

TESTING OF STRATIFIED CLUSTER SAMPLING TECHNIQUE TO PRODUCE UNBIASED ESTIMATOR FOR PARAMETER OF POPULATION

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Abstrak

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This research is done based on the importance testing of sampling technique before the real survey is done. The aim of this research is to test stratified cluster sampling technique in producing unbiased estimator of population. Based on theory, stratified cluster sampling technique is able to produce unbiased estimator. The reserch method used survey technique where the subjects are the whole the twelveth grade of Senior High School in lubuklinggau and Musi Rawas. The calculation sample shows that the real number of population is 54,45 % whereas the result of sample is 55,5 % with sampling error 0,0464, therefore the samples have estimated parameter of population accuratly.

Introduction

This research is based on the importance research activity in public opinion that should be done by LP2M as an Institute of Research Manager at Islamic Higher School (STAI) of Bumi Silampari of Lubuklinggau. Before the real survey has been continued, the researcher who is currently a head of LP2M needs to test sampling technique which theoretically can produce unbiased estimator for its population.

The research where is unavailable frame of sampling therefore taking sampling technique has to be modified in such a way, therefore the survey accuracy can increase.

Formulation of problem

The problem answered in this research is what stratified cluster sampling technique producing unbiased estimator for parameter of population.

Scope of problem

The parameter of population estimated on this research is the proportion of population. The subjects are twelfth grade students of Senior High School which are located in Lubuklinggau and Musi Rawas. The data collected in this research were the students' choices in study program at Islamic Higher School (STAI) Bumi Silampari Lubuklinggau.

Purpose and benefit of research

The aim of this research is to test what stratified cluster sampling produce unbiased estimator of population. The theoretical benefit of this research is as information to design survey in large population. Practically, this research is as a guidance for academic community and society in doing public opinion survey.

Theory Foundation, Thinking Framework And Research Hypotheses

Theory Foundation

Probability Sampling Theory

This theory explain, if taking sampling done with principle of probability, then sampling distribution of estimator can be known which covers parameter of population will be estimated. Therefore, it can be made interval estimation accompanied a statement of confident that interval calculated will be contained parameter of value unknown.

Stratified Random Sampling

Stratified random sampling method is to take sampling technique which divided population into groups homogenous which is called stratum, Then sample is taken randomly each stratum (Sugiarto: 2000). According Suppranto (2007) The heterogeneous population need to divided in clusters, it is mentioned subpopulation. Stratified sampling method consist of proportional and disproportional sampling. The way taking proportional stratified sample done with selecting each unit sampling appropriate with size it, whereas disproportional stratified sampling is conversly. Although this technique have high representative but there are weaknesses as Heru and Yasriel said (2003) that taking sampel with this technique is no more easy and cheap than simple random sampling because frame samplig have to be arranged for each stratum before sampel is taken.

Cluster Random Sampling

Cluster random sampling is a proccess of sample taking that choose cluster not individual. All groups have same opportunity to become sample member. This technique is done mainly research which there is no frame of sampling. Asep and Agus Iskandar also wrote that it is used by researchers to determine sample which devide population into some districts.

Stratified Cluster Sampling Theory

Yamane in Megawati (2013) explain that stratified cluster sampling combines the characteristics of stratified sampling and cluster sampling. It break down the population into strata which is internaly homogenous, therefore heteregenous among one another and cluster are selected from each stratum. According to Eriyanto (2007) firstly researcher do identification each one cluster. Then researcher is grouping the clusters into stratums. After that sample is taken based on stratums which are made before. If clusters can be identified based on similarity of it characteristic then sampling error can be reduced.

Estimation of population

This theory explain that one of estimator is well if it is unbiased. A estimator is told good if value of estimator same as it estimator value. According to Joko Adi Nursiyono (2014) decent

estimator is which have realibility and strength so that it can approach parameter of populatioan. In the survey research, estimation able to be done with the way to determine how many deviation of sample value to certain number with its population.it could be obtained with standar error numeral. The formulation below are used for estimation of population parameter mainly to nominal data.

$$\frac{P(1-P)}{N}$$

$P(1-P)$: Variation of population

N : Number of sample

Parameter of Population Theory

Population parameters or universs are all objects or individuals that have certain characteristics.To explain the attributes of the population, the term statistics and parameters are used. This is the sum of summary data that shows the attributes of the sample and population. Awallsgiyanto said that parameters and statistics are measures or constants that indicate the character of the population. Population parameters are denoted by capital letters "N"

Framework of Thinking

The Framework of thinking in this research is if taking of sample in large population combine between stratified and cluster technique then it will produce unbiased estimator for parameter of population.

Hypotheses of Research

Stratified cluster sampling able to produce unbiased estimator for parameter of population.

Procedure of Research

Research Method

Research method which used for testing formulation of hypotheses is survey method.

Population and Sample

The population in this research are students of senior high school 12 grade in 2018 in Lubuklinggau and Musi Rawas region as there is to the table.

Tabel 1. The number of population based on region

NUMBER	DISTRICT	NUMBER OF STUDENT	NUMBER OF SCHOOL
1	LUBUKLINGGAU	2424	26
2	MUSI RAWAS	2671	34
TOTAL		5095	60

Sample in this research is some students of senior high school at 12 grade in Lubuklinggau and Musi Rawas Region which amount 440 person, and consist of 44 school. The table 1.2 bellow is the number of sample which is taken randomly.

Tabel 2. The Number of sampel

NUMBER	DISTRICT	NUMBER OF STUDENT	NUMBER OF SAMPLE SCHOOL
1	LUBUKLINGGAU	-	19
2	MUSI RAWAS	-	25
TOTAL		440	44

The number of sample in this research is counted to use software developed by EPI bellow:

Gambar 1. The calculation of sample size with Epi software

Sample Size Calculations for a Proportion for Cluster Surveys
 Allows input of the ICC or the DEFF and average number of observations per cluster
 Version 3.02.27

Target population size: 5000
 Estimated percentage in the target population with the event of interest: 30 %
 Confidence interval width: ± 5 %
 Confidence coefficient: 95 %
 Please provide information on either the ICC or the DEFF and average number of observations per cluster
 ICC: 0
 Estimated Design effect (DEFF): 1.5
 Compute

ICC: 0.01724437 DEFF: 1.5 With an average of 39 observations per cluster

	Avg. no. of observations per cluster	Number of Clusters	Total sample size	DEFF
	39	44	440	1.13517241
	31	42	462	1.17343276

The figure shows that total population is about 5095 with proportion of population 50% margin of error 5% level confident 95% design effect 1.5 produce number of sample about 440 which is divided into 44 clusters where there are 10 respondents for each cluster.

Sampling Technique

Sample is taken with to combine stratified and cluster sampling. The first step researcher chooses school randomly, next step researcher does taking respondents in each school which is chosen as sample. Before sample is taken, firstly be done stratified based on number of school in Lubuklinggau and Musi Rawas. The next stage is taken sample proportionally. Areas that have more populations will get more samples. Based on table 1.2 showed Musi Rawas area getting 25 sample whereas Lubuklinggau to get 19 school.

Data Collecting

Data collected are choice of student about study program in Islamic higher school of Bumi Silampari of Lubuklinggau. Data collecting done with way census. After data has collected the next stage take sample from population then it be continued to counting. Instrument used in data collecting in this research is questionnaire. Example below is one of question which are asked to students.

Tabel 3. Example of survey question

If you register to Islamic higher school of Bumi Silampari of Lubuklinggau, which would you choose of study program below?

- A. Islamic of education
- B. Communication and Islamic broadcasting?

Data Analysis Technique

Data of census is taken it sample and then are done estimation. The result of sample will be compared with data of population that notice margin of error tolerated. If the statistic of sample exceed bound of error means that the estimation is biased while number of margin of error lower assumed that estimation have estimated his parameter. Prediction parameter of population use interval of confidence. The level of confidence is range of value from one to certain number which is inside it predicted there is real of population number (Eriyanto: 2007).

According to Association of Public Opinion Research of Indonesia (AROPI), level of confidence which often be used are 90%, 95% and 99%. Level of confidence 90% means probability the result of sample same as population is 90%, possibility error is 10%.

While level of confidence 95% means probability value of sample same as population is 95% and possibility of error is 5%. Whereas level of confidence 99% means probably proportion of sample same as population is 99% and possibility the sample do not same as population is 1%. Below is formula which is used to count level of confidence for proportion of population.

$$\hat{p} - Z_{\alpha/2} \frac{\sqrt{\hat{p}(1-\hat{p})}}{n} < p < \hat{p} + Z_{\alpha/2} \frac{\sqrt{\hat{p}(1-\hat{p})}}{n}$$

In this research counting of data use *Microsoft Excell Software*.

Data Analysis

a. Data of Population

Table 4. Proportion of Student Choices to Islamic Education Program

DISTRICT	NUMBER OF STUDENT
LUBUKLINGGAU CITY	1443
MUSI RAWAS REGENCY	1331
TOTAL	2774
PERSENTAGE(%)	54,4

The table show that there are 1443 students in Lubuklinggau region choices islamic education program and 1331 students in Musi Rawas regency so that total of student are 2774 or 54,4% which express theirselt to choose Islamic Higher School of Bumi Silampari of Lubuklinggau if their register in this college.

b. Sample Data

DISTRICT	NUMBER OF SAMPLE
LUBUKLINGGAU CITY	111
MUSI RAWAS REGENCY	133
TOTAL	244
PERSENTAGE (%)	55,5

The table show that there are 111 students choices islamic education program in lubuklinggu city and 133 students in Musi Rawas regency so that total of students choices of Islamic Education Program are 244 person or 55,5%.

c. Standar Of Error

$$\begin{aligned}
 SE &= \frac{\sqrt{P(1-P)}}{N} \\
 &= \frac{\sqrt{0,5545(1 - 0,5545)}}{440} \\
 &= \frac{\sqrt{0,24702975}}{440} \\
 &= \sqrt{0,0005614321} \\
 &= 0,02369954
 \end{aligned}$$

d. Interval Of Estimation

$$\begin{aligned}
 \hat{p} - Z_{\alpha/2} \frac{\sqrt{\hat{p}(1-\hat{p})}}{n} &< p < \hat{p} + Z_{\alpha/2} \frac{\sqrt{\hat{p}(1-\hat{p})}}{n} \\
 &= 0,05545 (1,96) \frac{\sqrt{0,05545(1-0,05545)}}{440} \\
 &= 0,05545 (1,96) \sqrt{0,0005614321} \\
 &= \\
 &= 0,05545 (1,96) \quad 0,02369954 \\
 &= 0,05545 - 0,046451 \\
 &= 0,5080
 \end{aligned}$$

$$\begin{aligned} &= 0,05545 (1,96) \sqrt{\frac{0,05545(1-0,05545)}{440}} \\ &= 0,05545 (1,96) \sqrt{0,0005614321} \\ &= 0,05545 (1,96) \quad 0,02369954 \\ &= 0,05545 + 0,046451 \\ &= 0,6011 \end{aligned}$$

Based on the statistical computation above it is found that the calculation of interval estimation is in 0,5080 to 0,6011 Whereas proportion of population is 0,544 and standar of error is 0,0464. The number of SE 0,0464 is still lower than margin of error so that there is no biased on estimation.

Conclusion

From data analysis is concluded that stratified caluster sampling technique have estimated acuratly parameter of population so that this technique produced unbiased estimator.

BIBLIOGRAPHY

- AROPI. 2009. *Bagaimana Merancang dan Membuat Survey Opini Public*. AROPI: Jakarta.
- Asra, Abuzar dan Ahmad Prasetyo. 2015. *Pengambilan Sampel Dalam Penelitian Survey*. Raja Grafindo Persada : Jakarta.
- Adi, Joko Nursiyono. 2014. *Kompas Teknik Pengambilan Sampel*. In Media: Bogor.
- Hasan, Iqbal. 2012. *Pokok-Pokok Materi Statistik 2 (statistik inferensial)*. Bumi Aksara: Jakarta.
- Iskandar,. 2008. *Metodologi Penelitian Pendidikan dan Sosial Kuantitatif dan Kualitatif*. GP Press: Jakarta.
- Isgiyanto, Awal. 2009. *Teknik Pengambilan Sampel pada Penelitian Non-Eksperimental*. Mitra Cendekia: Yogyakarta.
- Morissan dkk,. 2012. *Metode Penelitian Survey*. Kencana Prebada Media Grup: Jakarta.
- Nirmawati, Umidan Dadang Munandar. 2008. *Teknik Sampling: Teori dan Praktek dengan menggunakan SPSS 15*. Gava Media: Yogyakarta.
- “OpenEpi -- Sample Size Calculation for Cross-Sectional, Cohort, and Clinical Trials,” accessed September 10, 2018, <http://web1.sph.emory.edu/users/cdckms/samplesize%20icc%20deff2.html>.
- Sugiarto dkk,. 2017. *Teknik Sampling*. Garamedia Pustaka Utama: Jakarta.
- Subaris, Heru dan Yasril. 2013. *Teknik Sampling untuk Penelitian Kesehatan*. Graha Ilmu: Yogyakarta.
- Saeful, Asep Muhtadi dan Agus Ahmad Safei. 2003. *Metode Penelitian Dakwah*. Pustaka Setia: Bandung.