Optimizing Random Sampling Through Mutation Modeling: A Quick Count Case Study for Maximum Efficacy

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Abstract

Quick Count is a quick method of counting votes in a general election that aims to provide an estimate of the results before the official count. Therefore, the development of statistical models that are more cost and time efficient, and more effective or accurate is needed.

In this study, researchers propose a new approach in the form of applying the Mutation Model to Simple Random Sampling (EnhanceSRS) to optimize.

Starting with the technique of determining the number of respondents (voters), along with a list of polling stations (TPS) where quick-count volunteers should be located.The peak of effectiveness and efficiency in the case of Quick Count data is at the 90% Confidence Level, Margin of Error 0.01%, with the number of polling stations selected 0.21% of the population. And the Improve SRS method provides average results that are closer to the actual value of 3% average than the regular SRS method..

Keywords : Sample Random Sampling, Mutation, Margin of Error, Confidence Level

I. INTRODUCTION

The Election quick count is a method of quickly calculating an election result using sample polling stations [1]. With a quick count, the results of the vote count are usually known within hours after the vote count at the polling station is closed. The Presidential election quick count uses computational techniques to increase its accuracy and efficiency. Computational and statistical models are used to estimate the results to achieve accuracy and efficiency.

Earl Babbie (1986) cited by Somantri (2006)[2] in his book "The Practice of Social Research", says "Sampling is the process of selecting observations". The selection process referred to here is the process of obtaining a sample. Somantri (2006: 63) [2]suggests that a sample is a small part of the population members taken according to certain procedures so that it can represent the population. When a population (the whole group to be studied) is too large or difficult to access as a whole, researchers use sampling techniques to take samples that are representative of the population. In other words, sampling allows researchers to make inferences about the population based on data obtained from the sample[1].

This research is aimed at exploring a commonly used sampling technique, namely Simple Random Sampling (SRS)[3] which is improved with the Mutation technique. The data used is data on the distribution of polling stations (TPS) in Jambi Region owned by the General Election Commission of the Republic of Indonesia. Also with this research, researchers' innovations related to the population can be more in-depth and can help improve the effectiveness and efficiency of the sampling process.

II. LITERATURE REVIEW

This research is a comparison between sampling techniques to be able to represent the population based on data obtained from the sample. The system to be built consists of five main processes, namely:

A. Population Determination

To determine a group for research object, namely in the form of simulation data originating from the General Election Commission (KPU) which can be accessed at https://pemilu2019.kpu.go.id/#/ppwp/hitung-suara/ seem Presidential & Vice Presidential Election 2019 Results.

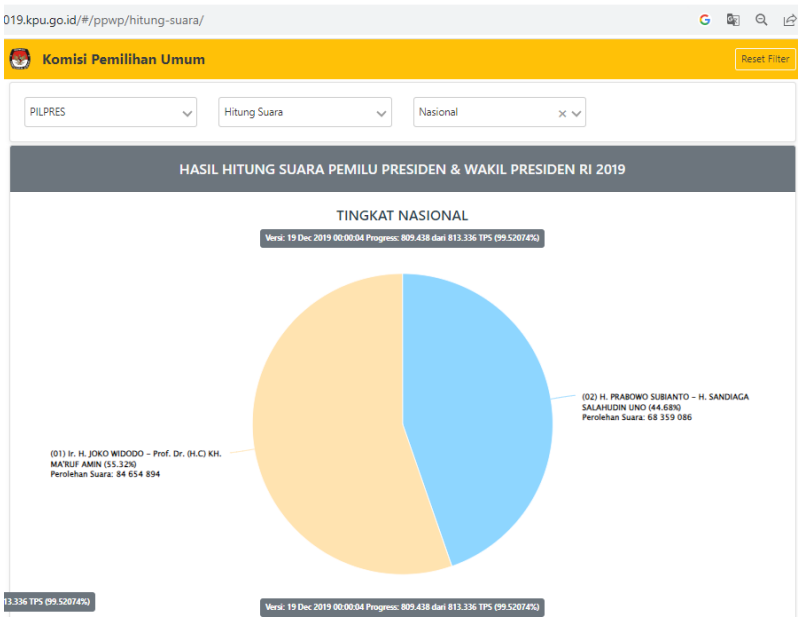

Figure 1. Result of Election Pres & Wapres Election 2019
(https://pemilu2019.kpu.go.id/#/ppwp/hitung-suara, acces in October'30 2023)

The polling station data on the page is then used as a reference for the sampling location to be analyzed, and the actual results on the page are used as a counterweight to the accuracy of the sampling analysis performed.

B. Sampling Method

It is a statistical computational technique so that the sample obtained can represent the true population [1]. That is, the basic concept behind the use of sampling is that by taking a representative sample, researchers can make estimates or inferences about the characteristics of the population as a whole. The method in this study uses Simple Random Sampling (SRS)[4], which is a sampling method in which each member of the population has an equal chance of being selected as a sample. In addition, the data index exchange mode between individuals is also used (Mutation). Furthermore, the value comparison between standard SRS and improved Mutation technique[5] on SRS (EnhanceSRS) is obtained.
Mutation is one of the important operations in Genetic Algorithms that is similar to the mutation process in biological evolution, which is the process of individual genetic variation and exploration in the search space for the best solution [5].
This process is randomized where some of the best-indexed data is selected with a certain probability and ends with the creation of new variations in the population.Suppose there are individual chromosomes representing potential solutions to an optimization problem as follows:
Initial index: [3, 7, 2, 9, 5]
During the mutation operation, one or more genes in this chromosome are selected with a certain probability, and the values of these genes are then randomly changed. For example, the 3rd and 4th index genes are selected to undergo mutation:
Index after mutation: [3, 7, 6, 12, 5]
The result of mutation is a new variation in the population that may have a better or worse solution depending on the nature of the problem and how much change has occurred.

The following are the steps in improving SRS with the proposed Mutation:
a) Identify the Population
b) Create two individual TPS lists in the form of random index lists
c) Determine the total number of samples according to the existing sample size method
d) Comparing individual index data 1 with individual index data 2, and using the smaller TPS data for use
e) Collecting the list of polling stations used for volunteers based on the sample size and selected polling stations.
f) Comparing the results of SRS and improveSRS calculations against the actual results of the 2019 Presidential and Vice Presidential Elections to validate which method is recommended.

The comparison of sampling techniques will then be validated again against the actual values of existing calculation results. This means that the smaller the deviation value, the sampling method that is recommended at the end of the research.

C. Sample Size

To provide accurate results, several alternative sampling size search methods were researched and compared. Davis & Cosenza, 1993 in Kuncoro, 2013[4], stated that the number of research samples is influenced by several factors, including: the amount of data available, data homogeneity, degree of confidence, margin of error and availability of resources.

According to Gay & Diehl (1996) in Kuncoro (2013)[6], the minimum sample size that can be accepted for a study depends on the type of study. The guidelines include:

a) For descriptive studies, the minimum sample is 10% of the population.
b) For correlational studies, a minimum of 30 samples are needed to test whether there is a relationship.
c) For causal.comparative studies, a minimum of 30 subjects per group is required.
d) For experimental studies, a minimum of 15 subjects per group.

Thus, determining the minimum sample size for a descriptive study can be formulated as follows:

a) Descriptif Formula (Margin 10%):

$$n = \frac{10.N}{100} \qquad \text{.............................. (1)}$$

n= sampling size
E = Margin of Error (0.05)
N= population size

b) Formula National Educational Association (NEA) /Krejcie & Morgan:

$$n = \frac{chi.N.P(1-P)}{d^2(N-1)+chi.P(1-P)} \qquad \text{.............................. (2)}$$

n= sampling size
Chi= chisquare value (1 parameter =3.841)
N=population size
P=population proportional(0.5 Heterogen)
d=confidence level 90%, *Margin of Error* (MoE) 0.05

c) Formula Estok Navitte Cowan:

$$n = \frac{Z^2\left(p(1-p)\right)N}{Z^2\left(p(1-p)\right)+(N-1)E^2} \qquad \text{.............................. (3)}$$

n= sampling size
E = margin of error (0.05)
N= population size
Z= confidence level, (90% =>Z = 1.65)
p = proportional population(0 sd 0.5)

d) Formula Taro Yamane/Slovin:

$$n = \frac{N}{1+N(e^2)} \qquad \text{.............................. (4)}$$

n= sampling size
E = margin of error (0.05)
N= population size

The Confidence Level is the level of confidence that the sample used will represent a depiction of a population. For example, if a sampling has a confidence level of 95%, meaning the researcher is confident that the survey will be similar 10 times, then 95% of these will contain the true population parameter value. Meanwhile, the Margin of Error shows the deviation between the research results and the actual data. For example, if a study has an MoE of ±3%, this means that the sample results may differ by a maximum of ±3% from the actual parameter value. MoE decreases with increasing sample size, and the higher the Confidence, the greater the MoE that occurs [1].

D. Post Research

Wrensch, M. et al (2007) in "Comparison of Random Sampling Methods in a Large Prospective Cohort Study" [3], examined various random selection sampling techniques to evaluate various random sampling techniques, including Simple Random Sampling, Stratified Random Sampling , and other techniques. Also Milgrom, J. et al (2013) in "The Effects of Different Sampling Methods on the Detection of Antenatal Depression and Anxiety: A Comparison of Four Methods" [7]where the research aimed to compare four sample selection methods different for detecting prenatal depression and anxiety in pregnant women. These include convenience sampling techniques, quota sampling techniques, and others.

Similar research was also conducted by Skinner, C. J. and Wakefield, J (2008), on "Cluster Sampling and Area Sampling: Recent and Less Recent Developments" [8]. This research discusses the use of Cluster Sampling Techniques and Area Sampling Techniques in survey research, which is the beginning of the latest development of the next sampling method. "A Comparison of Four Sampling Methods in a Rural African Setting" (2006) by Sié, A. et al [7], which examines the comparison of four different sample selection methods in the context of regional research. rural; namely by using Simple Random Sampling Techniques, Cluster Sampling Techniques, and other techniques.

There is also, "Comparing Probability and Non-Probability Sampling Methods in Conservation Research: A Case Study of Formosan Landlocked Salmon" (2007) by Chang, F. and Chou, W. Y[9], with a focus on the comparison between Sampling Techniques Probability and Non-Probability based in the context of conservation research. Chang evaluated the Stratified Random Sampling Technique and other techniques[10]. Likewise, several other references, whether from books, articles or scientific websites, provide various information regarding determining sampling size and the sampling techniques used along with elements of novelty or updates.

E. Sampling Simulation

Based on the methodology, an interactive Sampling System Simulation is created with the requirements:
a) Data Parsing and Decoding Menu, which is a menu for pulling data online from the 2019 KPU website, as well as archiving and describing it.
b) Search for sampling sizes for calculating the number of sampling
c) Sampling technique analysis from various methods, form of variance, deviation, accuracy and weight values.
d) Evaluation and Comparison Between Methods, as a menu to see the final results of the comparison between sampling methods from determining the number of samples, accuracy and final weight.
e) Reports and Recommendations, as a menu to display conclusions and recommendations from research results.

III. METHODOLOGY

With the development, testing and validation processes, The comparison of SRS with the minmaxSRS:
a) Identify Population 1 with a random index
b) Identify Population 2 by sorting the number of votes in a polling station in ascending order
c) Identifying Population 3 by sorting the number of votes in a polling station in descending order
d) Determine the total number of samples according to the existing sample size method
e) Generate random numbers, and collect sampling data as large as the sample size obtained
f) Compare the sampling results of Population 1, Population 2 and Population 3 with the actual results.

This comparison of sampling techniques will then be revalidated against the actual values of the 2019 DKI Jakarta Presidential and Vice Presidential Election. This means that the smaller the deviation value, the sampling method that is recommended at the end of the research.

IV. RESULT AND DISCUSSION

A. Analysis *Simple Random Samping* (SRS)

The SRS method is carries out sampling with each element in the population having the same probability of being selected as the sample. Computationally, this method is the fastest and easiest compared to other sampling methods. The random process in SRS has a high representativeness of reflecting the characteristics of a population, so it can reduce the risk of bias and there are no subjective influences that can influence the sample selection process.

Table 2.Result of SRS-Method

Populasi Propinsi JAMBI (ID 15885):11342 TPS

Jumlah Pemilih Sah : 2.058.993 (858.738 + 1.200.255) | Prosentase : 41.71% x 58.29% (M -16.59%)

Simple Random Sampling TPS (SRSJ) | SRS | SRSM | SRS-MAX | SRS-MIN |

Jumlah Suara JAMBI : 2.058.993 (11.342 TPS)

No	TKper	Zvalue	He/Ho	JM	PM	HASIL-Margin	JE	PE	HASIL-Estok	JS	PS	HASIL-Slovin
Sampling Error / ME: 0.01												
1	90	1.65	0.5	205.900	10%	T1127: 40.86% x 59.14%=-0.85%	6.784	0.33%	T39: 39.91% x 60.09%=-1.8%	9.952	0.48%	T58: 37.4% x 62.6%=-4.31%
2	95	1.96	0.5	102.950	5%	T566: 41.29% x 58.71%=-0.42%	9.560	0.46%	T53: 35.47% x 64.53%=-6.24%	9.952	0.48%	T55: 36.57% x 63.43%=-5.14%
3	99	2.58	0.5	20.590	1%	T110: 39.64% x 60.36%=-2.07%	16.508	0.8%	T86: 38.3% x 61.7%=-3.41%	9.952	0.48%	T53: 41.67% x 58.33%=-0.04%
Sampling Error / ME: 0.025												
1	90	1.65	0.5	205.900	10%	T1126: 42.17% x 57.83%=0.46%	1.089	0.05%	T5: 42.96% x 57.04%=1.25%	1.599	0.08%	T8: 44.81% x 55.19%=3.1%
2	95	1.96	0.5	102.950	5%	T554: 40.3% x 59.7%=-1.41%	1.536	0.07%	T8: 37.68% x 62.32%=-4.03%	1.599	0.08%	T9: 39.26% x 60.74%=-2.45%
3	99	2.58	0.5	20.590	1%	T112: 41.33% x 58.67%=-0.38%	2.660	0.13%	T15: 46.12% x 53.88%=4.41%	1.599	0.08%	T8: 40.44% x 59.56%=-1.27%
Sampling Error / ME: 0.05												
1	90	1.65	0.5	205.900	10%	T1135: 41.69% x 58.31%=-0.02%	273	0.01%	T1: 23.1% x 76.9%=-18.61%	400	0.02%	T2: 37.37% x 62.63%=-4.34%
2	95	1.96	0.5	102.950	5%	T566: 45.04% x 54.96%=3.33%	385	0.02%	T1: 64.08% x 35.92%=22.37%	400	0.02%	T1: 64.08% x 35.92%=22.37%
3	99	2.58	0.5	20.590	1%	T112: 41.68% x 58.32%=-0.03%	666	0.03%	T3: 42.82% x 57.18%=1.11%	400	0.02%	T2: 44.8% x 55.2%=3.09%

The Table 2 illustrates the population of the research location (Jambi Province), with a sample size of 2,058,993 which is a combination of the results of candidate 1 (858,738 votes) and candidate 2 (1,200,255 votes) with the actual percentage being 41.71% x 58.29% and the total number of polling stations owned 11342 votes (with an average voter of 150 votes per TPS).

In the SRS results, from a population of 2,058,993 voting rights, the ideal number of samples that can be taken is 205,900 votes / 1127 polling stations (aka 10% of the total population) and is able to produce a deviation of only 0.85% from the actual; The average value of the SRS method is able to synchronize the final recapitulation in the income accuracy of Candidate 1 (V01) of 40.86% from the proper 41.71%. This means that with 10% of the existing population (equation 1), SRS is declared capable of obtaining the highest effectiveness results.

Using sampling assumption data by following equation 4 (Taro Yamane/Slovin) produces a sampling number of 9,952 votes / 56 sample polling stations (only 0.48% of the total population), resulting in a deviation of 4.31% from the actual; The SRS method with this sample size on average gives a vote income for Candidate 1 (V01) of 37.40% from the proper 41.71%. This means that it is 0.48% of the existing population (equation 4); SRS is correct in producing the fact that V02 is superior to V01 and is able to provide good effectiveness and efficiency values. For the record, if candidate 1 gets x%, then candidate 2, because they only use the 2 candidate pair system, is automatically worth 100-x% (in this case 62.60% of the achievement should be 58.29%).

Meanwhile, if you use a sampling size according to equation 2 (NEA/Krejcie & Morgan) or equation 3 (Estok Navitte Cowan), SRS provides an accuracy deviation of 1.80%, with a percentage achievement for candidate 1 of 39.91%; where using a sample size the figure was 6,784 votes / 38 polling stations (0.33% of the total population). Research in this calculation used a confidence ratio of 90%, and an MoE of 0.01.
The simulation accuracy value is obtained based on the average value of random TPS selected by the SRS method, with sampling size limitations according to each method.

Until the final data obtained from the SRS Method deviation analysis for Jambi Province are as follows:

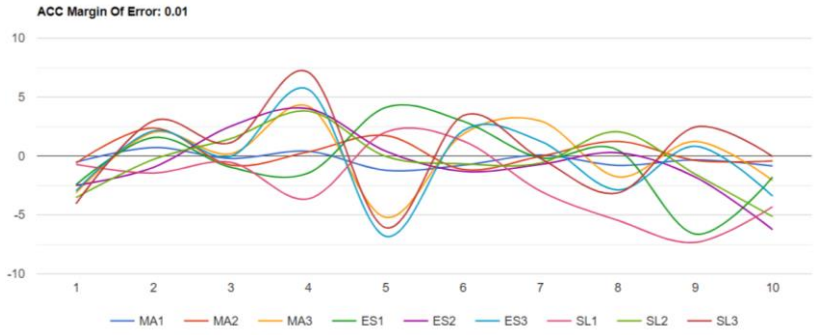

Figure 3. SRS-Method Deviation

MA1 is the equation 1 method with a sampling size of 10% of the data, ES is the Estok method and SL is the Slovin sampling size method (equation 4). Group 1 produces a stable deviation graph, while the Slovin graph produces the highest deviation value. This shows that the more sampling data, the more stable the results obtained and tend to be closer to the true (representative) value.

Table 3. SRS-Method Mean-Deviation

ACC Margin Of Error: 0.01

No	MA1	MA2	MA3	ES1	ES2	ES3	SL1	SL2	SL3
1	-0.52	-0.59	-3.12	-2.44	-2.5	-2.96	-0.71	-3.53	-4.05
2	0.72	2.38	2.01	1.57	-0.97	2.13	-1.45	-0.29	2.99
3	-0.21	-0.77	0.19	-0.96	2.53	-0.02	-0.54	1.48	1.13
4	0.4	0.35	4.23	-1.45	4.02	5.66	-3.64	3.81	7.12
5	-1.21	1.74	-5.21	4.12	0.41	-6.82	2.03	-0.03	-6.09
6	-0.78	-1.14	1.85	2.95	-1.31	2.14	1.28	-0.66	3.42
7	0.08	-0.03	2.98	-0.15	-0.72	1.26	-2.98	-0.6	-0.21
8	-0.8	1.24	-1.78	0.51	0.28	-2.88	-5.46	2.06	-3.14
9	-0.33	-0.37	1.24	-6.63	-1.78	0.83	-7.34	-1.53	2.46
10	-0.85	-0.42	-2.07	-1.8	-6.24	-3.41	-4.31	-5.14	-0.04
Deviasi	0.72	2.38	4.23	4.12	4.02	5.66	2.03	3.81	7.12
Mean	0.59	0.9	2.47	2.26	2.08	2.81	2.97	1.91	3.07
P/M	100%	100%	100%	100%	100%	100%	100%	100%	100%

A more detailed explanation of the SRS can be seen in Table 3, from the target data for the two actual candidate pairs of 41.71% x 58.29% (2,058,993 samples), the SRS method with Tk. 90% confidence and MoE 0.01 on the MA1(Morgan) sampling size is at its stable peak with an average deviation of 0.59%, with the highest deviation at 0.72%, so it can be declared as a very good result. The average deviation of the SRS on the Estok Native Cowan sampling size is 2.26% with the highest deviation being 4.12%; even though only using 0.33% of the sample from the entire population. Meanwhile, at the Slovin sampling size (0.48% of the total population) the average deviation is 2.03% (maximum 2.97%); However, if viewed from an efficiency perspective, the Slovin sampling size normalization method is the one that achieves effectiveness (has a low deviation value) and the best efficiency (using a minimum number of samples).

A Truth Value of 100% at a T Confidence of 90% and an MoE of 0.01 indicates that from all the sampling carried out, the results from SRS are 100% candidate 2 as the winner (P/M according to actual).

B. Analysis of the enhanceSRS Method

Analysis of the enhanceSRS method begins with the process of forming two individuals with random indexes. Then in sequence, the index data from individual 1 is compared with the index data from individual 2; If the amount of data for individual 2 is smaller than the amount of data for index individual 1, then the data with index individual 2 will be used. Smaller values are used in this improvement, with the hope that the number of sample polling stations selected will increase. While maintaining the determined sampling size. The mutation concept allows researchers to increase the number of TPS to achieve maximum value. However, sampling limitation rules

are still used to achieve effectiveness and efficiency values of a sampling process. The research results of enhanceSRS with Mutations are summarized as follows:

Table 4. Result *EnhanceSRS Method*

Populasi Propinsi JAMBI (ID 15885):11342 TPS

Jumlah Pemilih Sah : 2.058.993 (858.738 + 1.200.255) | Prosentase : 41.71% x 58.29% (M -16.59%)

Mutasi Simple Random Sampling TPS (SRSMUT) | SRS | SRSM | SRS-MAX | SRS-MIN |

Jumlah Suara JAMBI : 2.058.993 (11.342 TPS)

No	TKper	Zvalue	He/Ho	JM	PM	HASIL-Margin	JE	PE	HASIL-Estok	JS	PS	HASIL-Slovin
Sampling Error / ME: 0.01												
1	90	1.65	0.5	205.900	10%	T1297: 41.65% x 58.35%=-0.06%	6.784	0.33%	T43: 46.66% x 53.34%=4.95%	9.952	0.48%	T63: 45.34% x 54.66%=3.63%
2	95	1.96	0.5	102.950	5%	T653: 43.25% x 56.75%=1.54%	9.560	0.46%	T57: 43.52% x 56.48%=1.81%	9.952	0.48%	T60: 42.63% x 57.37%=0.92%
3	99	2.58	0.5	20.590	1%	T129: 43.44% x 56.56%=1.73%	16.508	0.8%	T104: 44.06% x 55.94%=2.35%	9.952	0.48%	T63: 46.66% x 53.34%=4.95%
Sampling Error / ME: 0.025												
1	90	1.65	0.5	205.900	10%	T1298: 41.55% x 58.45%=-0.16%	1.089	0.05%	T6: 41.38% x 58.62%=-0.33%	1.599	0.08%	T10: 40.84% x 59.16%=-0.87%
2	95	1.96	0.5	102.950	5%	T665: 41.75% x 58.25%=0.04%	1.536	0.07%	T9: 38.19% x 61.81%=-3.52%	1.599	0.08%	T10: 35.84% x 64.16%=-5.87%
3	99	2.58	0.5	20.590	1%	T132: 37.63% x 62.37%=-4.08%	2.660	0.13%	T17: 34.42% x 65.58%=-7.29%	1.599	0.08%	T10: 28.28% x 71.72%=-13.43%
Sampling Error / ME: 0.05												
1	90	1.65	0.5	205.900	10%	T1313: 42.25% x 57.75%=0.54%	273	0.01%	T1: 15.16% x 84.84%=-26.55%	400	0.02%	T2: 21.04% x 78.96%=-20.67%
2	95	1.96	0.5	102.950	5%	T651: 43.62% x 56.38%=1.91%	385	0.02%	T2: 56.42% x 43.58%=14.71%	400	0.02%	T2: 56.42% x 43.58%=14.71%
3	99	2.58	0.5	20.590	1%	T130: 42.25% x 57.75%=0.54%	666	0.03%	T3: 49.72% x 50.28%=8.01%	400	0.02%	T2: 48.74% x 51.26%=7.03%

Table 4 presents the results of EnhanceSRS, from the research population (Jambi Province), with a sample size of 2,058,993 which is a combination of the results of candidate 1 (858,738 votes) and candidate 2 (1,200,255 votes) with the actual percentage being 41.71% x 58.29 % and with a total of 11,342 polling stations (with an average voter of 150 votes per polling station).

In the enhanceSRS results, from a population of 2,058,993 voting rights, the ideal number of samples that can be taken is 205,900 votes / 1297 polling stations (aka 10% of the total population) and is able to produce a deviation of only 0.06% from the actual; The average value of enhanceSRS is able to synchronize the final recapitulation in the income accuracy of Candidate 1 (V01) of 41.65% from the proper 41.71%. This means that with 10% of the existing population (equation 1), SRS is declared capable of getting the highest effectiveness results.

Using sampling assumption data by following equation 4 (Taro Yamane/Slovin) produces a sampling number of 9,952 votes / 63 sample polling stations (only 0.48% of the total population), resulting in a deviation of 3.63% from the actual; EnhanceSRS with this sample size on average gives a vote income for Candidate 1 (V01) of 45.34% from the proper 54.66%. This means that it is 0.48% of the existing population (equation 4); Improve on SRS is the fact that V02 is superior to V01 and is able to provide good effectiveness and efficiency values.

Meanwhile, if you use a sampling size according to equation 2 (NEA/Krejcie & Morgan) or equation 3 (Estok Navitte Cowan), SRS provides an accuracy deviation of 4.95%, with a percentage achievement for candidate 1 of 46.66%; where using a sample size the figure was 6,784 votes / 43 polling stations (0.33% of the total population). Research in this calculation used a confidence ratio of 90%, and an MoE of 0.01.

The simulation accuracy value is obtained based on the average value of random TPS selected by the enhaceSRS method, with sampling size limitations according to each method.

Until the final data obtained from the EnhanceSRS Method deviation analysis are as follows:

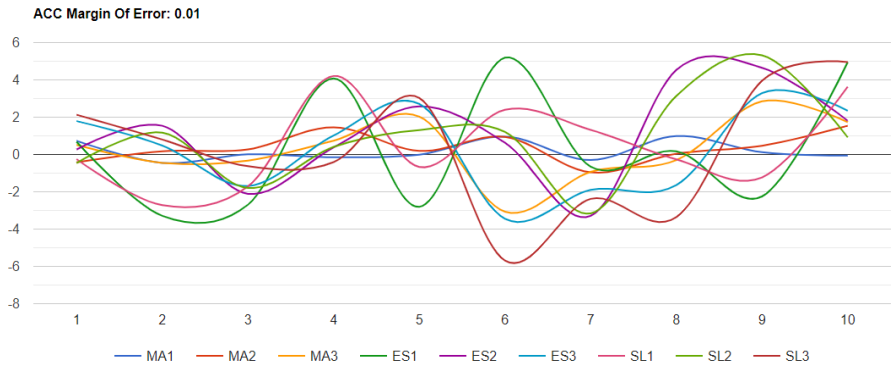

Figure 4. *EnhanceSRS Method* Deviation

MA1 is the sampling size method resulting from equation 1 with a sampling size of 10% of the data, ES is the Estok method and SL is the Slovin sampling size method. Group 1 produces a stable deviation graph, while the Slovin graph produces the highest deviation value. This shows that the more sampling data, the more stable the results obtained and tend to be closer to the true (representative) value.

Table 5. *EnhanceSRS*-Method Mean-Deviation

ACC Margin Of Error: 0.01

No	MA1	MA2	MA3	ES1	ES2	ES3	SL1	SL2	SL3
1	0.73	-0.42	0.51	0.68	0.27	1.79	-0.25	-0.46	2.13
2	-0.45	0.17	-0.45	-3.29	1.54	0.48	-2.72	1.17	0.8
3	0.01	0.27	-0.33	-2.69	-2.11	-1.69	-1.71	-1.8	-0.63
4	-0.15	1.46	0.74	4.08	0.38	1.02	4.21	0.41	-0.41
5	-0.01	0.19	2.03	-2.81	2.58	2.71	-0.67	1.31	3.03
6	0.96	0.94	-3.07	5.19	0.63	-3.45	2.4	1.21	-5.69
7	-0.3	-0.96	-0.93	-0.65	-3.29	-1.9	1.32	-3.16	-2.38
8	0.99	0.04	-0.3	0.17	4.53	-1.64	-0.26	3.14	-3.36
9	0.12	0.47	2.85	-2.25	4.65	3.29	-1.23	5.32	3.95
10	-0.06	1.54	1.73	4.95	1.81	2.35	3.63	0.92	4.95
Deviasi	0.99	1.54	2.85	5.19	4.65	3.29	4.21	5.32	4.95
Mean	0.38	0.65	1.29	2.68	2.18	2.03	1.84	1.89	2.73
P/M	100%	100%	100%	100%	100%	100%	100%	100%	100%

MA1 is the sampling size method resulting from equation 1 with a sampling size of 10% of the data, ES is the Estok method and SL is the Slovin sampling size method. Group 1 produces a stable deviation graph, while the Slovin graph produces the highest deviation value. This shows that the more sampling data, the more stable the results obtained and tend to be closer to the true (representative) value....

B. Discussion dan Novelty

The use of heuristic elements in several sampling techniques is an update that can be made to adapt to existing data conditions. In the Simple Random Sampling (SRS) Method, the application of the Mutation mode in the Genetic Algorithm can be used for individual selection. According to the rules given, look for the best conditions to be selected; namely based on the smallest index data size.

Apart from being able to maintain a minimal sampling size, which is only around 0.33% to 0.48% of the total population data, EnhanceSRS produces better computation than the primary SRS method. This is proven by the resulting maximum deviation and average deviation values which are lower and have a more stable character.

Moreover, its ability to produce accuracy of up to 45.34% x 54.66% of the actual data on the vote acquisition for Jambi Province was 41.71% x 58.29% (for Slovin) even though it used around 0.48% of the population data. The final results of the comparison can be seen in Table 6 as follows:

Table 6. Perbandingan *SRS* dan *EnhanceSRS*

Deviasi	Margin Sampling **10 % Populasi (1127 & 1297 TPS)**		Estok Native Cowan **0.33 % Populasi (39 & 43 TPS)**		Slovin **0.48% Populasi (58 & 63 TPS)**	
	Mean	Peak	Mean	Peak	Mean	Peak
SRS	0.59	0.72	2.26	4.12	2.97	2.03
EnhanceSRS	0.38	0.99	2.68	5.19	1.84	4.21

Sampling size research in equation 1 from the start has a low deviation or has a very good accuracy value. This is normal considering that the data used is very large for the size of a Quick Count. This is in accordance with the rules of sampling, that if counting many votes in a general election can be very expensive and time consuming then using a smaller sample will save resources, including costs and time. And by using appropriate statistical techniques, a relatively small sample can provide an accurate estimate of the results. In comparison, a sampling size of 10% using 1297 TPS, produces a final calculated value of 41.65% x 58.35%; while the Estok Method using only 43 TPS samples can provide a final calculation value of 46.66% x 53.34% and the Slovin Method with 58 TPS samples can provide a final calculation value of 45.34% x 54.66% of the actual calculation target of 41.71% x 58.29%. This means that there is a more effective and efficient way with a less significant difference in accuracy.

V. Conclusion

The application of the Simple Random Sampling (SRS) Sampling Method and Improve Mutations in the SRS Method was successfully applied to the Quick Count process along with the Novelty stages in each process.
The SRS and EnhanceSRS methods are able to handle large populations, and are able to meet the best effectiveness values (Confidence Level) and efficiency values (small sampling size).
The NEA/Krejcie & Morgan, Estok Navitte Cowan and Taro Yamane/Slovin Sampling size methods can be used in the Quick Count process in terms of providing variations in accuracy and deviation values by using only the minimum number of TPS samples possible.
In the sampling experiment, the higher the value, the closer it is to the actual value, aka the better it is, and this can be used as a basis for determining groups when forming individuals at the beginning of the Improve Mutation EnhanceSRS process.
Research proves that the EnhanceSRS method with Mutations provides better effectiveness and efficiency values compared to ordinary (primary) SRS.

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