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USING IMPROVED TWO-SOURCE CAPTURE-RECAPTURE METHODS IN SETTLING DISPUTED ELECTION RESULTS

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ABSTRACT: *Introduction of new technology to check rigging and manipulation of election results by the Independent National Electoral Commission (INEC) raised hopes and dreams of many Nigerians, especially the new electorates, that the 2023 general election in Nigeria would be free and fair. Cross-checking INEC declared election results using this recapture model is supposed go beyond questionnaires. Sampling technique to select polling units where re-run election is to take place is necessary. They have been issues of vote suppression, rigging, manipulation or intimation in those areas would have largely been reduced. The new estimator has shown that there were no serious cases of vote suppression, manipulation or intimation by any political party, as far as this Local Government Area is concerned. If there were vote suppression, it is only about 1.78% which is negligible. Using simulated data, we found that efficient recapture model* (M_e) *provides better and more reliable estimate than the conventional models.*

KEYWORDS: Disputed, election results, Nigeria, settlement, high recapture, efficient estimate.

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INTRODUCTION

Rigging and manipulation of election results in Nigeria is an old story. It stated in 1922 when British colonial masters conducted the first election in Nigerian, which was the legislative council election in Lagos and Calabar (Isma'ila and Othman, 2015). Documented evidence showed that British took decisive measures to rig each of the elections in favour of their preferred candidates. The 1958/59 election, also conducted by the same British colonial masters, was even worst. Their favoured candidates won the election through foul means. Since then, the Nigerian elections had been characterized by violence, manipulation and rigging of election results (Aiyede, 2007; Onapajo & Uzodike, 2014). This was in line with the assertion made by Jameel (2011) when he said: "Elections in Nigeria are not issue based but about ethnicity, religion and regionalism".

However, the introduction of new technology to check rigging and manipulation of election results by the Independent National Electoral Commission (INEC) raised hopes and dreams of many Nigerians, especially the new electorates, that the 2023 general election in Nigeria would be free and fair. The Commission's chairman at the Chatham House in 2022 even promised the whole World that the 2023 election would be free and fair because of the new technology being introduced into the system. Yet the Commission did not keep to its promise the 2023 presidential election results were not transmitted in real time. The Commission's claim that there were glitches in its Bimodal Voters Accreditation System (BVAS) and its INEC viewing portal (IReV) was rejected by the opposition parties who alleged that officials of the Commission had been heavily compromised by the ruling party. The presidential election result and other results that ensued were then challenged at the various tribunal courts in Nigeria. But we believe these quarrels would have avoided if this new model of ours was introduced to the INEC, and the Commission is willing to apply it in election disputed areas. The aim of this study is therefore to develop a new model for a two-source capture-recapture formulation whose estimator will be used in settling disputed election results.

LITERATURE REVIEW

Animal population estimation, along with other domains like quality control and epidemiology, heavily relies on capture-recapture approaches (Akanda and Alpizar-Jara, 2017). More precise population estimates are possible by using the Generalized Estimating Equations (GEE) technique, a potent statistical tool that expands the use of capture-recapture models to open populations. The GEE method offers a framework for estimating population size while taking these demographic shifts into account, which helps to overcome the shortcomings of closed population models. Using capture-recapture research, Worthington et al. (2018) created a multi-state model to calculate the size of a closed population. The outcomes of the simulation indicate the results of the simulation demonstrate how accounting for migration between states can skew estimates of population size. A new approach with a simple parametric bootstrap variance estimator and a fair number of capture occasions was proposed by Mamadou et al. (2019) to estimate the parameters of a robust design. The models covered by the study assume that the k-dimensional distribution has a single restriction (identification assumption) that identifies the target variable and leaves the statistical model unfettered. Using capture-recapture techniques, Kreshpaj et al. (2021) calculated the extent of occupational injury (OI) underreporting in Sweden in 2013 among

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both precarious and non-precarious workers. The Swedish study provided actual evidence that workers in precarious employment have a 50% greater rate of under-reporting of OIs. The number of female sex workers in Ghana was estimated using a capture-recapture technique (Guure et al., 2021). In order to model the relationship between exposure to unstable housing and evictions with intimate partner violence (IPV) and workplace violence among a community-based longitudinal cohort of cisgender and transgender female sex workers in Vancouver, Canada, from 2010 to 2019, Goldenberg et al. (2023) used bivariate and multivariable logistic regression with GEE. According to Akanda and Alpizar-Jara (2014), the capture-recapture data are binary longitudinal or repeated measurements data that are gathered on the same people at successive capture events. Over time, these repeated observations frequently show correlations.

METHODOLOGY

Before we discuss the new model, let us briefly review the existing models in two-source capture-recapture experiments.

Petersen-Lincoln Estimator

The study of animal abundance gave raise to capture-recapture methods. Animals are captured, marked and released; and are recaptured either by trapping or sightings. Fishery biologists refer to the model as Petersen's method, while ornithologists and mammologists call it Lincoln index (Amstrup et al., 2005). In this study, however, we call it Petersen-Lincoln estimator to accommodate the name of the two pioneer researchers on capture-recapture experiment. The Petersen-Lincoln estimator is simply given as:

$$\widehat{N} = \frac{n_1 n_2}{m_2} \tag{1}$$

where n_1 = the number of animals captured in the first surveillance;

n_2 = the number of animals captured in the second surveillance;

m_2 = the number of animals recaptured in the second surveillance.

The case of two-source method is the origin of capture-recapture models (Craig, 1996). If the probability of no recapture is zero, the approximate variance of this estimator derived by Russell et al. (1998) is:

$$Var(\widehat{N}) = \frac{n_1 n_2 (n_1 - m_2)(n_2 - m_2)}{m_2^3} \tag{2}$$

Fienberg (1972) transformed capture-recapture history into matrix form. Thus, for a two-source capture-recapture experiment, its two-by-two matrix shall be:

$$\mathrm{A} = \begin{bmatrix} n_{11} & n_{12} \\ n_{21} & n_{22} \end{bmatrix} = \begin{bmatrix} n_{11} & n_{10} & n_{1\bullet} \\ n_{01} & n_{00} & \\ n_{\bullet 1} & & N \end{bmatrix} \tag{3}$$

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where:

n_{11} = Individuals seen in the first list are also seen in the second list (recapture);

n_{10} = Individuals seen in the first list but are not seen in the second list;

n_{01} = Individuals not seen in the first list are seen in the second list;

n_{00} = Individuals not seen in both lists.

n_{10}+ n_{01} = n (the observed population size)

N = the true population size

Thus, n_{11} + n_{10}+ n_{01}+ n_{00} = N. But since n_{00} is not known, it has to be estimated so that the estimate of N shall be reliable. Assuming that the marked proportion in the second list is equal to the marked proportion of individuals in the first list, and that the two lists are independently selected Amstrup et al. (2005) suggests that n_{11} /n_{01} ≈ n_{10} /N. Hence, the expected value n_{11} is the product of n_{10} and n_{01} divided N. Symbolically, E(n_{11}) = $n_{10}n_{01}$/N.

Some notations and parameters similar to Pollock et al. (1990) are presented below to guide us.

• Parameters:

$\hat{N}_0$ = estimator for model M_0 (i.e., no effect model)

$\hat{N}_b$ = estimator for model M_b (i.e., behavioral response to capture model)

$\hat{N}_e$ = estimator for model M_e (i.e., efficient recapture model)

p_{10} = capture probability for individuals in the first list

p_{01} = capture probability for individuals in the second list

p_{11}= capture probability for individuals in both lists

No effect model (Mo)

This model assumes that neither time variation, behavioral response to capture nor individual's heterogeneity affects capture history. Some authors call it "all things being equal model". Under this model, every individual has equal chance of being observed in the list. Hence we have: p_{10} = p_{01} = p_{11} = p. From Otis et al. (1978), the estimator for p is $\hat{p} = n/2\hat{N}_0$, while estimator for N is:

$$\hat{N}_0 = n^2/4n_{11}, \quad (4)$$

where n = n_{10} + n_{01} (the observed population) and its variance is:

$$\text{var}(\hat{N}_0) = \hat{N}_0(1-p)^2/p^2 \quad (5)$$

See Otis et al. (1978) for details of (2.5) and (2.6).

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Behavioral response to capture model (M_b)

This model was developed to take care of experience individuals encountered during their first enlistment. If the experience is bad, the individual may be shying away from being enlisted again. This is called trap-shyness in ecological studies. But if the experience is good, the individual will be happy to be trapped again. This is called trap-happiness (Otis et al., 1978). In such a situation, p_{11} and p_{01} are the same; which implies that, $p_{11} = p_{01} = p$. Otis et al. (1978) showed that the maximum likelihood for p is: $\hat{p} = (n_{10} + n_{01} - n_{11})/(2N - n_{10})$, and the estimator for N is:

$$\widehat{N}_b = \frac{n_{01}^2}{n_{01} - (n_{01} - n_{11})} \quad (6)$$

$$var(\widehat{N}_b) = \frac{\widehat{N}_b(1-p)^2(1+(1-p))}{p^3} = \frac{\widehat{N}_b(q)^2(1+q)}{p^3} \quad (7)$$

The proposed efficient recapture model (M_e)

Petersen-Lincoln estimator is the basis for two-source capture-recapture experiment but it may result to unreliable estimate when recapture (m_2) size is few. In our introduction, we stated that the higher the recapture in a two-source capture-recapture experiment, efficient will be the estimate than when the recapture size is few. It is on this basis that we propose this new model that will make a two-source capture-recapture method more reliable than it used to be. That is to say, the higher the probability of recapture, the more efficient will be the estimator. In such a situation, $p_{10} = p_{11} = p$. With the algorithm developed by Otis et al., the relevant estimator for p shall be: $\hat{p} = (n_{10} + n_{11})/(N_e + n_{10})$ and the estimator of N_e shall be:

$$\widehat{N}_e = \frac{n_{11}(n_{01} - n_{11}) + (n_{10} + n_{11})n_{10}}{2n_{11}} \quad (8)$$

and $var(\widehat{N}_e) = \frac{n_{10}^4 q^2}{4N^3 p^6} + \frac{Np^2q^2}{4}$ (9)

RESULTS/FINDINGS

Having reviewed the two-source capture-recapture models and their estimators, we now use them in application to compare with the new model before applying them in the disputed election results.

In Section 2, we noted that $E(n_{11}) = n_{10}n_{01}/N$. This is true with variates of hyper-geometric distribution being approximately the same with its expected value (Fienberg, 1972). We use this fact to simulate data for different values of N, n_{10} and n_{01} to compare results obtained from M_0, M_b, M_{PL} and our proposed model M_e. Python Program was used to do the stimulation.

- In Table 1, the recapture (n_{11}) ranges from 5 to 10, while the true population size is N = 90. On average, Petersen-Lincoln estimator ($\widehat{N}_{PL}$) was a good estimator, but it collapsed

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eventually when n_{01} is equal to n_{11}. Both the no effect estimator ($\widehat{N}_0$) and our proposed estimator ($\widehat{N}_e$) overestimated the true population, while behavioral response to capture estimator ($\widehat{N}_b$) underestimated it. Our proposed estimator ($\widehat{N}_e$) performed poorly because of few recaptures (n_{11}).

- However, when recapture size has been increased in Table 2 our proposed estimator $\widehat{N}_e$ is by far a better estimator than other ones.
- In Tables 3, the conventional estimators are far behind estimating the true population, but our proposed estimator nearly hit the target. This is because the number of recapture cases has been increased tremendously.
- In Table 4, the story is the same. Though the true population size and first capture (n_{10}) incidence have not changed, the little change in the second capture (n_{01}) did not change the story. This is due to increased number of recapture sizes.
- Even though both the true population and n_{10} have been increased in Table 5, yet our proposed estimator still remains a better option because of the increased number of recapture (n_{11}) sizes.

In conclusion, we have shown that no matter how N, n_{10} and n_{01} have been suppressed or increased, once recapture (n_{11}) size is high, our proposed estimator does a better estimate than the traditional estimators.

Table 1: Ten Simulated data sets: N = 90, n_{10} = 50 and n_{01} = 10

S/N	n_{11}	$\widehat{N}_0$	$\widehat{N}_{PL}$	$\widehat{N}_b$	$\widehat{N}_e$
1	5	180	100	56	278
2	8	113	63	52	205
3	10	90	50	50	278
4	7	129	71	53	150
5	7	129	71	53	150
6	7	129	71	53	150
7	8	113	63	52	205
8	6	150	83	54	235
9	8	113	63	52	205
10	8	113	63	52	205
Total	74	$\bar{X}$ = 126	$\bar{X}$ = 70	$\bar{X}$ = 53	$\bar{X}$ = 206

Table 2: Ten Simulated data sets: N = 200, n_{10} = 100 and n_{01} = 50

S/N	n_{11}	$\widehat{N}_0$	$\widehat{N}_{PL}$	$\widehat{N}_b$	$\widehat{N}_e$
1	34	165	147	119	205
2	36	156	139	116	196
3	27	208	185	130	247
4	32	176	156	122	215
5	39	144	128	112	184
6	31	181	161	123	221
7	37	152	135	115	192
8	27	208	185	130	247

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9	34	165	147	119	205
10	32	176	156	122	215
Total	329	$\bar{X}$ = 173	$\bar{X}$ = 154	$\bar{X}$ = 121	$\bar{X}$ = 213

Table 3: Ten Simulated data sets: N = 200, n_{10} = 100 and n_{01} = 60

S/N	n_{11}	$\widehat{N}_0$	$\widehat{N}_{PL}$	$\widehat{N}_b$	$\widehat{N}_e$
1	35	183	171	133	205
2	44	145	136	119	172
3	33	194	182	137	215
4	39	164	154	127	189
5	40	160	150	125	185
6	41	156	146	123	181
7	39	164	154	127	189
8	39	164	154	127	189
9	45	142	133	118	169
10	42	152	143	122	178
Total	397	$\bar{X}$ = 162	$\bar{X}$ = 152	$\bar{X}$ = 126	$\bar{X}$ = 187

Table 4: Ten Simulated data sets: N = 200, n_{10} = 100 and n_{01} = 70

S/N	n_{11}	$\widehat{N}_0$	$\widehat{N}_{PL}$	$\widehat{N}_b$	$\widehat{N}_e$
1	51	142	137	123	158
2	44	164	159	135	177
3	42	172	167	139	183
4	50	145	140	125	160
5	56	129	125	116	146
6	42	172	167	139	183
7	47	154	149	130	168
8	47	154	149	130	168
9	45	161	156	133	174
10	52	139	135	122	155
Total	476	$\bar{X}$= 153	$\bar{X}$= 148	$\bar{X}$= 129	$\bar{X}$= 167

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Table 5: Ten Simulated data sets: N =300, n_{10} = 150 and n_{01} = 70

S/N	n_{11}	$\widehat{N}_0$	$\widehat{N}_{PL}$	$\widehat{N}_b$	$\widehat{N}_e$
1	51	237	206	172	305
2	40	303	263	188	371
3	52	233	202	170	300
4	44	275	239	181	344
5	53	228	198	169	296
6	53	228	198	169	296
7	49	247	214	174	315
8	41	295	256	186	364
9	51	237	206	172	305
10	42	288	250	184	357
Total	476	$\bar{X}$ = 257	$\bar{X}$= 203	$\bar{X}$= 160	$\bar{X}$= 296

We started with low recapture (n_{11}) size; and as we increase the size, we have more reliable estimates which our proposed estimator has proven. This shows that when recapture size is high in a two-source capture-recapture experiment, there will be no need for multiple-source capture-recapture experiment which may incur huge expense as Sutherland (2003) noted.

In the study of animal abundance, good baits and careful handling of captured animals is the key; so that animal's response to recapture will be positive (trap happiness). In epidemiological studies, counseling of patients (or clients) is very important; so that patients will understand why they are included in the list. In election matters, voter education is very crucial, so that the electorates will know why they are invited to participate in another exercise, despite the disappointment of the first one. We now demonstrate how the model would be used in settling disputed election result.

The Nigerian Presidential Election, February 25, 2023

The February 25, 2023 Nigerian Presidential Election result declared by the Independent National Electoral Commission (INEC) was very controversial. Here are some of angry comments made against the election results:

Dear friends, we have witnessed an unusually stressful and challenging elections and vote casting process under very difficult conditions in most cases. Unfortunately, the human demons in our country and their lunatic agents in various parts of the country didn't allow for a peaceful and just process in those places. There was a place where the gate was locked, and thugs told the people, "If you are not voting our party, don't come in." In some places, people are told, "If you don't want to vote our party, go back to your place." In certain places, there was a report of no more Presidential Ballot Papers, but there were Ballot Papers for the Senatorial and House of Representatives elections. There were others where a particular party's logo was not on the Ballot Papers at all. Also, there were cases of thugs snatching Ballot Papers. The question is: Who are the kinds of leaders or aspirants who would orchestrate those kinds of criminalities? (Dr. Paul Enenche, 2023).

We went round to so many areas, and over twenty polling units we visited in the morning before 8.30am we did not see any INEC personnel or materials in those areas. It was when we got to Kabusa registration area that we saw many INEC vehicles ready to go to their

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polling units. We saw a polling unit of INEC in that Kabusa registration units that have 1916 registered voters. They had their materials, they had their personnel but they didn't bother to even setup those materials. And when I was snapping pictures of what was going on they said: "Madam leave this place". But I said I cannot leave because you refused to start and I have to make report to the Nigerian Civil Society Situation Room. And as we are complaining of Abuja, the situation of Southeast was so bad. At the point we issued the press release, only 6% of the entire Southeastern Nigeria was where INEC materials and personnel were deplored. The worst is that at Okpala Avenue that is opposite INEC office in Enugu, there was no INEC personnel, no INEC material till up to 11am, and even 12 pm in the midday. In fact, this is the worst election I have observed since 1999 (Mma Odi, 2023).

INEC made a press statement when uploads were not done. You said there was no hacking of your server, but you know there was problem with uploading your results. Till this minute I am speaking, many results have not been uploaded on your server. So you cannot be using justification that a vote took place in a polling unit when INEC failed in uploading results from those polling units. If you have uploaded those results immediately after vote was casted in each polling unit, we will have access to them and I will not be asking questions here. But as I speak with you, those results were not uploaded for hours and hours. If results were not uploaded, we as a Party cannot be challenged that the process is over. The process is not over because it is faulty, results were not uploaded and if those results were not uploaded, we are definitely going to contest the authenticity of whatever presentation is being made here (Dino Melaye, 2023).

The election exposed enduring system weaknesses and therefore signal a need for further legal and operational reforms to enhance transparency, inclusiveness, and accountability (EU EOM, 2023)

Opposition political parties also added salt to an injury. They described it as the worst election ever conducted in Nigeria since the return to civilian rule in 1999. They alleged heavy vote suppression, rigging, manipulation, intimidation; and vowed to challenge the result in the court. However, based on the antecedents of Appeal and Supreme courts in handling election cases in the past, they were unsure of winning their case in the court. Their fear supported research finding by Onapajo and Uzodike (2014) that manipulation of judicial process leads to false winner. But in this research we found that all hope is not lost. There is another option available which we believe will settle the quarrel, and it is cost effective and less time consuming. We use presidential election result declared by INEC in the Anambra West Local Government Area of Anambra State Nigeria and the one by the Concerned Citizens of Anambra West (CCAW) election monitors to demonstrate how this our new estimator could be used in settling disputed election results without resorting to anarchy or going to the Election Tribunals.

In Anambra West Local Government Area, there are ten council wards and 164 polling units where the February 25, 2023 presidential election took place (See Table 6.1). Votes earned by each political party are shown in Table 6.2. Through proportional representation, polling units in each ward was listed and questionnaires designed by CCAW election monitors administered to the electorates in those polling units two days the presidential election was concluded. Specific questions in that 'post-election check questionnaire' included:

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- In the presidential election conducted on February 25, 2023 by the INEC did you vote? (Y/N)
- Which political party/candidate did you vote for? Please specify ----------
- In the list of political parties/candidates provided in the questionnaire, please tick your preferred political party/candidate if the presidential election is to be conducted again.

Response to the questionnaire from the respondents is coded as described below:

- n_{10} = number of respondents that voted on the February 25, 2023 presidential election only;
- n_{01} = number of respondents that responded to the questionnaire only (new voters);
- n_{11} = number of respondents that voted on the February 25, 2023 presidential election and also responded to the questionnaire (recapture).

The aim of CCAW monitors is to cross-check complains of vote rigging, suppression of election results which the opposition political parties alleged had happened in that particular local government area. Table 8 shows the number of votes earned by each political party/candidate declared by INEC, CCAW monitors, and the estimated votes earned using the proposed estimator.

Table 6. Wards in Anambra West Local Government Area and polling units for the 2023 Nigeria General election

Ward Name	[1]Number of polling unit	[2]Polling-unit proportional representation
Ezi Anam	21	12
Ifite Anam	20	12
Nzam	16	9
Olumbanasa ode	18	10
Olumbanasa Inoma	15	9
Oroma Etiti Anam	16	9
Umuenwelum Anam	12	7
Umueze Anam I	7	4
Umueze Anam II	23	14
Umuoba-Abegbu Mmiata Iyiora	16	9
Total	164	95

[1]MANPOWER Nigeria; www.manpower.com.ng/place

[2] Concerned Citizens of Anambra West; chuba64@gmail.com

Entries in column n_{10} (i.e., INEC declared result) and $\widehat{N}_e$ (the estimated result) in Table 8 will help us arrive at a far-reaching conclusion whether the allegation of opposing political parties in that local government area hold water or not.

- In Table 8, we observed that the leading political party in that election still maintained its lead even when efficient recapture estimator is applied.

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- In INEC declared result, LP earned 12,400 votes; and in our proposed efficient recapture estimator ($\widehat{N}_e$) LP earned 15,154.
- APC earned 360 votes in the INEC declared results, but when $\widehat{N}_e$ is applied the Party earned 768.
- The same interpretation applied to other Political Parties.

Table 7: Parties that participated on February 25 Presidential Election and vote earned in Anambra West Local Government Area[1]

Name of party	Vote earned	%
LP	12,400	92.22
APC	360	2.68
APGA	357	2.66
PDP	226	1.68
NNPP	37	0.28
BP	14	0.10
APM	13	0.10
ZLP	11	0.08
APP	7	0.05
YPP	5	0.04
A	4	0.03
PRP	4	0.03
ADC	3	0.02
AAC	3	0.02
ADP	1	0.01
NRM	1	0.01
AA	0	0.00
SDP	0	0.00
Total	13,446	100.00

[1] MANPOWER Nigeria, www.manpower.com.ng/place

Table 8: 2023 Presidential Election Results earned by each political party in Anambra West Local Government Area declared by INEC and the estimated votes earned using efficient recapture model

Name of Party	[1]n_{10}	[2]n_{01}	[3]n_{11}	[4] $\widehat{N}_e$	%
LP	12400	10560	9259	15154	87.92
APC	360	205	119	768	4.46
APGA	357	200	160	597	3.46
PDP	226	210	150	313	1.82
NNPP	37	10	9	95	0.55
Other Parties	66	15	8	309	1.79
Total	13446	11200	9705	17236	100

[1] MANPOWER Nigeria, www.manpower.com.ng/place
[2] Concerned Citizens of Anambra West; chuba64@gmail.com

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[3] Electorates that participated in INEC February election and responded to the questionnaire (recaptures)
[4] Computed results using the proposed model

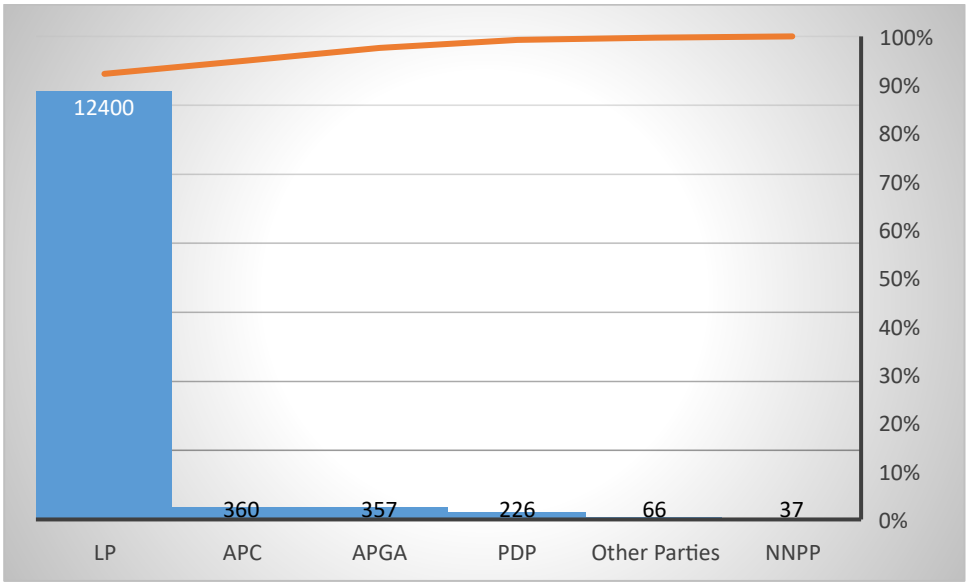

Figure 1: Efficient recapture model for Individuals seen in the first list but are not seen in the second list

2023 Presidential election results earned by each political party in Anambra West Local Government area declared by INEC and the estimated votes earned using efficient recapture model shows individuals seen in the first list but are not seen in the second list with the highest vote (12,400) by LP while (37) the least is NNPP.

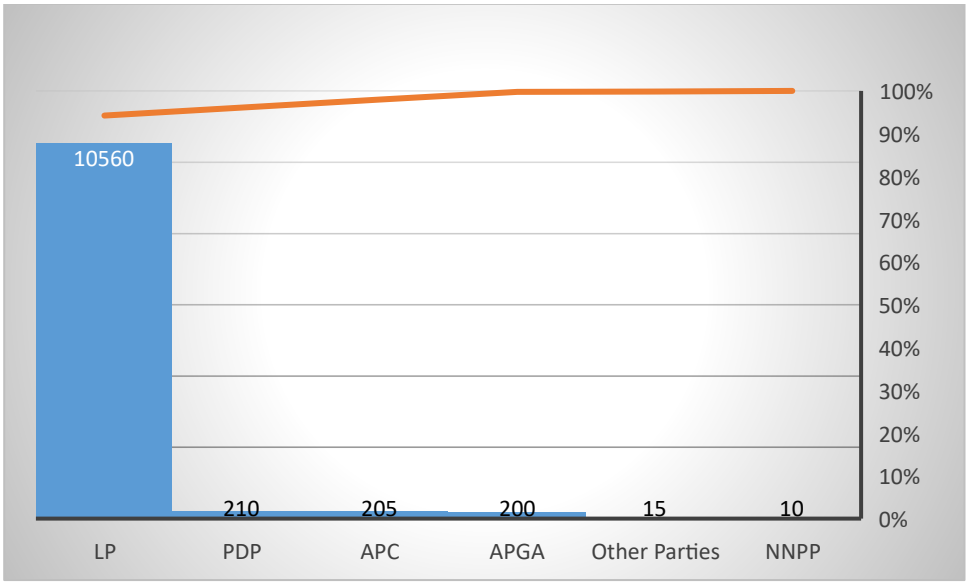

Figure 2: Efficient recapture model for Individuals not seen in the first list are seen in the second list

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2023 Presidential election results earned by each political party in Anambra West Local Government area declared by INEC and the estimated votes earned using efficient recapture model for Individuals not seen in the first list are seen in the second list efficient recapture model for Individuals not seen in the first list are seen in the second list with the highest vote (10,560) by LP while (10) the least is NNPP.

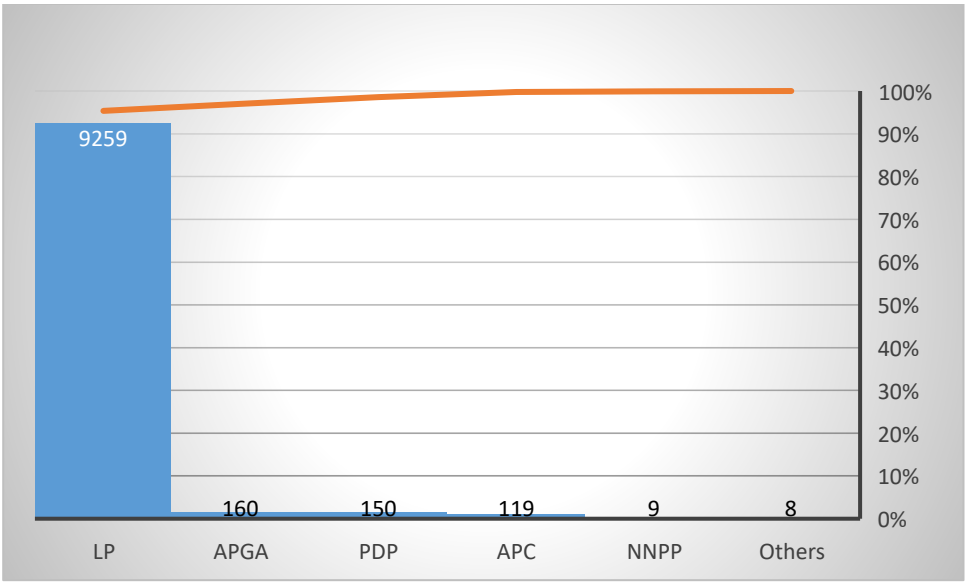

Figure 3: Efficient recapture model for Individuals seen in the first list are also seen in the second list (recapture)

2023 Presidential election results earned by each political party in Anambra West Local Government area declared by INEC and the estimated votes earned using efficient recapture model for Individuals seen in the first list are also seen in the second list (recapture) with the highest vote (9,259) by LP while (8) the least from other political parties except APGA, PDP, APC, NNPP.

CONCLUSIONS

The new estimator has shown that there were no serious cases of vote suppression, manipulation or intimation by any political party, as far as this Local Government Area is concerned. If there were vote suppression, it is only about 1.78% which is negligible (See Tables 7 & 8). We, however, state that this may not be true in other local government areas in Nigeria where the same election was conducted. Cross-checking INEC declared election results using this new model is supposed go beyond questionnaires. Sampling technique to select polling units where re-run election is to take place is necessary. And since there is no time and fund to conduct a fresh election, our proposed model will be the easiest and quickest way to settle disputed election results.

If INEC had been introduced to this model and the Commission has the political will to apply it in areas where election results were heavily disputed, those comments made by the aggrieved Nigerians, opposition political parties and the International Monitoring Teams would not have occurred. Complain of vote suppression, rigging, manipulation or intimation

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in those areas would have largely been reduced. Too, all the political parties that participated in the election would have no cause to go to the Election Tribunals to seek redress, or resort to violate demonstrations. Even the heavy burden INEC carried on its shoulder in defending election results it declared in various Election Tribunals in Nigeria would have been less or may not have occurred at all. Aside stringent electoral reforms to check all sorts of electoral malpractices, we are equally advocating the use of this state-of-art method, capture-recapture, to cross-check any declared election results that are in contention in future elections. Osisiogu & Chinwuba (2023) used similar method in tracking the population size of fake drug syndicates in Lagos.

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