foods meet an important need of
 90 the urban population in the developing countries because of
 91 their convenient availability and reasonably inexpensive price.
 92 It satisfies the socio-economic need of the majority of urban
 93 populace in the developing world. They provide essential food
 94 services to population groups such as office workers, students,
 95 labourers, commuters, industrial workers and city dwellers in
 96 places like bus terminals, industrial sites, market places, school
 97 compounds, road sides and major street corners (Muyanja
 98 *et al.*, 2011). Bryan *et al.* (1988) reported that street vending is
 99 a common feature in countries with high unemployment rate,
 100 low salaries, limited work opportunities and social programs.

101 Urban food supply in developing countries is majorly driven
 102 by highly unregulated informal sector (Akinbode *et al.*, 2011).
 103 Street food vending makes up about 74% of the total food sup-
 104 ply in the developing countries (Ekanem, 1998). Besides being
 105 a source of income for women and men, it also satisfies impor-
 106 tant attribute of fast-food business by offering convenient and
 107 ready-to eat foods at relatively cheap prices. It has tremendous
 108 capacity to improve the lifestyle, nutrition and food security
 109 among urban populations in the developing countries (Akin-
 110 bode *et al.*, 2011). The regularity and consistency of street food
 111 consumption makes street food an important potential vehicle
 112 for micronutrient fortification to take care of 'hidden hunger'
 113 among rural and urban dwellers in the developing countries
 114 (Draper, 1996).

115 Contributions of street food vending to the economy of
 116 developing countries in not well appreciated because of the
 117 informal nature of the enterprise. There is little or no reliable
 118 official statistics on the volume of trade, employment and
 119 income generation of the enterprises. Street food trade is a
 120 multi-million dollars venture involving large volumes of busi-
 121 ness that provides a competitive source of employment and
 122 income to millions of people. For example, Dawson and Canet
 123 (1991) reported that there were approximately 100 000 vendors
 124 in Malaysia with collective annual volume of sales amount to
 125 over \$2 billion (USD).

Safety and health hazards associated with street foods 126
 127

128 Illness of food-borne origin remains an important public health
 129 concern the world over (WHO, 2002). Food-related diseases out-
 130 breaks are most prevalent in developing countries due to mishan-
 131 dling of food during preparation, vending and storage as well as the
 132 attitude of vendors and consumers to hygiene practices. The major-
 133 ity of illnesses/diseases occurring in the developing countries are of
 134 water and food-borne origin. WHO (2002) reported water and food
 135 diarrheal diseases to be the leading causes of illness and death kill-
 136 ing approximately 2.2 million people annually in developing coun-
 137 tries. The figure for casualty could be greater than this because of
 138 the lack of official statistics on the incidence of food related dis-
 139 eases outbreak (Ekanem, 1998).

140 Studies had shown the presence of a high level of spoilage
 141 and pathogenic microorganisms in street foods from some
 142 developing countries of Africa and Asia. These lend credence
 143 to the implication of street-vended foods in the outbreak of gas-
 144 trointestinal diseases and food borne illnesses like cholera,
 145 acute diarrhea and typhoid fever (Mensah *et al.*, 2002).

146 Aside the linkage of street food consumption with gastroin-
 147 testinal and other diseases, presence of intestinal parasites of
 148 health significance had been reported in consumers and vendors
 149 of street foods. Ayeh-kumi *et al.* (2009) reported the presence
 150 of parasitic infection in the stools of 21% of 204 food vendors
 151 from seven metropolitan areas of Accra, Ghana. Some of the
 152 identified parasites such as *Cryptosporidium parvum*, *Giardia*
 153 *lamblia*, *Entamoeba histolytica* and *Ascaris lumbricoides* have
 154 been linked with water and food borne diseases such as diar-
 155 rhea (Stanley and Reed, 2001). The presence of parasites was
 156 also reported from street foods from Kenya (Nyarango *et al.*,
 157 2003), Ethiopia (Andargie *et al.*, 2008) and Nigeria (Idowu and
 158 Rowland, 2006). The report of Idowu and Rowland (2006) was
 159 more alarming due to the fact that more parasites were found
 160 on food vendors involved in child care activities.

161 The major route of parasitic infections is through fecal-oral
 162 transmission. Human-infective parasites or their eggs and cysts
 163 can be ingested directly through the consumption of contami-
 164 nated foods or through percutaneous transmission (Adenusi
 165 *et al.*, 2015). The resistant capability of these parasites and
 166 their spores was described as a major threat to the attendant
 167 diseases control (Idowu and Rowland, 2006).

168 Diseases outbreaks are the most visible aspect of much
 169 broader street food safety problems. Intoxications linked to
 170 consumption of mycotoxins infested foods have been reported
 171 (Wagacha and Muthomi, 2008). Street foods especially snacks
 172 in developing countries are prone to mycotoxins contamination
 173 because of their sources (legume and cereal) and prevailing
 174 favourable climates of high temperatures and relative humidity.
 175 The ability of mycotoxins to contaminate food along the entire
 176 food chain and their high thermal stability poses great treat to
 177 the safety of street foods (Wagacha and Muthomi, 2008). Pres-
 178 ence of mycotoxins beyond WHO allowable limits of detection
 179 (2.0 µg/Kg) and quantification (7.0 µg/Kg) have been detected
 180 in some street foods in developing countries (Mensah *et al.*,
 181 2002; Sultan and Magan, 2010; Ezekiel *et al.*, 2013).

182 Mycotoxins are described as silent killers because the effects
 183 of their ingestion will not manifest from onset until serious

184 damages have been done to the health of infected persons. The
 185 consequences include kidney and liver failure, brain and neural
 186 disorders and death. The debilitating long-term complications
 187 of food-borne diseases include reactive arthritis and paralysis
 188 (Wagacha and Muthomi, 2008). Unborn and lactating babies are
 189 not spared from the hazards of mycotoxins (Proietti *et al.*, 2014).

190 Some foods have natural components that predispose human
 191 health to such risks as impaired food utilization, gastrointestinal
 192 and neural disorder and reduced growth rate among others. The
 193 undesirable components include high levels of nitrates in green-
 194 leaf vegetables (EFSA, 2010), marine biotoxin (Hungerford, 2005)
 195 and anti-nutritional factors such as solanine in potato (Soetan and
 196 Oyewole, 2009), tannins, saponins, phytic acid and mineral binding
 197 substances in cereals and legumes especially sorghum and soya
 198 bean (Proietti *et al.*, 2014). Presence of these components in cereals
 199 and legumes, which are the major ingredients of local snacks in
 200 developing world, predispose the consumers to major health chal-
 201 lenge when not properly cooked.

202 Display of game meat for sale is also a common feature on
 203 the major streets of West Africa (King *et al.*, 2000). Lack of
 204 statutory requirements for general inspection of game carcasses
 205 before sale and facilities for the diagnosis of important zoono-
 206 ses at the abattoir level expose consumers to major health risks
 207 (King *et al.*, 2000; Okoli *et al.*, 2005). An outbreak of Ebola in
 208 West Africa was linked with handling and consumption of
 209 Chimpanzee (*Pan troglodytes* spp.) (King *et al.*, 2000). Anthrax,
 210 bovine tuberculosis, brucellosis, Q fever, toxoplasmosis, lepto-
 211 spirosis, trichinellosis and taeniasis are some of the diseases
 212 that might be transmitted with consumption of un-inspected
 213 meat from domestic animals and wildlife populations (Mwenye
 214 *et al.*, 1996).

215 To preserve and improve the appearance of their products, some
 216 street food vendors use non-food grade additives. This is a common
 217 practice among vendors of fried meat and chicken parts in Nigeria.
 218 Proietti *et al.* (2014) reported detection of additives such as textile
 219 colouring agents in some street foods, snacks and soft drinks in
 220 Indonesia. Johnson and Yawson (2000) reported that vendors of
 221 *waakiye* (food made with rice and beans in Accra, Ghana) used col-
 222 ouring agents during preparation to give it brown colour. Unknown
 223 to these vendors, some of these additives could have detrimental
 224 effect on human health. Benzoic acid (a preservative with irritating
 225 properties) and tetradifon (neurotoxic organic phosphate) used as
 226 an insecticide were detected in some street foods in Bangkok
 227 (Vatanasuchart, 1994). Johnson and Yawson (2000) reported the
 228 presence of residual chlorpyrifos, one of the most toxic organo-
 229 phosphates which may trigger thyroid and neuro-endocrine dys-
 230 function (Tait *et al.*, 2009), in 70% of street foods tested in Accra,
 231 Ghana.

232 Presence of heavy metals beyond allowable limits had been
 233 reported in some street foods. High level of lead was detected
 234 in smoked-fish sample for sale in a Nigerian market by Ade-
 235 kunle and Akinyemi (2004). Tomlins and Johnson (2004)
 236 reported heavy presence of arsenic (As), cadmium (Cd), copper
 237 (Cu), lead (Pb) and mercury (Hg) in street-food samples from
 238 Accra, Ghana. High concentration of heavy metals above
 239 World Health Organization (WHO) recommended limits were
 240 also detected in some street food samples in Indonesia (Simo-
 241 poulos and Bath, 2000), Egypt (Dogheim *et al.*, 2004) and
 242 Sudan (Elfaki *et al.*, 2011). Long-term consumption of some of

these metals may pose serious health risks to humans 243
 (McLaughlin *et al.*, 1999; Proietti *et al.*, 2014). 244

Food safety awareness 245

Food safety awareness among consumers of street-vended foods 246
 247

Concerns for the health of consumers who are the major risk 248
 bearers of street foods in developing countries prompted several 249
 research efforts to gauge their awareness on its safety. It had 250
 been posited that consumers' awareness on the safety of food 251
 would dictate their attitude towards its consumption (Akinbode 252
et al., 2011). The attitudinal disposition of the consumers 253
 would be the main driver of quality and safety standards of the 254
 food (Lagerkvist *et al.*, 2013). 255

Reports on the level of consumers' awareness of the risks in 256
 street foods in the literature varied. The risk or safety concern 257
 could be chemical (pesticide residue), health, spoilage/ 258
 microbial, regulatory or deceptive/ideal situation. Concerns 259
 mostly reported for street foods in developing countries were 260
 majorly health and spoilage/microbial related (Lues *et al.*, 261
 2006). Most consumers interviewed in the study of Boodhu 262
et al., (2007) ranked microbiological hazards as the most seri- 263
 ous food hazards. 264

Most reports in the literature showed that the majority of 265
 consumers of street foods were not aware of health risks of its 266
 consumption. Ezekiel *et al.* (2013) reported that the majority of 267
 consumers (85%) of peanut cake in Nigeria were not aware of 268
 the risk of aflatoxin contamination of peanut cake. This was 269
 corroborated by the findings of Alimi *et al.* (2015), Akinbode 270
et al. (2011) and Benkerroum (2012) that consumers of *fura de* 271
nunu, street foods in Nigeria and traditional foods of North 272
 African countries, respectively, thought that the foods were 273
 safe for consumption. Rheinländer *et al.* (2008) were of the 274
 opinion that the trust consumers had in the vendors over 275
 the time which was mostly driven by the culinary prowess of 276
 the vendors and gustatory properties of the food, coupled with 277
 convenient availability most often becloud them from noticing 278
 inherent threats in street foods. In a study conducted in the 279
 Caribbean, Jackson *et al.* (2003) revealed that consumers did 280
 not attribute certain illnesses to being food borne due to ven- 281
 dors' negligence of safety practices but possibly due to other 282
 factors such as indigestion or their own actions. Misperception 283
 of food safety issues would imply error of judgment which 284
 could prevent them from changing food safety related behav- 285
 iours (Unusan, 2007). However, Benny-Olliviera and Badrie 286
 (2006) reported that a significant 95.7% of 'doubles' (a popular 287
 street food in Trinidad) consumers interviewed were aware of 288
 health risks of its consumption. Most of the consumers inter- 289
 viewed by Akerele *et al.* (2010) in Nigeria and Odwin and 290
 Badrie (2008) in Barbados and Trinidad (West Indies) were 291
 also aware of safety threats of street food consumption. 292

Perception of consumers to safety of street foods 293
 294

Awareness of street food safety issues could shape the consum- 295
 ers' perception of the safety practices which would in-turn 296
 influence the choice of eating place (Ezekiel *et al.*, 2013). 297

AQ5

298 Generality of opinion was that food taken outside of the home
299 harbors more risks than those at home (Odwin and Badrie,
300 2008). Most reports in the literature identified outward hygienic
301 environment as the major safety index used by consumers to
302 establish whether the eating places would provide safe or
303 unsafe foods. Owusu-Sekyere *et al.* (2014) reported that food
304 safety incidents were perceived by beef consumers in Ghana to
305 be as a result of unhygienic environment. This was corroborated
306 by Akinbode *et al.* (2011) that street food consumers in
307 Nigeria hinged their decision to buy or not to buy from particu-
308 lar selling points on the cleanliness of physical surrounding of
309 the selling points. Other street food safety concerns mentioned
310 in the literature were the appearance of food handlers, packag-
311 ing and the temperature of the foods which was related to
312 doneness (Badrie *et al.*, 2004).

313 Rheinländer *et al.* (2008) reported that consumers often used
314 social and normative notions to describe their perceptions of
315 the safety of street food. Perception of physical appearance of
316 vending environment was verbalized as 'neatness' while ven-
317 dor's appearance was verbalized as 'neat' and 'orderly' which
318 means being a tidy person.

319 **Factors influencing consumer food**
320 **safety awareness**

321 Level of education, income, knowledge of food safety and age
322 mostly influence awareness of food safety. Street foods are
323 mostly patronized by people with low level of education and
324 income. Highly educated people are more conscious of what
325 they eat and where they get their foods. Studies had shown that
326 level of education influence information seeking behaviour of
327 consumers and positively affect their food safety awareness
328 (Ezekiel *et al.*, 2013; Alimi *et al.*, 2015).

329 Age of the consumers affects their disposition to safety
330 threats of street foods. The majority of street food consumers
331 reported in the literature were in 18 to 35-years old age
332 bracket. This shows that youths eat more out of home than
333 other population groups (Alimi *et al.*, 2015). This is expected
334 as they are in active productive age. It is thought that the pres-
335 sure of their occupations could prevent them from eating at
336 home thereby resorting to patronize convenient eating outlets
337 (Akerle *et al.*, 2010). Sanlier (2009) reported that food safety
338 knowledge and awareness were higher in adult consumers than
339 in the youth, i.e, awareness increases with age. This was cor-
340 roborated by Unusan (2007) and Owusu-Sekyere *et al.* (2014).
341 This implied that youths are the most vulnerable group to the
342 risks inherent in street foods. Therefore, any effort to create
343 awareness on the safety of street foods should consider ways to
344 reach out to this group of population.

345 There are divergent reports on the influence of gender on
346 food safety awareness. Findings of Unusan (2007) and Sanlier
347 (2009) that gender had significant influence on consumers' food
348 safety awareness in Turkey was in contrast to the report of
349 Badrie *et al.* (2006) which stated that gender had no influence
350 ($P > 0.05$) on food safety awareness of consumers in Trinidad.
351 It should also be pointed out that while Unusan (2007) reported
352 that more male respondents had higher scores on food safety
353 awareness than females; Sanlier (2009) report was to the con-
354 trary. The differences are understandable as surveillance

systems and methodology used are not the same (Buzby and 355
Roberts, 2009). However, the popular opinion in the literature 356
is that majority of street food consumers are men (Akerle 357
et al., 2010; Akinbode *et al.*, 2011; Alimi *et al.*, 2015). 358

Sources of information on food safety risks 359

Ezekiel *et al.* (2013) reported that 54% of the respondents who 360
were aware of the risk of aflatoxin contamination received the 361
information from medical counsel at health centers or seminars, 362
while 19% got the information through mass media. In a survey 363
on the knowledge of risk of aflatoxin ingestion among health 364
workers in Ibadan, Nigeria, Ilesanmi and Ilesanmi (2011) 365
reported that 80.6% of respondents were aware of the risk of 366
aflatoxin ingestion. This finding placed health workers at the 367
vantage position for dissemination of information on apparent 368
risk of aflatoxin ingestion. However, Badrie *et al.* (2006) 369
reported that mass media, most especially television (70%) and 370
newspapers (54.5%), were the major sources of information on 371
food safety awareness in Trinidad, West Indies. This supported 372
the earlier view of Jackson *et al.* (2003) that information on 373
food safety would get to the majority of Caribbean consumers 374
if disseminated through education programs on television and 375
radio. Therefore, the approach for the dissemination of food 376
safety information should be geographical/location specific. 377

Consumer awareness of incidence of illnesses 378
associated with street-vended foods 379

The significance of hazards posed by street food consumption 380
cannot be fully appreciated due to the lack of official data on 381
the incidence of illnesses associated with its consumption in 382
developing countries (Alimi *et al.*, 2015). It is not mandatory 383
in most developing countries to report occurrence of food- 384
borne illnesses to appropriate agencies (Sanlier, 2009). Lack of 385
surveillance program and near-absence/non-implementation of 386
food safety laws in most developing countries further exposed 387
unknowing consumers to the risk of street food consumption. 388
There are reports of association of disease outbreak with street 389
food consumption (Ekanem, 1998). Mensah *et al.* (2002) linked 390
outbreak of diarrhea in Ghana to street foods. About 8.6% of 391
hospitalized patients in Southeastern Nigeria had Taenia eggs 392
in their stools (Onah and Chiejina, 1995) 393

Consumers in Trinidad associated 15.4% of food-borne ill- 394
nesses to street foods and 7.1% to take-away restaurant foods 395
(Odwin and Badrie, 2008). In a survey conducted by Badrie 396
et al. (2006) 55% of the respondents felt food poisoning would 397
most likely occur at restaurants. 398

Most vulnerable population groups to street 399
food hazards 400

Reports from studies showed that none of the population 401
groups is free from hazards of street foods. However, young 402
adult within 19 to 36-years age bracket (Akerle *et al.*, 2010) 403
representing active productive and reproductive class of the 404
population are the most vulnerable to the hazards of food 405
safety. The average age reported for *fura de nunu* (a popular 406
street food in West African sub-region) consumers by Alimi 407
et al. (2015) was 32.9 years, while the mean age for peanut 408

409 cake consumers reported by Ezekiel *et al.* (2013) was 24 years.
410 Akinbode *et al.* (2011) found that the majority of street food
411 consumers (87.5%) were less than 31 years old and were
412 mostly engaged in informal economic activities such as com-
413 mercial bus driving, commercial motorcycle riding and petty
414 trading.

415 **Willingness to pay for safety**
416 **of street foods**

417 Studies on the willingness of consumers to pay for safety of
418 street food in developing countries are scarce. Reports on the
419 willingness of consumers to pay for the safety of street foods
420 are expected to provide information and give insight on the
421 awareness, attitude and disposition of consumers to street food
422 safety treats and their decisions. The scanty studies downplay
423 the importance of consumers' attitude to make purchasing deci-
424 sion based on their knowledge or awareness of street food
425 safety concerns. The awareness of health problems would guide
426 the judgment of consumers on the level of risk involved in
427 their former eating habits and whether or not to change their
428 behaviour (Wilcock *et al.*, 2004). The knowledge of willingness
429 of consumers to pay (WTP) for safety intervention would give
430 insight into the disposition implies a good knowledge of
431 negative impact of street foods on the health of consumer.
432 A well-conducted willingness to pay study would guide con-
433 cerned parties to respond to fears of consumers on street food
434 safety and formulate policies appropriately.

435 Few studies available on willingness to pay for safety of
436 street foods used quantitative techniques to provide empirical
437 data on factors that may influence concerns of consumers and
438 guide their behaviour. In a study on consumer WTP for safer
439 vegetables in urban markets of developing countries, Lagerkvist
440 *et al.* (2013) revealed that the major determinants of WTP pre-
441 mium for food safety across major urban fresh vegetable
442 market categories in Kale, Nairobi, Kenya were market
443 segment-specific. Type of market outlet was found to be the
444 major criterion splitting WTP into two subsets of roadside and
445 open-air markets on one side and supermarket and specialist
446 shops on the other side. Having university education or not was
447 the most important criterion for purchase intention in roadside
448 and open-air markets, while the risk perception relating to
449 heavy metal contamination was the most significant determi-
450 nant of WTP for supermarkets and specialist shops subset.

451 Owusu-Sekyere *et al.* (2014) also reported substantial prefer-
452 ence heterogeneity in relating WTP for beef safety quality
453 assurance labels by consumers in the cities of Kumasi and
454 Sunyani in Ghana. Food safety issues of preference to consum-
455 ers were certification of animal health status through stamp
456 from veterinary officers, food safety inspection and certification
457 label from food and drugs board department, nutritional label
458 of the beef products and price of the product. All the studied
459 safety preferences had significant influence ($P < 0.001$) on will-
460 ingness of consumers to pay premium in both cities. However,
461 consumers in the two cities gave highest WTP intention for
462 verified animal health status which was influenced by age,
463 income and education in Sunyani municipality, and age,
464 income, education and gender in Kumasi metropolis. Other
465 WTP studies on street foods in developing countries also iden-

tified the aforementioned as the most important demographic 466
factors affecting willingness of consumers to pay premium for 467
safety of street foods which was premised on their personal 468
health concerns (Akerlele *et al.*, 2010; Akinbode *et al.*, 2011; 469
Alimi *et al.*, 2015). While age, income and education had posi- 470
tive correlation with WTP in these studies, it was negative with 471
gender. The studies showed that women were more willing to 472
protect their health as well as that of their household. However, 473
Lagerkvist *et al.* (2013) reported that WTP premium for safety 474
of fresh vegetables was largely unrelated to income at high end 475
urban markets in developing countries. 476

477 **Safety intervention**

In view of the important role street food vending is playing in 478
the economy of the developing countries, it has been argued 479
that it is not advisable to ban it out right but the safety con- 480
cerns associated with it should be addressed to prevent out- 481
break of diseases and illnesses. This review identified safety 482
perception as the major driver of attitude and behaviour of 483
street food consumers to safety which in-turn dictate the pur- 484
chase intent and WTP premium for safety intervention. The 485
safety perceptions identified in the studies showed that the task 486
of ensuring safety of street foods in developing countries 487
requires multi-faceted approach. The tasks of ensuring safety of 488
street foods would involve working on the attitude of 489
vendors towards preparing and handling safe food in a hygienic 490
environment, raising the awareness of consumers on food 491
safety issues and formulating policies and acts that are 492
regional/location specific to give strength to safety approaches 493
recommended. 494

495 **Conclusions**

Willingness to pay study provides a good baseline to assess the 496
acceptance of safety intervention for street foods and offering 497
suggestions to policy makers and regulating agencies on robust 498
safety intervention strategies that are acceptable to the consum- 499
ers (Lagerkvist *et al.*, 2013; Alimi *et al.*, 2015). The major 500
strength of WTP study is that it provide baseline information 501
base on the socio-economic characteristics of the consumers. 502
Differences existed on the determinant factors that shaped the 503
perception of consumers on safety issues and the premises for 504
purchase intention among the studies. The differences in the 505
determinant factors are expected as there could be differences 506
in the prevailing demographic and socio-economic factors, cul- 507
ture, preferences and experience among the studied communi- 508
ties (Wilcock *et al.*, 2004). Also, differences in methodology 509
and surveillance systems used by the studies could be responsi- 510
ble (Buzby and Roberts, 2009). 511

Willingness to pay was identified as one of the strategies to 512
ensure safety of safety of street foods to the consumers. How- 513
ever, the added cost that would result from implementation of 514
reports of WTP which could disenfranchise those consumers 515
that could not afford the extra cost. 516

This review also identified general low level of awareness of 517
the safety of street foods among consumers in developing 518
countries which limit their perception of safety concerns. 519
Raising the awareness of consumers through education with the 520
use of reach out programs such as workshops, seminars and 521

522 disseminating information on mass media was proposed in liter-
 523 ature (Griffith *et al.*, 1995; Badrie *et al.*, 2006; Ilesanmi and
 524 Ilesanmi, 2011; Ezekiel *et al.*, 2013; Alimi *et al.*, 2015).
 525 Encouraging the formation of consumers driven safety aware-
 526 ness and protection organizations as suggested by Ekanem
 527 (1998) would ensure effective dissemination of information and
 528 make their voice heard on matters concerning them. The use of
 529 hygiene education base on health education concept to promote
 530 food safety awareness among consumers with active involve-
 531 ment of professionals in food and health related disciplines as
 532 advocated by Griffith *et al.* (1995) would enhance effectiveness
 533 of food safety intervention.

534 Above all, development of appropriate public policies that
 535 would address all the facets of street food vending from raw-
 536 materials through the hygiene of the vendors and the vending
 537 environment to the retail street foods should be developed.
 538 Properly developed and enforced policies would ensure the
 539 safety of all along the chain and protect the health of final
 540 consumers.

541 Scanty literature on WTP a premium for safety on street
 542 food vending could be a major limitation to the development of
 543 global baseline for safety intervention. Therefore, there is need
 544 for more proactive research and surveillance programs to assess
 545 the awareness of consumers and hear their views and inputs on
 546 safety concerns and approach to be adopted for safe street food
 547 vending across developing countries.

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