Does SNAP eligibility have racial or ethnic gradients: a geospatial social exploratory

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Abstract: Recently, much discussion has centred on disproportionate dependence of certain racial groups on SNAP programme. This racial overture is sparked by comments made during the Fox News-Wall Street Journal Republican Presidential debate by Newt Gingrich, former Speaker of the House, who asserted that President Obama is a 'food stamp president'. This stereotypic SNAP overture is posting a larger narrative about government assistance and disproportionate dependence of some racial minority groups on government programmes. However, are majority of SNAP recipients fit minority profiling? We explain this overarching question through geospatial study of racial and spatial equity in government welfare programmes on food stamp. Specifically, this study explains the variations in participation votes in the food stamp programme using census tract data for counties and metropolitan areas as case examples. In addition to profiling the food stamp population across state, this study provides information required for developing the targeted nutrition education campaign.

Keywords: Supplemental Nutrition Assistant Program; SNAP, minorities, census, tract, Iowa, GIS.

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1   Introduction

The Supplemental Nutrition Assistant Program (SNAP), the name adopted on October 1, 2008 as part of the Food, Conservation, and Energy Act of 2008, to replace the Food Stamp Program (FSP), is the largest of 15 domestic food and nutrition programmes administered by the US Department of Agriculture (USDA) (Fox et al., 2004). SNAP is targeted on the most struggling families: about 93% of the benefits go to households with income at or below the poverty line (Sprague, 2012). As the cornerstone of America's nutrition assistance safety net, SNAP contributes to boosting food security and enhancing adults and child health and well-being through a more nutritious diet. The monthly benefits provided by SNAP and delivered through Electronic Benefit Transfer (EBT) Cards; enhance the food purchasing power of eligible low-income households. Generally, because eligibility is not restricted to a specific demographic sub-group, SNAP has served a wide range of low-income households, including families with children, elderly people, and people with disabilities. As stated in the original Food Stamp Act of 1977,

(P.L.108-269) (SNAP Legislation, 2012), the goal of SNAP is to "alleviate hunger and malnutrition ... by increasing food purchasing power for all eligible households who apply for participation".

For more than 40 years FSP and now SNAP has served as the foundation of America's national food and nutrition safety net. In 2011, for example, it helped nearly 45 million low-income individuals (about 1 in 7 Americans) in 21.1 million households each month to afford nutritionally adequate diets. The number of SNAP eligible individuals increased by almost 50% between fiscal year (FY) 2011 and 2005 and even more rapidly (about 70%) between FY2007 and 2011 (US Federal Budget, 2013). The Congressional Budget Office (CBO) in March 2012, projects the number of people who receives SNAP benefits to continue to rise from FY2012 through 2014, then decline in succeeding years. By FY2022, the CBO projects about 34 million individuals (or 1 in 10 US residents) will receive SNAP benefits each month, and SNAP expenditures will total $73 billion. In inflation-adjusted dollars, federal spending in FY2022, according to CBO, is projected to be about 23% less than it was in 2011, but still about 60% higher than in 2007. The current and projected increase in SNAP eligibility has been linked to the economic downturn which started with the financial crisis in late 2007. During this period, the unemployment rate doubled from 5% in December 2007 to nearly 10% in the last month of 2009 and absolute number of unemployed workers increased sharply on the same period (US Department of Labor, Bureau of Labor Statistics, 2013).

Recently, many discussions on the FSP and SNAP have been focused on issues of disproportionately high dependence on the programme by certain population sub-groups. These discussions are sparked by remarks made by the GOP presidential candidates during the 2012 primary debates. For example, during the Fox News-Wall Street Journal GOP presidential debate, Newt Gingrich, former Speaker of the House of Representative (CBSNEWS, 2012), asserted that President Barack Obama is a 'food stamp president'. Similar stereotypic overtures were made by Rick Sanatorium, another 2012 GOP Presidential Candidate. However, does SNAP eligibility and participation have racial/ethnic gradients? Specifically, are racial/ethnic minorities more than Whites of similar income level in a given State participated in SNAP? Does the geographic variation in SNAP eligibility have racial or ethnic profiles? In this study, we address these questions by focusing analysis on the racial/ethnic, socio-demographic and spatial distributions of SNAP eligibility in Iowa at different geographical scales. The few studies that have attempted to investigate geographic variation and disparities in SNAP/FSP have focused on access to commercial retailers that accept E&T, participating rates, food security, and equity in welfare programmes. Other studies have reported no significant racial/ethnic disparity in SNAP eligibility and participation. In this study, we adopt a geographically-based approach to improve understanding of the spatial variation in SNAP participant propensities across socio-economic and racial/ethnic sub-groups. Utilising the ability of geographic information system (GIS) technology to integrate disparate socio-economic and demographic databases, and to facilitate quantitative analysis, the study generates information essential to predicting future demands for SNAP benefits, and by extension, other welfare programmes. The study further adds important insights on SNAP participation patterns in IOWA among the low-income population by illuminating racial/ethnic difference in participation.

The remainder of the paper is structured as follows. Section 2 examines related studies, while Section 3 explores SNAP in greater detail. Section 4 is constituted by the research methodology, used in this study. The study is conducted in Iowa and a few of

the SNAP qualified counties are visualised and analysed in Section 5. Section 6 concludes the paper.

2   Literature review

Camou in Schneider et al. (2005, pp.197–218) explores the theories of policy designing, citing the helplessness of a legislative context in policy making understanding at extra governmental and small scale. The study published in the paper (Clifton, 2004) emphasises on the mobility constraints that low-income population faces, in order to acquire their food, and correlation between these mobility constraints and coping strategies to complete their routine task. In the paper (Donkin et al., 1999), the authors develop and map the indices to describe the variation between cost and healthy food availability in London. John et al. in their published work (Iceland and Steinmetz, 2003) examine the residential housing pattern and analyse the effects of using census block groups over census tracts. Sara describes the use of GIS in data management and dissemination and the issues raised in using GIS extensively (e.g., technical, institutional, and political) in the work published in McLafferty (2004). In Morton et al. (2005), the authors take initiatives to solve the problem of food desert in Iowa. Kameshwari (Pothukuchi, 2004) discusses about the community food assessments (CFAs), which contribute as a significant step in the planning for community food security. In the paper (Ramasubramanian, 1999), Laxmi brings to the attention, the concerns about the accessibility of affordable and nutrient rich food in food deserts. Sharma et al. (2011) explore the geospatial patterns in each county in the State of Iowa to investigate, which tract needs SNAP support. The outcome of this research serves as the building block for the current study. McEntee and Agyeman (2009) develop an effective GIS method to identify the food deserts in the State of Vermont, USA. Alisa et al. in Coleman-Jenson et al. (2011) explain the food security status for US households throughout the entire year in 2011. They claim an active and healthy life for all the members of estimated 85% households because of the easy accessibility of nutritional rich food. In contrary, the remaining 14.5% household express food insecurity at-least sometime during the entire year. Out of which, 5.4% household are claimed to have severely low food security; their eating patterns are disrupted due to the unavailability of enough financial capacity and inadequate food resources. For the same size and household composition, the average spending on food is 27% more by the typical food-secure household compared to the typical food-insure household (Menounos, 2012). According to the 2010 survey, 59% of such food-insecure households participated in federal food assistance programme. Baker et al. (2006) investigate whether these exists any disparity in accessibility of the food, used to make healthy dietary plans. The investigators assess the location and available food variety in community supermarkets and fast food restaurants in a defined area of St. Louis and to perform the study, 2000 census data is used. The results reveal that the spatial distribution of fast food restaurants and supermarkets varies based upon the racial distribution and poverty rates. The accessibility of healthy food is more likely in higher-income communities, predominately White then the high-poverty regions, having mixed-race, White or all African-American (for all income brackets) population. This study explores the relationship between food quality vs. race or ethnicity but does not SNAP dependence vs. race or ethnicity. Bodor et al. (2010) investigate the relationship between food access and obesity, taking gender, race, ethnicity, age, education, physical

activity, and poverty level into account of the study. The points of interest are supermarkets and convenience stores in New Orleans, Louisiana and below poverty level, African American female group represents the majority of the participation. The authors claim that weight is inversely proportional to supermarkets but directly proportional to convenience stores. In the cohort, the less educated older residents exhibit highest rate of obesity. Though, this study emphasises on food quality vs. obesity, but does not provide any explanation for SNAP vs. race or ethnicity.

3 Supplemental Nutrition Assistance Program

Since a long period of time, USDA continues to administer the food aid programme, targeting the low or no-income population in the USA. The programme is popularly known as FSP (even today), despite it was renamed to SNAP few years back.

The SNAP benefits are distributed to the states with active assistance of respective state government. The distribution is performed in top-down manner (State $\rightarrow$ County $\rightarrow$ Tract $\rightarrow$ Household), where the SNAP eligibility analysis is available only at the tract level, due to unavailability of supporting data at individual level. So, a tract in a county may be considered as the finest level of spatial granularity and in order to qualify for SNAP benefits, the income ratio of at least 50% population should not exceed the federal poverty level (185%) (Department of Social Services, 2013). If any tract in a county meets such criteria, the encompassed households, applied for the benefits, will receive SNAP support, provided the other qualifications are affirmative.

In earlier years, the distribution of the FSP benefits to the qualified end users, used to be the coloured paper stamps or coupons, in three different colours: brown (US$1), blue (US$5), and green (US$10), worth different price values. The paper stamps or coupons were used to buy edible prepackaged food such as soft drinks, confectionery, etc. Through, there was no other constraint on the nutritional quality of the food, except the food should be prepackaged. In the world of computing, the paper stamp could not sustain any longer and in June 2004, were replaced by EBT Cards. Due to this replacement, in October 2008, the FSP was renamed as Supplemental Nutrition Assistance Program (SNAP) (2013).

In the earlier years, the qualified population used to receive paper stamp or coupons to buy prepackaged food. But in 21st century, in the world of computing, the paper stamp/coupons have been replaced by EBT cards to distribute all the food-stamp benefits. Using the card any edible but prepackaged (potential restriction) food can be purchased. The food may include soft drinks and confectionery, and need not necessarily to be rich in nutritional factors. The EBT card system is a specialised debit card system, used in late 1900s and issuance was administered by private contractor for public-assistance welfare programmes as well. The successful replacement of all paper stamps/coupons by EBT cards, motivated the renaming of the FSP as SNAP in October 2008. In order to avail the SNAP benefits, the recipients must have below-poverty income. According to the June 2009 statistics, per person average monthly benefit was $133.12. The statistics also revealed the facts about the highest number of US population (39.68 million, in Feb. 2010), participated for SNAP benefits since 1960. In the paper, the SNAP elaboration is subsectionized to deliver better understanding to the reader.

3.1 *Who can qualify for SNAP*

Under the SNAP benefit scheme, USDA with the potential assistance of state administration helps in buying the healthy food to low-income households, where the temporal granularity is month. USDA constitutes the rules and regulations that determine:

1   the eligibility criteria for SNAP benefits

2   the limit on income and resource ownership

3   the maximum benefits per household size.

As per the specified rules and regulations, the applicants must meet one of the following criterions strongly in order to qualify for the SNAP assistance:

1   disabled or elderly living on a small income

2   low wages work

3   completely unemployed or part-time work

4   receiving no other assistance payments.

3.2 *Application process for SNAP*

Though, at the federal level SNAP is administered by USDA, the application process at the state level may vary. This work explains the application process exclusively for Iowa only as this region is the spatial interest in this study. Iowa Department of Human Services (Iowa DHS) works at county level that entertains the SNAP application from its households and facilitates the SNAP benefits. This helps a household to find a nearest DHS office to ease the entire process. For example, a SNAP applicant in Story County may approach to the nearest DHS, Story County Department of Human Services. DHS provides an online application system and required documents can be submitted to the local office. Alternatively, an application for SNAP participation can be requested by phone, fax, or mail from the nearest DHS office or can be fetched in person. The total household gross monthly income should be less than the value, specified in USDAs regulations. For the whole household, under the penalty of perjury, a senior adult or authorised representative can sign the complete application. Upon receiving the application, the local DHS sets up an interview to verify the eligibility for SNAP benefits. There may be a set of other required documents (please see below), needed to bring to the interview. Once the SNAP eligibility is verified, within 30 days of application submission, the households start to get benefits.

    Required documents for interview. Though, there may additional requirement of the documents, few of them are given below:

•   Income and expenses verification.

•   Identity proof such as driver's license.

•   Social Security Numbers (SSN) – for all household members.

•   Bank statements.

•   Shelter costs statement

a   rent or mortgage payment

b   utility bills – heat, electricity, water/sewage/garbage, telephone, etc.

Household status changes. Households availing the SNAP benefits must report to local DHS office:

1   if the household income meets the required income level for the household size

2   any changes in address to avoid problems.

In case, if a household fails to report the status change in due course of time, the extra SNAP benefits received, will have to be returned. The authorised person may be prosecuted up to severe penalty such as jailed in addition to repayment of the amount.

4   Research methodology

Today, about 80% data available in the database world is spatial data (Demiryurek et al., 2010). To perform the operations on such mammoth datasets, the collection of efficient database management technologies are required. Since a long period of time, GIS technology is serving the scientific community by offering the rich set of functionalities, exploiting the large, complex, and heterogeneous spatial data to derive the best possible outcomes. The technology is continuously getting equipped with the advance functionalities that address the challenges of modern era. GIS consists of a huge pack of potential functionalities that primarily deal with diverse spatial data manipulation and intuitive visualisation. Lately, a new edge, as a powerful functionality, has been extended to GIS technology, where it is capable to handle the temporal challenges in the dataset. GIS technology is extensively used in various research and commercial domains that include, Natural Resource Management, Environmental Science, and Community and Urban Planning, etc. Because of the its potential ability of manipulating the diverse geographic units in analysing and presenting information, GIS is employed to examine critical applications such as public health issues, and spatial relationships among socioeconomic conditions. Primarily, GIS is utilised (Dangermond, 1969) to easily visualise the complex input spatial dataset, to store and maintain large amounts of geographic information, and to create of fine and informative maps, available at various scales. This research study also relies on the potential use of GIS technology for the visualisation of SNAP participated spatial pockets and to distinguish them from the unqualified units. The entire research methodology for this study is divided into three sequential research stages and each of them is individually illustrated here.

4.1 Planning

The maturity of a research topic is generally followed by the lucid and prudence planning by the investigators to address the research challenges. This process involves the informal evaluation of the possible options that can be considered for the investigation. In the broader sense, the research planning leads to a clear research design that is expected to produce most definite solutions of the problem. Though, the judicious evaluation of the feasibility of the study on the proposed research design is always a concern. Among the other options, the capacity and capabilities of the research investigators and the

availability of the required resources need careful weighing that generally ends up in the trade-off situation between ideal cases and possible cases. In this research work also, the planning, the foundation of the study mainly focuses on the procedure, planned to carry out this research with the precision. This primarily involves the feasibility of the objective of the study, the types of data required, and finding the appropriate resources for the potential data. The validity, veracity, and the accuracy of the data always pose challenges to the investigators. Based on our previous research experience, underpinned by the insights through intensive literature survey, it is observed, the intertwined amalgamation of two datasets

1   demographic data, required for SNAP participation

2   base map data, required to assist geospatial visualisation, can best address the scientific research questions posed in this study.

4.2   Data collection and modulation

Today, the scientific research encompasses interdisciplinary research expertise to address societal challenges, engulfed deeply. Economic, social welfare and demographic challenges are just to name a few. To explore and clearly understand the socio-economic dynamics, the availability of noise-free, clean and up-to-date, compatible, and innovative dataset is a pre-requisite that leads to better measurement and monitoring the socio-economic stress on society. In this research study, the imperative socio-economic datasets are collected primarily from two secured online resources:

1   The US Census Bureau (http//:www.census.gov).

2   Environmental Systems Research Institute (http://www.esri.com).

The US Census Bureau contains the large repository of rich set of freely available most complete, complex, and huge, disparate demographic datasets. The dataset is highly efficient and useful to investigate and explore the spatial patterns of SNAP participation. The interactive visual demonstration of these geospatial footprints require the basemap layer(s), underlaid. The esri.com archives the huge collection of wide variety of basemap layers and is accessible through its online services. It is important to note once again that the census tract is the finest spatial granularity as the income data, required to evaluate SNAP participation and is not available for individual households.

Formula to determine SNAP eligibility. The unavailability of income data for individual households encourages USDA to administer the SNAP participation at the tract level, the finest spatial granularity. Let's assume that N is a number, representing the total population in a tract to determine the SNAP participation.

$$N_{<1.85} \text{(total population with ratio to poverty level less 1.85)} = \sum_{i=.50}^{1.75 \text{ to } 1.85} N_i \quad \dots \quad (1)$$

$$\%N_{<1.85} \text{(percentage of population with ratio to poverty level 1.85)}$$

$$= \left(\frac{N_{<1.85}}{N}\right) * 100 \qquad \qquad \dots \qquad (2)$$

Table 1   Collected and processed data (excel format)

Geography identifier	Total population	Ratio of income to poverty level; under .50	Ratio of income to poverty level; .50 to .74	Ratio of income to poverty level; .75 to .99	Ratio of income to poverty level; 1.00 to 1.24	Ratio of income to poverty level; 1.25 to 1.49	Ratio of income to poverty level; 1.50 to 1.74	Ratio of income to poverty level; 1.75 to 1.84	Total population with ratio less than 1.05	% of population with ratio less than 1.85
19169000100	7,086	64	146	31	105	110	160	46	661	9.328252893
19169000200	3,696	124	66	31	74	109	95	50	549	14.8538961
19169000300	3,284	169	57	116	82	141	39	24	658	20.0365408
19169000400	3,036	207	38	92	69	66	87	41	600	19.76284585
19169000500	1,426	191	144	67	153	192	156	32	935	65.5680244
19169000600	4,621	300	254	188	154	224	153	39	1,312	28.39212292
19169000700	3,281	893	359	196	180	282	181	25	2,116	64.49253276
19169000800	23	0	0	0	0	0	0	0	0	0
19169000900	4,115	277	182	140	205	247	142	67	1,260	30.61968408
19169001000	4,135	675	500	374	361	205	333	167	2,515	60.82224909
19169001100	3,601	620	376	272	344	297	99	28	2,036	56.53985004
19169001200	69	0	0	0	5	5	0	0	10	16.949915254
19169001301	4,755	629	392	329	197	243	303	103	2,196	46.1829653
19169001302	3,561	122	64	73	79	48	122	26	534	14.9957677
19169010100	5,986	97	33	118	103	166	183	87	831	13.88239225
19169010200	3,964	70	56	96	127	116	82	73	620	15.6407669
19169010300	3,996	91	70	65	SO	118	120	66	610	15.265526527
19169010400	2,881	72	42	29	166	44	122	32	496	17.21624436
19169010500	1,961	27	30	24	52	126	146	39	443	22.59051504
19169010600	5,087	77	74	108	99	199	155	116	828	16.27678396

The raw data from US Census Bureau is available only in excel format and its dissemination, sometimes, involves the extensive process of the data modulation. This study extensively relies on off-the-shelf Esri's ArcMap that requires dbf (dBase file) format for the input data, Esri's ArcCatalog is used to export an excel file into dbf equivalent (though, Microsoft Office 2003 can also be used). Table 1 consists of the demographic data (Census 2010) for income to poverty estimation. The mathematical formulas in equations (1) and (2) are used to calculate the SNAP participation. The right most column of the table is the percentage of population, with ratio of income to poverty level less than 1.85. In this column, the data is classified into two groups, based upon the total percentage of population, with income to poverty level ratio less than 1.85:

1   less than or equal to 50%

2   greater than 50%.

The census tracts with the characteristics of the latter classification are considered SNAP participants and may require different decorative patterns for distinct visual demonstration.

4.3   Visualisation

The feature-rich nature of ArcMap is the motivation for its potential exploitation in this research study. The interactive visualisation, deriving easy to understand interpretation, of large and complex spatial or aspatial information is its unique capability and widely used in numerous research arenas that deal with the spatial component in input data. Additionally, it offers a large set of potential operations that significantly ease the user's task in data manipulation. JOIN is one such operation that links the SNAP participated tracts to their geography, read from the shape file and plotted in the map area. After the database and attribute tables are joined, on the basis of the percentage of the population in a tract, it can be classified, whether it is a potential applicant for SNAP assistance or non-participant. The final output is a collection of the county maps, rendering the encompassed tracts in its spatial region. The central objective of the display is to visually demonstrate the SNAP qualified census tracts, represented by distinct decorative pattern. This study exposes only those counties in the State of Iowa that exhibit at least one SNAP applicant tract. Authors are conservative for the space usage; only the spatial maps, for a few interesting qualified counties are accommodated in this paper.

5   Visual patterns for SNAP distribution

This section demonstrates the visual patterns of SNAP eligible geography in Iowa. The results are organised on the basis of county and all 99 counties in Iowa are scanned to find out the SNAP qualified tracts. The racial or ethnic participation is overlaid further, but only for those counties that exhibit wider racial diversity in their tracts, the interesting spatial regions, are considered for analysis.

5.1 SNAP eligible geospatial patterns

As mentioned previously, in this research work, the State of Iowa (Branstad, 2013) is employed as the region of study. The census tract (Census Tract, 2013) is considered the finest spatial granularity as the income data for individual participant is unavailable.

In this study, the GIS technology is extensively used to visualise the spatial patterns. The results are displayed as the spatial maps, rendering the tracts on the county-basis. The display clearly distinguishes the SNAP participated tracts from the unqualified ones and in the representation, to have clear distinction between them; two distinct decorative patterns are used. In this paper, the usage of the space is kept conservative and only the interesting SNAP participated counties are accommodated. In the Webster County, census tract 7 participates in SNAP (Figure 1). Figure 2(a) through Figure 2(f) together offer a glimpse of the interesting counties, succeeded for SNAP participation in the State of Iowa and their qualified census tracts. This spatial outcome serves as the foundation for the further analysis of SNAP that deals with the investigation of the racial or ethnic gradients, if any.

5.2 SNAP eligible racial or ethnic patterns

The core objective of this research work is to investigate whether only certain racial or ethnic groups have dependency on the SNAP program. In other words, whether there exists any linkage between SNAP distributions and race or ethnicity. The entire population in a tract is segregated into four diverse racial categories:

1 White

2 African-American

3 Hispanic

4 Others.

In order to render all the four racial classes, in a SNAP qualified tract, the pie charts with four sections are drawn. Each section is assigned a different colour, representing a section of population. The class – White – is rendered using orange colour in the pie chart. African-American is represented using blue colour. The yellow colour is used for Hispanic population, whereas green coloured decoration in the pie chart represents the last racial section, others. Though, it is advisable to demonstrate the results for all qualified counties, but in this research, only those interesting counties are renders, that are inhabited by more diverse population. Under this category, only three counties are chosen as potential candidate: Black Hawk, Linn, and Polk and their visual patterns of the SNAP qualified racial participation are depicted in Figure 3(a), Figure 3(b), and Figure 3(c) respectively. In each figure, the qualified tracts are demonstrated using the lighter background shades that clearly differentiate them from the unqualified ones. The logophiles are encouraged to read the Table 2, populated with the enumeration of the qualified tracts in the three counties.

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Figure 1   Webster county (FIPS: 19187) (see online version for colours)
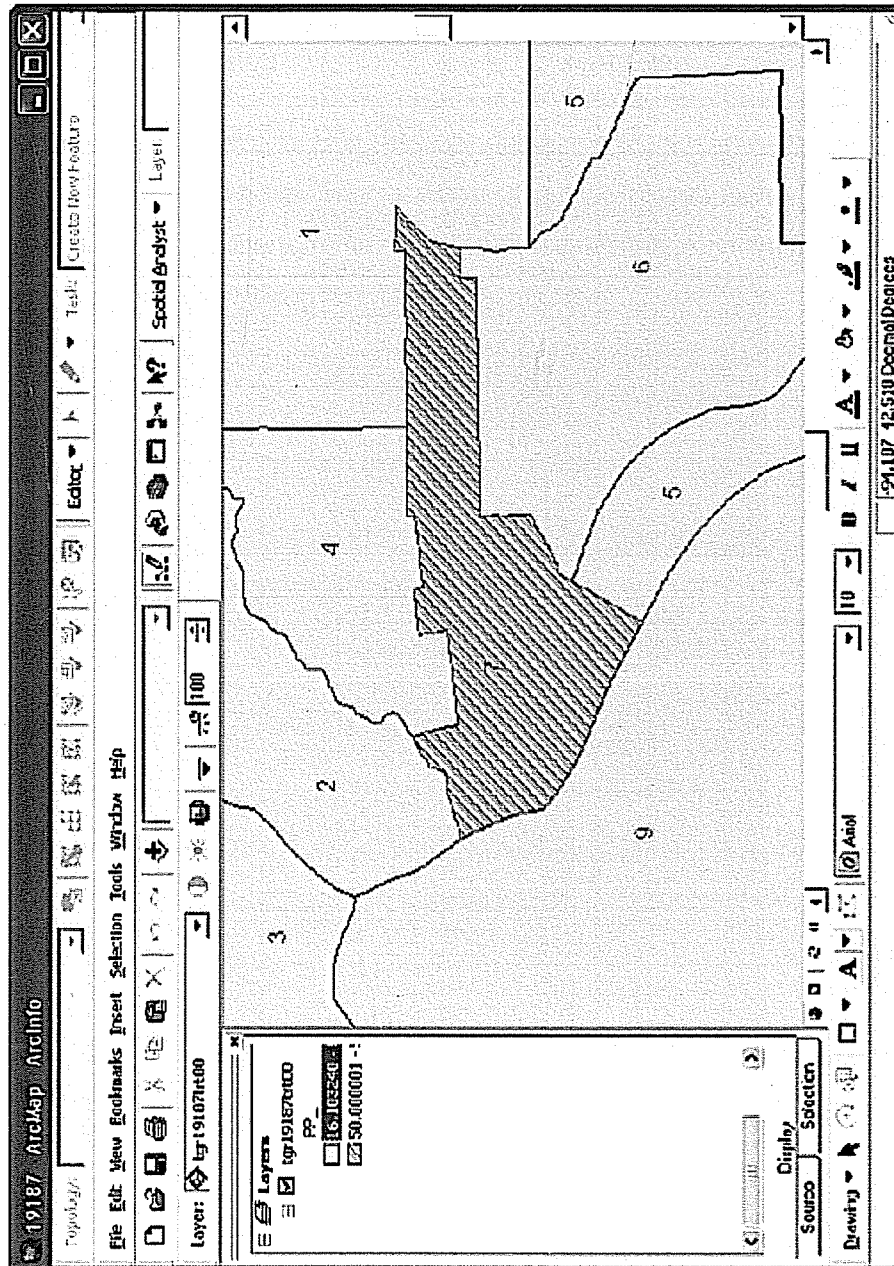
Table 2   Counties and their SNAP qualified tracts

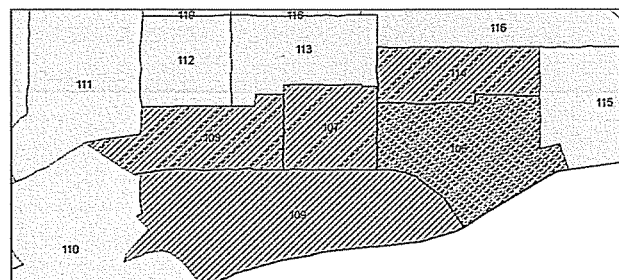| S. no.	County name	SNAP qualified tracts number
1	Black Hawk	1, 3, 5, 9, 23.02
2	Linn	19, 27
3	Polk	12, 26, 50, 51, 52

Figure 2   (a) Polk County (FIPS: 19153) (b) Woodbury County (FIPS: 19193)
(c) Scott County (FIPS: 19163) (d) Story County (FIPS: 19169) (e) Johnson County
(FIPS: 19103) (f) Black Hawk County (FIPS: 19013) (see online version for colours)
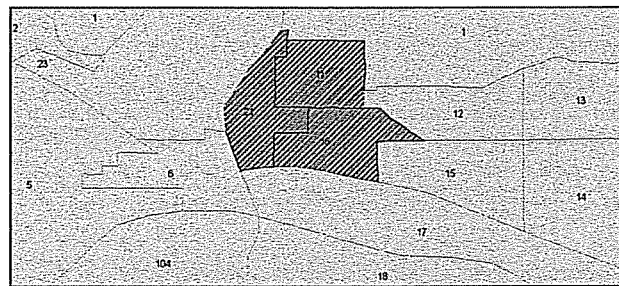
(a)
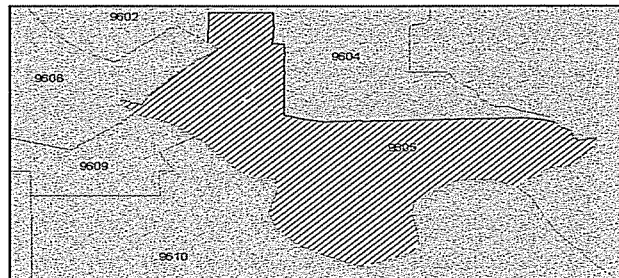
(b)

(c)

Figure 2   (a) Polk County (FIPS: 19153) (b) Woodbury County (FIPS: 19193)
(c) Scott County (FIPS: 19163) (d) Story County (FIPS: 19169) (e) Johnson County
(FIPS: 19103) (f) Black Hawk County (FIPS: 19013) (continued) (see online version
for colours)
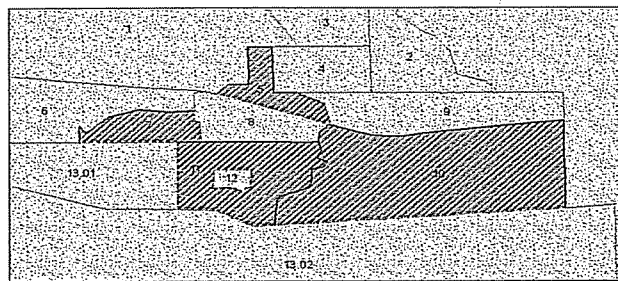
(d)
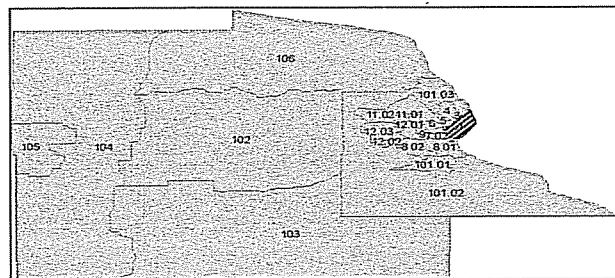
(e)
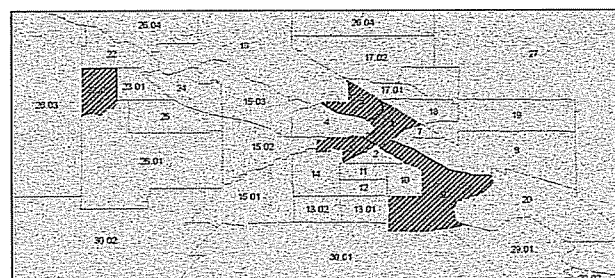
(f)

Figure 3   (a) Black Hawk County (b) Linn County (c) Polk County (see online version
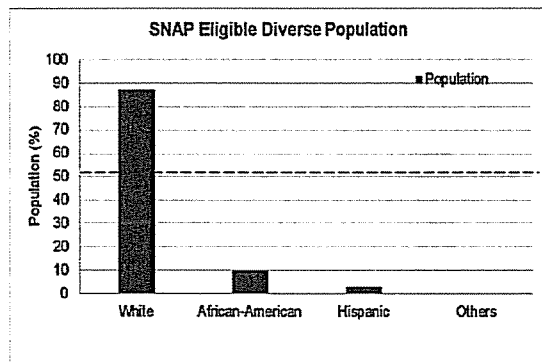for colours)
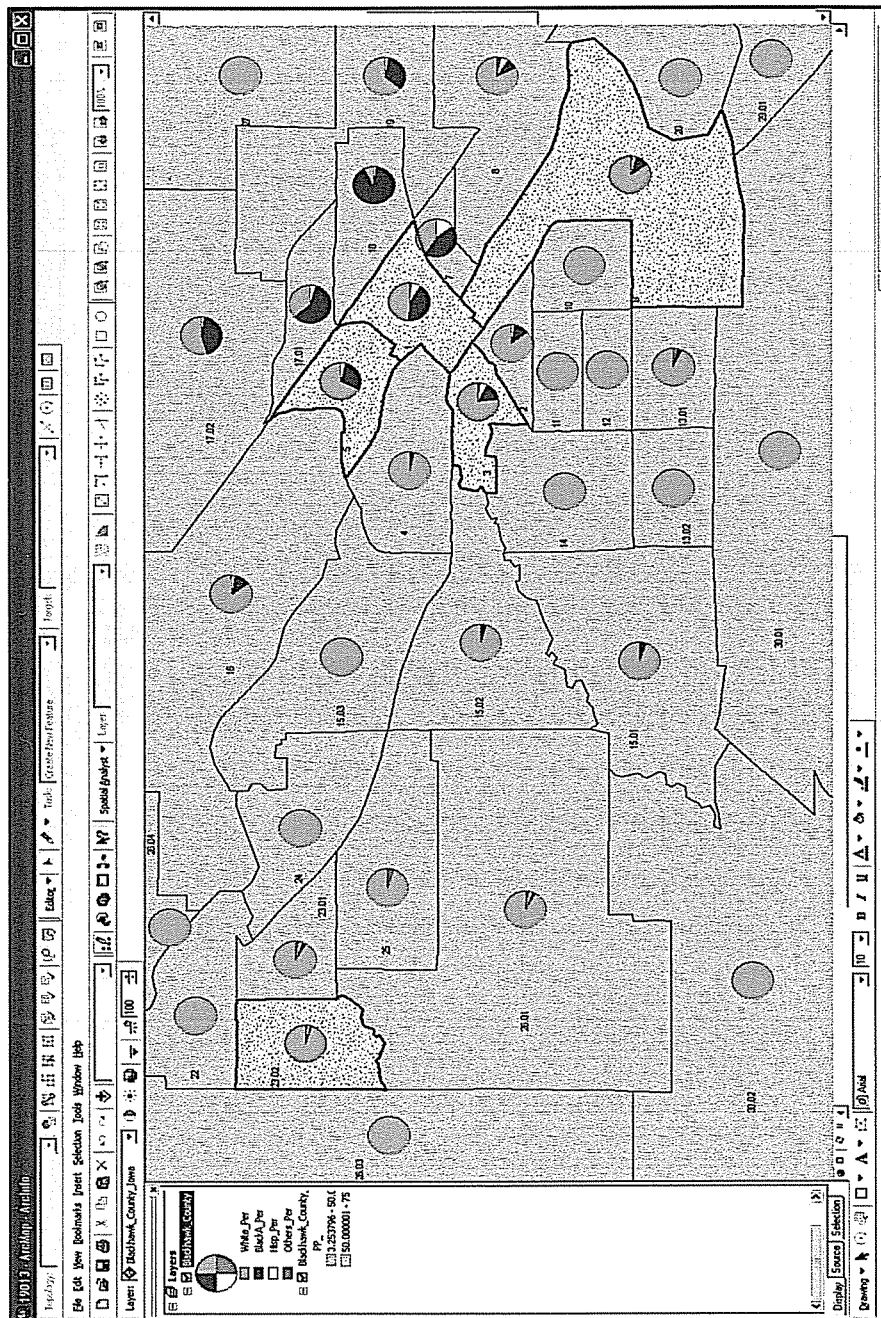
(a)

Figure 3   (a) Black Hawk County (b) Linn County (c) Polk County (continued)
(see online version for colours)
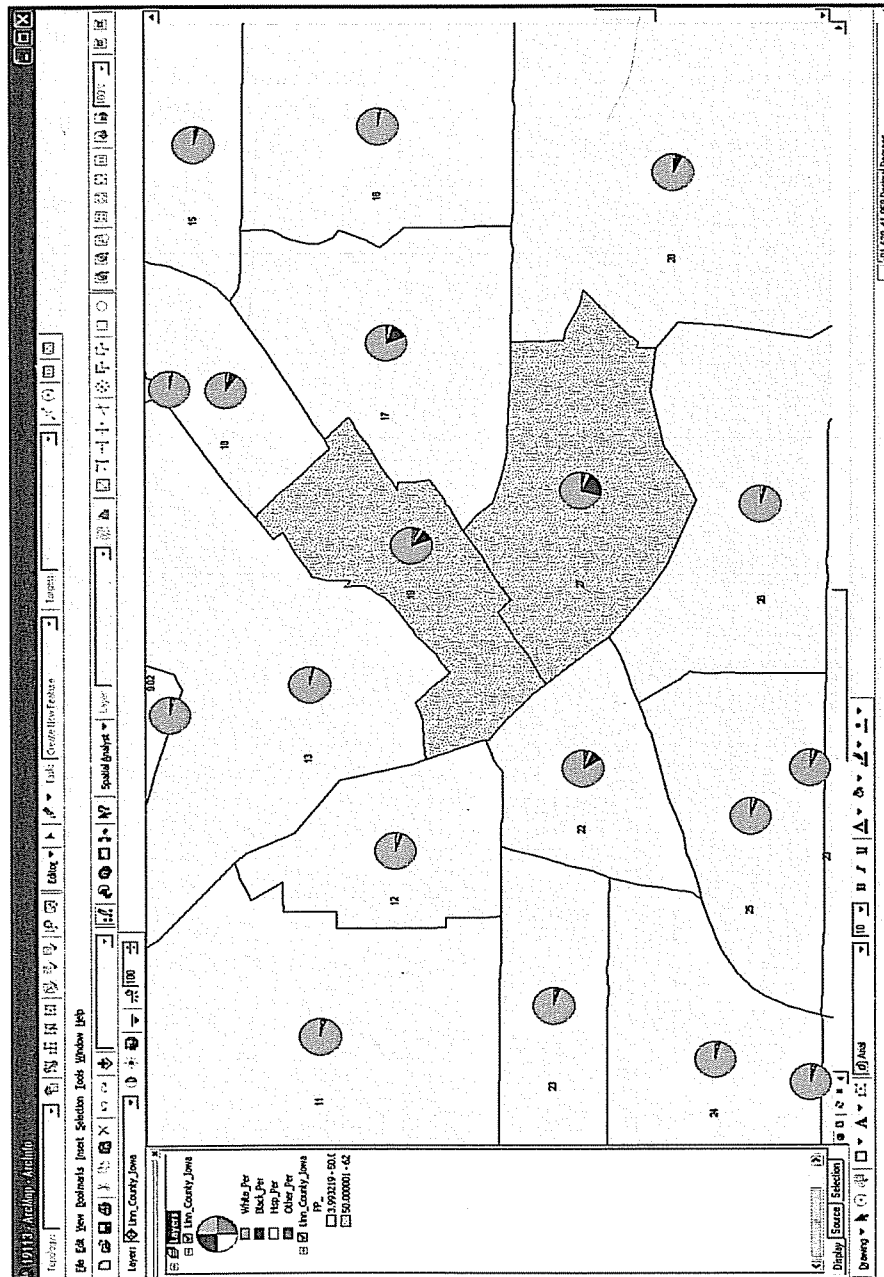
(b)

Figure 3   (a) Black Hawk County (b) Linn County (c) Polk County (continued)
          (see online version for colours)
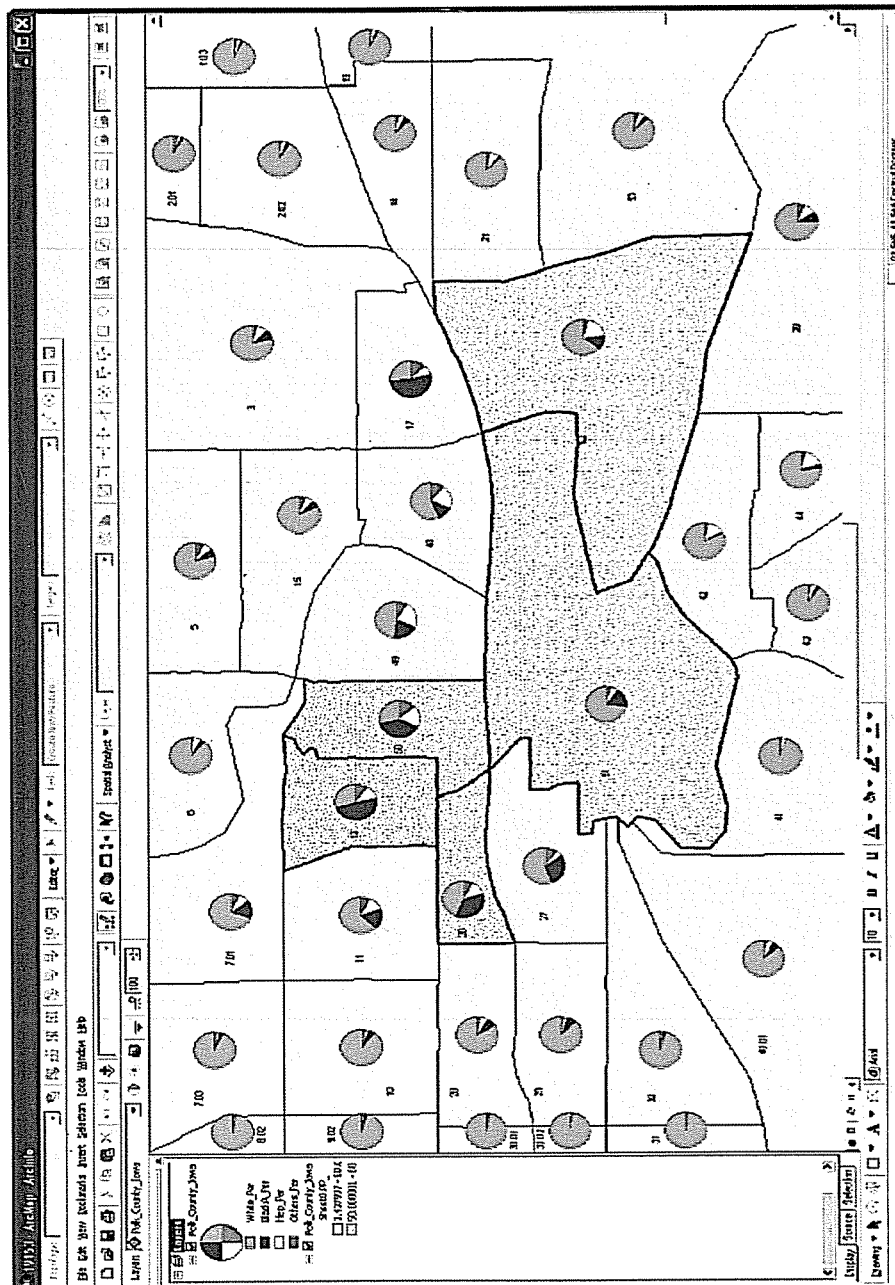
(c)

Figure 4   Black Hawk County, (a) tract 3 (b) tract 5 (c) tract 9 (see online version for colours)
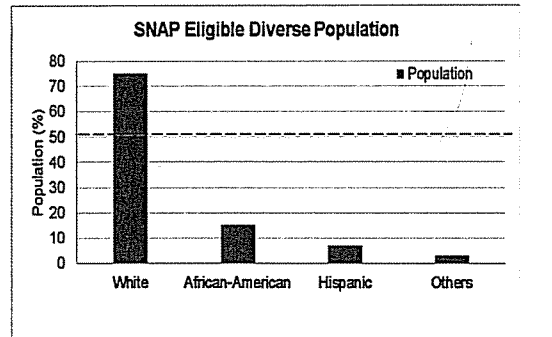
(a)
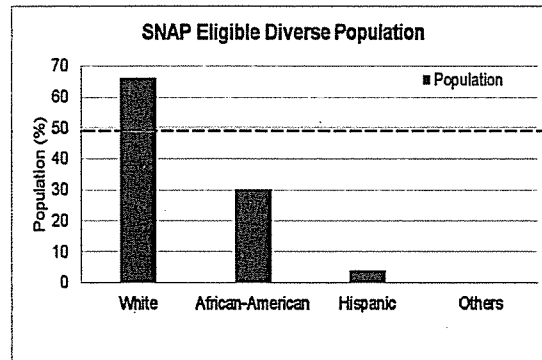
(b)

(c)

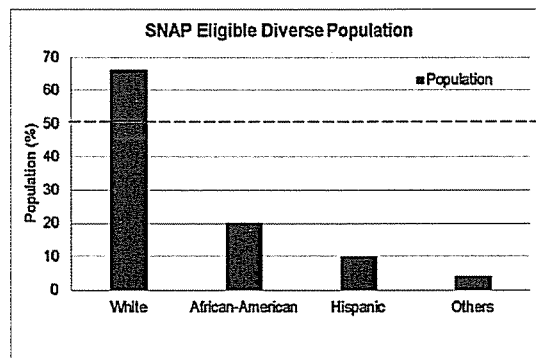**Figure 5**   Linn County, (a) tract 19 (b) tract 27 (see online version for colours)
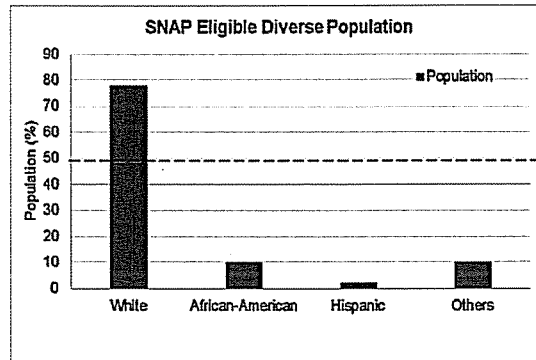
(a)
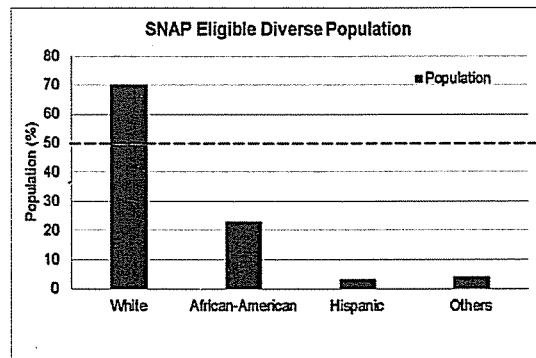
(b)

Figure 6   Polk County (tract 51) (see online version for colours)

5.3 ` Description of hypothesis testing

In this study, the results are deduced on county-basis and a tract in each county is considered as the smallest spatial granularity that can best describe the SNAP dependence, racially or ethnically. As it is mentioned already, the study is conducted for all 99 counties in the State of Iowa and the statement, the SNAP recipients link to minority profiling, is hypothesised. The hypothesis is proved by contradiction and following basis is argued for the validation.

In a SNAP qualified tract, if there exist 50% or more majority participation votes (here is White) in overall population, evidents that at least a community section, primarily represented by majority population, White, is also availing SNAP benefits. Let us understand it further by explaining the scenario of Black Hawks County as an example. The results discover that in Black Hawks County [Figure 3(a)], there are five tracts, qualified for SNAP recommendation. Figure 4(a) through Figure 4(c), exhibit the percentage of diverse population in SNAP qualified tracts for Black Hawks County. The dotted horizontal line in each graph corresponds to 50% population in a tract. The bar graphs are demonstrated only for those tracts that exhibit (50 +X) % of White populous occupancy in the entire tract. Here 'X' is a positive real number, restricted to a closed internal [0, 50]. This ascertains, in those SNAP qualified tracts, there is at least X % (such that $0 \leq X \leq 50$) of majority population, White, availing the full benefits of USDAs SNAP support and this contradicts the hypothesis.

## 5.4 Worst case scenarios analysis

The USDAs SNAP assistance is alleviating the life of millions of economically deprived inhabitants in the crucial states of the USA and its benefits to human well-fares are widely recognised in the literature. The outreach of this programme has extended to 46.2 million by October 2011. The discussion on the disproportionate dependence of certain racial and ethnic groups on the SNAP program is uproared during the Fox News-Wall Street Journal Republican Presidential debate by Newt Gingrich, former Speaker of the House, pointing SNAP recipients as minority.

In this section, we analyse the racial or ethnic participation in SNAP program for worst case scenarios. Such scenarios include those stressed cases, where despite all low-economy minority votes are exhausted, the total count of the minority population is far less than the expected number ($\geq 50\%$) in a SNAP qualified tract. This reveals the fact that low-income majority footprints are also present in the tracts that are actively participating in SNAP program. The analysis is done for some interesting SNAP qualified tracts. For the Black Hawks County [Figure 7(a) through Figure 7(c)] in the tracts 3, 5, and 9, the low-income majority SNAP participation is 24%, 16%, and 37% respectively. The Linn and Polk Counties also exhibit the similar snapshots and in the tracts 19, 27 (of Linn) and 51 (of Polk), the low-income majority participation is 28%, 20%, and 15% respectively [Figure 8(a), Figure 8(b), and Figure 9]. The analysis strongly rejects the claims about the minority-biased participation in SNAP program and firmly disapproves the rattling stories, which believe that the geographic variation in SNAP eligibility has racial or ethnic profiles.
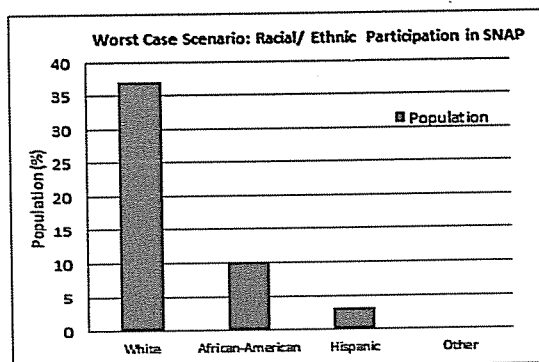
Figure 7   Black Hawk County, (a) tract 3 (b) tract 5 (c) tract 9 (see online version for colours)
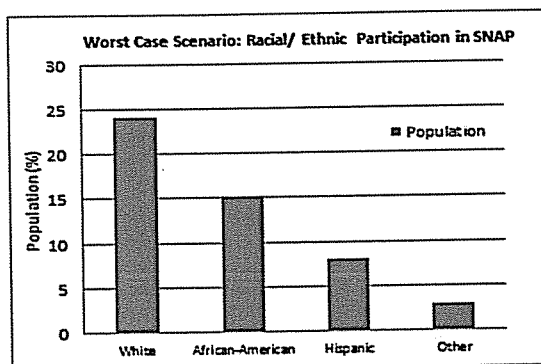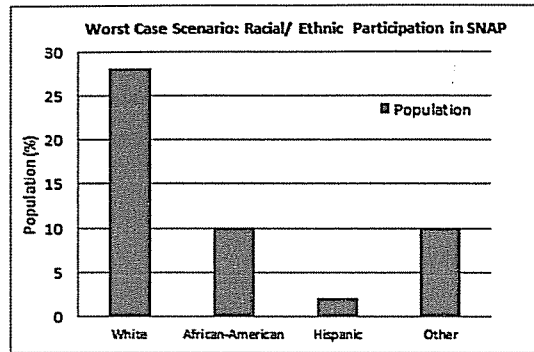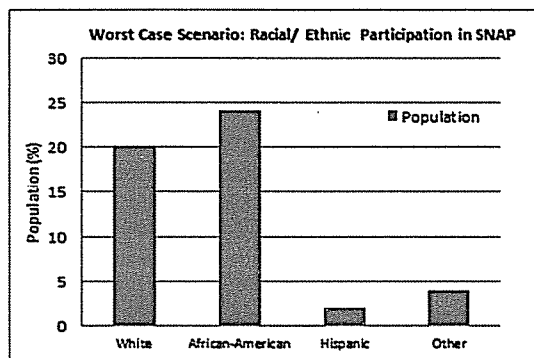

(a)
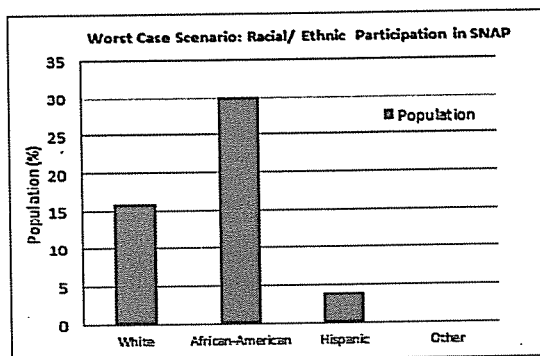
(b)

(c)

Figure 8   Linn County, (a) tract 19 (b) tract 27 (see online version for colours)
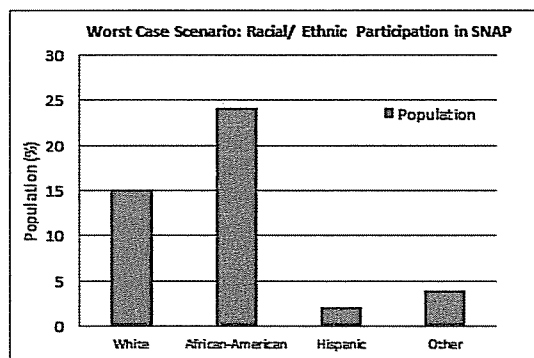

(a)

(b)

Figure 9   Polk County (tract 51) (see online version for colours)

6 Conclusions

USDA, assisted by the state governments, is alleviating the life of tens of millions of economically deprived households irrespective to the age, race/ethnicity, and gender, through enabling the SNAP. Thus, it is potentially contributing towards well-being and as of October 2011, the public participation documented was 46.2 million.

Recently, the discussion about the disproportionate dependence of certain racial or ethnic groups on the SNAP program was fuelled by politically motivated scornful comments, erupted during the Fox News-Wall Street Journal Republican Presidential debate by Newt Gingrich, former Speaker of the House, asserting the President Obama as a 'food stamp president'. The controversial remarks clearly linked the SNAP assistance t0 minority only. However, are the majority of SNAP recipients fit the minority profiling? We addressed this overwhelming query in this geospatial study on racial and spatial equity in government's welfare programme, called SNAP. This study investigated the racial or ethnic disparities in participation votes for SNAP by stepping through the qualified census tracts of counties.

The results of this study surprisingly rejected any argument favouring the minority-inclined participation in SNAP and strongly advocated that the geographic variation in SNAP eligibility was purely biased toward economic deprivation rather than racial or ethnic profiling. Evidently, the study strongly contradicted the controversial remarks too, made during the Fox News-Wall Street Journal Republican Presidential debate.

Acknowledgements

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