Report
on
Pooling of Central and State Sample Data
of
NSS 69thRound

SCHEDULE 1.2 : Drinking Water, Sanitation, Hygiene, Housing Condition and
SCHEDULE 0.2 : Survey on Slums

(MIZORAM)

DIRECTORATE OF ECONOMICS & STATISTICS, MIZORAM : AIZAWL

Report on Pooling of Central and State Sample Data
of
NSS 69th Round
(July, 2012 – December, 2012)
Drinking Water, Sanitation, Hygiene, Housing Condition and Survey on Slums
Mizoram

Publisher :
Directorate of Economics & Statistics
Mizoram :Aizawl.

Copies : 200

log on to : www.desmizo.mizoram.gov.in

Printer :

P R E F A C E

The present publication **"Report on Pooling of Central and State Sample Data of NSS 69th Round - Mizoram"** is the 4th of its kind published by this Directorate.

I placed on record my appreciation for the sincere efforts of Mr. Saithanzuala, Joint Director, Mrs. Mary Lalrinchhungi, Deputy Director (NSS), Ms. B. Vanlalruati, Research Officer (NSS), Mr. Lalbiakngura, Inspector of Statistics (NSS), Mrs.H.Lalchhuanawmi, Sub-Inspector of Statistics (NSS) for the generation of data, compilation and analysis of this Document.

I hope that this publication will be of immense help to officers of the Government who are involved in planning and policy framing, economists, researchers, academicians and the general public.

(LALRIKHUMA SAILO)
Director
Economics & Statistics
Mizoram, Aizawl.

Aizawl
5th July, 2019

CONTENTS

Page

CHAPTER I

INTRODUCTION AND BACKGROUND

The National Sample Survey Office (NSSO), Ministry of Statistics and Programme Implementation (MOSPI), Government of India, since its inception in 1950 has been conducting nationwide integrated large scale sample surveys, employing scientific sampling methods to generate data and statistical indicators on diverse socio-economic aspects. During the period 1st July 2012 to 31th December, 2012, NSSO carried out an all-India socio-economic survey on**Drinking Water, Sanitation, Hygiene, Housing Condition and Survey on Slums.**The last survey on these subject was covered in NSS 65th Round (July 2008 – June 2009). .

The main objective of the survey on **Drinking Water, Sanitation, Hygiene, Housing Condition and Survey on Slums,** conducted by NSSO was to get estimates of various aspects of characteristics of living conditions necessary for decent and healthy living of the household members by developing suitable indicators based upon collected information at National and State level.

One of the objective of states participation in the NSS programme is to provide a mechanism by which sample size would be increased and pooling of the two sets of data can be done so as to enable better estimates at lower sub state level,particularly at district level. At the state level,this will result in increased precision of the estimates and at disaggregated level,estimates will be more stable. But the major benefit will be derived in the case of estimates are generated at sub- state level like NSS regions/districts. Although the need for pooling Central and State sample data was felt for quite some time and the 13th Finance Commission had also made special provision for additional funds in each district to carry out this exercise, little progress was made in this respect in terms of evolving a uniform methology of pooling and also testing for poolability of the two sets of data. While some states, of their own, pooled the results of Centraland State samples for a few NSS rounds, there was a complete lack of uniformity in their approach which resulted in a loss of comparability of such pooled data. It was against this backdrop that the National Statistical Commission appointed a professional committee under the Chairmanship of Dr. R. Radhakrishna, Ex- Chairman, National Statistical Committee (NSC) to examine the issues. The Committee in its report gave a detailed methodology for pooling and also the tests for poolability.

Following the recommendations of Committee,DPD took initiative to provide all kind of technical guidance and support to states in pooling their data. DPD organized two workshops on “Pooling Central and States sample NSS data” at New Delhi in January and August 2013. A total of about 40 officers from 17 different States participated in the first pooling Workshop. During the second workshop, a total of 30 officers from 12 different states participated. Detailed procedure of carrying out poolability test of two sets of data – both parametric and non- paramedic and also of computation of district-level pooled estimates for a set of important indicators were shown and discussed with the States in the states in the said workshops for NSS 66th round survey. DPD took its own initiative to develop customised software for poolability tests of two set two sets of data which can be applied to data of any NSS Rounds. Tabulation Software for pooling in the central and state sample data of NSS 66th samples round based upon key parameters were developed by DPD and supplied to state DES for the pooling exercise. The customisedpoolability test software developed by DPD was also supplied to the State DES along with operational instructions so that states following layout other than central sample data layout can also conduct poolabilty test using the software at the desired level of domain. Report of the NSC Committee on pooling was also given to the States.

Subsequently, pooling workshop was merged with the regional GSDP Workshop of NAD where 2 days were devoted to the discussion/training on pooling. 5 such regional workshops were organized in 2014-2015. Hands-on training was also given to the participants in the Workshop.

During deliberations in the GSDP Workshop it was noted the importance of pooling of NSS 67th round and 68th round data of state and central sample data as assumes even greater significance for its use in the National Accounts Statistics. Generating estimates of GVA per worker based on NSS 67th round data and estimated worker (principal + subsidiary status)based on NSS 68th round data by compilation category after pooling the two sets of data is need of the hour as these two parameters are vital for estimating GVA by Labour Input method used in National Accounts Statistics. The workshop on “Methodology for poolability and pooling of NSS data of 67th round” was then held at Sardar PatelBhawan during 18-19 June, 2015 where estimate of worker and GVA per worker was attempted at sector and state level apart from other key parameters at district level after pooling the two sets of data. 50 officers from 22 different States participated in the Workshop , besides officers from D.P. Centres , DPD Head Quarter and CPD.

Parameters considered for pooling:

Considering the smaller sample size at district level the following broad parameters were considered for pooling.

a) District-wise estimated Average Floor Area per dwelling
b) District-wise estimated Housing Condition (Structure Type)

1.1 Testing the poolability of two sets of data:

District-wise following tests were undertaken.

a) District-wise Wald-Wolfowitz run test for Housing Conditionbetween Central and State sample [non parametric Z-test]
b) District-wise divergence test for Floor Area of each Household between Central and State sample[parametric Z-test]
c) District-wise Mean Test for Floor Area of each Household [parametric Z-test]
d)

1.2 Methodology of pooling:

Two alternate methods are used in pooling the central and state sample data.

a) **Weighting by Matching ratio:** Building aggregate estimate of pooled sample in proportion matching ratio m:n of central and state sample aggregate estimate where m and n are the allotted sample for central and state sample separately for rural and urban sector. Building ratio estimate of pooled sample as ratio of aggregate estimates.
b) **Weighting by inverse of variance:** Ratio estimates are built by weighting the ratio estimate of central and state sample in proportion to inverse of variance of ratio of the central and state sample.

1.3 Presentation of results:

Summary statements of results are placed in the document both for poolabilty test and pooled results for Mizoram state. Details results are also available in excel sheet and print files generated through the pooling software

1.4 Sample size: Total sample size of Mizoram State for central and state sample are given below:

RURAL

Central sample				State sample			
FSUs Allotted	FSUs Surveyed	Household Selected	Household Surveyed	FSUs Allotted	FSUs Surveyed	Household Selected	Household Surveyed
48	**48**	**576**	**576**	**48**	**48**	**576**	**576**

URBAN

Central sample				State sample			
FSUs Allotted	FSUs Surveyed	Household Selected	Household Surveyed	FSUs Allotted	FSUs Surveyed	Household Selected	Household Surveyed
48	**48**	**576**	**576**	**48**	**48**	**576**	**576**

ALL (Rural + Urban)

Central sample				State sample			
FSUs Allotted	FSUs Surveyed	Household Selected	Household Surveyed	FSUs Allotted	FSUs Surveyed	Household Selected	Household Surveyed
96	**96**	**1152**	**1152**	**96**	**96**	**1152**	**1152**

ALL (Central + State) + (Rural + Urban)

FSUs Allotted	**FSUs Surveyed**	**Household Selected**	**Household Surveyed**
192	**192**	**2304**	**2304**

CHAPTER II
SUMMARYFINDINGS

Chi-Square Test and MeanTest wasdoneover Average floor Areaper dwelling and Run Test was done over Housing Condition (structure type)for testingthepoolabilityofCentral sampleand State sample data for Rural and Urban Sectors.Districtsforwhichpoolabilitywasrejectedby theabovementionedtestsis givenbelow :

Table2.1 :Number ofDistricts for which Poolabilitywas rejectedover Structure Type and Floor AreabyRun Test usingZ-statistics(one-sided)and Mean Test and Chi-Square Test.

District Code	District	Rural Sector		Urban Sector	
Run Test					
1	MAMIT	-11.87	Y	-6.71	Y
2	KOLASIB	-9	Y	-9.64	Y
3	AIZAWL	-13.71	Y	-23.94	Y
4	CHAMPHAI	-11.87	Y	-9.64	Y
5	SERCHHIP	-9.64	Y	-9.64	Y
6	LUNGLEI	-13.71	Y	-13.75	Y
7	LAWNGTLAI	-13.75	Y	-	-
8	SIAHA	-9.64	Y	-6.71	Y
Mean Test					
1	MAMIT	0.56	Y	0.03	Y
2	KOLASIB	1.01	Y	0.55	Y
3	AIZAWL	0.43	Y	4.26	N
4	CHAMPHAI	0.60	Y	0.31	Y
5	SERCHHIP	0.81	Y	5.42	N
6	LUNGLEI	0.56	Y	1.53	Y
7	LAWNGTLAI	0.69	Y	-	-
8	SIAHA	0.49	Y	0.29	Y
Chi-Square Test					
1	MAMIT	0.56	Y	12.89	N
2	KOLASIB	1.01	Y	17.5	N
3	AIZAWL	0.43	Y	4.11	Y
4	CHAMPHAI	0.60	Y	1.19	Y
5	SERCHHIP	0.81	Y	1.09	Y
6	LUNGLEI	0.56	Y	0.27	Y
7	LAWNGTLAI	0.69	Y	-	-
8	SIAHA	0.49	Y	0	Y

Notes :
During 69th Round Survey, Lawngtlai Town was not yet declared as 'Notified Town', so there were 7 Districts for Urban Sample and the Total Districts come up to 7 as indicated above.

CHAPTER- III

TESTING POOLABILITYAND METHODOLOGYFORPOOLING

1 Testing Poolability ofcentral andstatesample

1.1 Thoughthecentralsampleandstatesamplearedrawnindependentlyfollowing identicalsamplingdesignwithsameconcepts, definitionsandinstructionstocollect thestate sampledataunitleveldatainsomecasesarenotproperly validated.Thereisalsoexpectedagency biasinthetwosetsofdatageneratedby differentagencies.Assuchthey cannotbemergedfor generating pooledestimatewithouttesting thatthesamplesarerealizedfromidenticaldistribution function.Sincetheparametricdistributionofthesamplemeanisunknownonemay adoptnon-parametric testssuchRuntest,Mediantest,chi-squaretestetctotestthatthesamplesarecoming fromidentical distribution function.

1.2 Mediantest

1.2.1 Instatistics,themediantestisaspecialcaseofPearson'sChi-squaretest.Itteststhe null hypothesisthatthe mediansofthe populationsfrom which two samplesare drawn, are identical.Observationsineachsampleareassignedtotwogroups,oneconsisting ofdatawhose valuesarehigherthanthemedianvalueinthetwogroupscombined,andtheotherconsistingof datawhosevaluesareatthemedianor below.APearson'sChi-square testisthenusedtodetermine whether theobservedfrequenciesineachgroupdiffer fromexpectedfrequenciesderivedfroma distributioncombiningthe two groups.

Letm^* bethemedianofthepooledsampledata.Construct2X2contingencytableasbelowand use chi-squaretest if Statesample and Central samplehaveidentical median.

Sample-type	**no ofsample observation**		**Total**
	<= m^*	**>m^***	
StateSample	N_{11}	N_{12}	$N_{1.}$
Central Sample	N_{21}	N_{22}	$N_{2.}$
Total	$N_{.1}$	$N_{.2}$	$N_{..}$

Observedfrequencyof each cellO_{ij}=N_{ij}wherei= 1 to 2, j= 1 to 2.

Expected frequencyofeach cellE_{ij}=($N_{i.}$*$N_{.j}$)/$N_{..}$wherei=1 to 2, j=1 to 2.

2

χ^2 **Value=**$\sum_{i=1}^{2}\sum_{j=1}^{2}(O_{ij}-E_{ij})^2/O_{ij}$**with degrees offreedom= (2-1)*(2-1)= 1**

Thestatisticalpowerofthistestmaysometimesbeimprovedbyusingavalueotherthanthe mediantodefinethegroupssay quintileclasses–thatis,byusingavaluewhichdividesthegroups into morenearlyequalgroups than the median would.

1.3 Multinomialdistributiontest orχtest

For discrete data suchasstatusof activity,educationallevelandcategoricalvariable such asland possedetc, standard tests of equality of sample proportions of two sets of data based on multinomialdistributions,relevantchi-squaretestsmay beusedaftergroupingthe attributes/categorical variables in to a suitable number of classes so that each class contains adequatenumberofsampleobservations.Construct2Xkcontingency tableforkclassesatthe domainwhere twosets of dataare tobe pooledasbelowandusechi-square testifState sampleand Central samplehaveidentical distribution.

Sample-type	**no ofsample observation**					**Total**
	Class-1	Class-2	...	Class-k-1	Class-k	
StateSample	N_{11}	N_{12}	...	N_{1k-1}	N_{1k}	$N_{1.}$
Central Sample	N_{21}	N_{22}	...	N_{2k-1}	N_{2k}	$N_{2.}$
Total	$N_{.1}$	$N_{.2}$	...	$N_{.k-1}$	$N_{.k}$	$N_{..}$

Observedfrequencyof each cellO_{ij}=N_{ij}wherei= 1 to 2, j= 1 to k.

Expected frequencyofeach cellE_{ij}=($N_{i.}$*$N_{.j}$)/$N_{..}$wherei= 1 to 2, j=1 to k.

χ^2 **Value=**$\sum_{i=1}^{2}\sum_{j=1}^{2}(O_{ij}-E_{ij})^2/O_{ij}$**with degrees offreedom= (2-1)*(k-1)= k-1**

1.4 Wald-Wolfowitzruntest

1.4.1 SupposeXandYareindependentrandomsampleswithcumulativedistributionfunction (CDF)as$F_S(x)$and$F_C(y)$.NullHypothesistobetestedisH_0:$F_S(x)$= $F_C(x)$forallxagainst alternativeHypothesisisH_1: $F_S(x)$<= $F_C(x)$ forallx and$F_S(x)$<$F_C(x)$forsomex. Letx_1, x_2,…..,$x_m$beiidobservationfromstatesamplewithdistributivefunction$F_S$andy_1,y_2,…..,$y_n$be iidobservationfromcentralsamplewithdistributive functionF_C.Poolthe data andorder themwith respecttocomparablecharacteristicunder considerationsay monthlypercapitaexpenditure (MPCE).In thepooled order sequenceput“1”forX and“0” for Y.LetUbethe totalruns observed where 'run'is a sequence of adjacent equal symbols. For example, following sequence: 1111000111001111110000 isdivided insixruns,threeofthem aremadeoutof “1”and theothers aremadeout of “0”. ThenumberofrunsU isarandom variablewhosedistribution forlargesample can betreatedas normalwith:

mean: $$\frac{2mn}{m+n}+1$$

variance: $$\frac{2mn(2mn-m-n)}{(m+n)^2(m+n-1)}$$

AfternormalizingthevariableUonemay useonesidedz-testfortestingtheNullhypothesis.In extremecasethevalueofUwillbe2meaning by observedcharacteristicofalltheobservationof onesample is less than theothersamples.

1.4.2 Oneofthelimitationsofthistestiswhenthereisatiebetweentwosamplesinthe observedvalue.Onehastoresolve tiesinusualmanner.However ifthere islarge number of ties whichisboundtooccurspeciallyforqualitativeattributeslikeeducationlevel,activity statusetc, thistestisnotrecommended.Thistestcanbewellappliedfor acontinuousvariablesuchasMPCE which areless proneto ties. Fordiscrete variablechi-squaretest is recommended.

1.5 Parametric test

1.5.1 **Aggregateestimate**:Lett$_{yc}$andt$_{ys}$betheestimateofYatdomainlevelofpooling basedoncentralandstatesamplerespectively withcorrespondingvariancesV(t_{yc})andV(t_{ys}).For largesample,makingallassumptionofparametrictest,onemay useZ-Statistictotestthenull hypothesis H0E(t_{yc})=E(t_{ys}) where E stands for expectation.

$$\mathbf{Z=}\quad \frac{(t_{yc}-t_{ys})}{\sqrt{(V(t_{yc})+V(t_{ys}))}}$$

V(t_{yc})and V(t_{ys}) couldbeestimated as

$$\hat{V}(t_{yc})=\sum_{l}(t_{yc1}-t_{yc2})^2/4\ ,\ \hat{V}(t_{ys})=\sum_{l}(t_{ys1}-t_{ys2})^2/4$$ based onsub-sample 1 &2

estimateswhere$\sum_{l}$ standsforsummingoverstratumxsub-stratumlevel varianceat thedomainof pooling.

1.5.2 **Estimateofrate**:Letr$_c$andr$_s$betheestimateofpopulationratesR$_c$andR$_s$ieY/X basedoncentralandstatesamplerespectively withcorrespondingmeansquareerrorMSE(r_c)and MSE(r_s).Forlargesample,makingallassumptionofparametrictest,onemayuseZ-Statisticto test thenullhypothesis H0E(r_c)=E(r_s)whereE stands for expectation.

$$\mathbf{Z=}\quad \frac{(r_c-r_s)}{\sqrt{(MSE(r_c)+MSE(r_s))}}$$

MSE(r_c)and MSE(r_s)are estimated asfollows:

$$mse(r_c)= (\hat{V}(t_{yc})- 2 * r_c \hat{Cov}(t_{yc},t_{xc})+r_c^2*\hat{V}(t_{xc}))/t_{xc}^2$$

$$mse(r_s)=(\hat{V}(t_{ys})- 2 * r_s \hat{Cov}(t_{ys},t_{xs})+ r_s^2 *\hat{V}(t_{xs}))/t_{xs}^2$$

where

^

$\hat{V}(t_{yc})=\sum_l (t_{yc1}-t_{yc2})^2/4$, $\hat{V}(t_{ys})=\sum_l (t_{ys1}-t_{ys2})^2/4$

$\hat{V}(t_{xc})=\sum_l (t_{xc1}-t_{xc2})^2/4$, $\hat{V}(t_{xs})=\sum_l (t_{xs1}-t_{xs2})^2/4$

$\hat{Cov}(t_{yc},t_{xc})=\sum_l (t_{yc1}-t_{yc2})(t_{xc1}-t_{xc2})/4$ based on sub-sample1 &2estimates.

where $\sum_l$ standsforsummingoverstratumxsub-stratumlevelvariance,covarianceatthedomain ofpooling.

2 Methodology forpooling

2.1 Pooling by inverseweight ofthevarianceofthe estimates

2.1.1 Aggregateestimate:Foranycharacteristic,considerthestatesample[s]intheform oftwoindependentsub-samples1ands2andthecentralsample [c]inthe formoftwoindependent sub-sample c1andc2.Basedonthis,therespective estimatesfor stateandcentralcanbecomputed as:

$t_s=\sum_l (t_{s1}+t_{s2})/2$ and $t_c=\sum_l (t_{c1}+t_{c2})/2$

Pooledestimateleadingtooptimumcombinationofthesetwoestimatesisgivenbyweighingwith inverseof thevarianceofthe estimate. Thus the pooledestimateis given by:

$$T_p=\frac{V(t_c)t_s+V(t_s)t_c}{V(t_c)+V(t_s)} \quad \text{with} \quad V(T_p)=\frac{V(t_c)V(t_s)}{V(t_c)+V(t_s)}$$

Ingeneral $V(t_c)$ and $V(t_s)$ areunknown and can be estimatedas

$\hat{V}(t_c)=\sum_l (t_{c1}-t_{c2})^2/4$, $\hat{V}(t_s)=\sum_l (t_{s1}-t_{s2})^2/4$

where $\sum_l$ standsforsummingover stratumxsub-stratumlevel variance at thedomain ofpooling.

Thus pooled estimate and estimateof pooled varianceisgiven by

$$\hat{t}_p=\frac{\hat{V}(t_c)t_s+\hat{V}(t_s)t_c}{\hat{V}(t_c)+\hat{V}(t_s)}, \quad \hat{V}(t_p)=\frac{\hat{V}(t_c)\hat{V}(t_s)}{\hat{V}(t_c)+\hat{V}(t_s)}$$

2.1.2 By virtue of weighing the two estimates at the domain level at which two estimates are pooled, the pooled estimate will always lie between the central and state sample estimates.

2.1.3 Estimateofrate:Let r_c and r_s betheestimateof R_c and R_s ieY/Xbasedoncentral andstate samplerespectively withcorrespondingestimatedmeansquareerrormse(r_c)andmse(r_s). Thepooled estimate and estimate of variance of pooled ratio estimate may be given by:

$$r_p = \frac{mse(r_c)r_s + mse(r_s)r_c}{mse(r_c)+mse(r_s)}, \qquad mse(r_p) = \frac{mse(r_c)mse(r_s)}{mse(r_c)+mse(r_s)}$$

Where $mse(r_c)$ and $mse(r_s)$ are calculated using formula given in para 1.5.2 above. Alternatively one can generate the pooled estimate of aggregate by inverse weight of estimate of variance obtained from central and state sample using formula given in para 2.1.1 for the characteristics x as well as y and obtain the pooled estimate of ratio as ratio of pooled estimate of aggregate. This will ensure consistency between pooled estimates of aggregate and the pooled estimate of ratio.

Let t_{xp} and t_{yp} be the pooled estimate of aggregate for the parameter X and Y. The pooled estimate of R (i.e Y/X) is given by

$r_p = t_{yp} / t_{xp}$

where $t_{yp} = a t_{yc} + b t_{ys}$ and $t_{xp} = c t_{xc} + d t_{xs}$ and (a,b),(c,d) are the estimated inverse variance weight pair of the characteristic x and y respectively.

The estimated mse of pooled ratio estimate r_p is given by:

$$mse(r_p) = (\hat{V}(t_{yp}) - 2\, r_p \widehat{Cov}(t_{yp}, t_{xp}) + r_p^2\, \hat{V}(t_{xp}))/t_{xp}^2$$

where $\hat{V}(t_{yp}) = \frac{ab}{a+b}$, $\hat{V}(t_{xp}) = \frac{cd}{c+d}$ and

$\widehat{Cov}(t_{yp}, t_{xp}) = ac\,\widehat{Cov}(t_{yc}, t_{xc}) + bd\,\widehat{Cov}(t_{ys}, t_{xs})$.

$\widehat{Cov}(t_{yc}, t_{xc}) = \sum_l (t_{yc1} - t_{yc2})(t_{xc1} - t_{xc2})/4$ based on sub-sample 1 & 2 estimates.

Similarly, $\widehat{Cov}(t_{ys}, t_{xs}) = \sum_l (t_{ys1} - t_{ys2})(t_{xs1} - t_{xs2})/4$

where $\sum_l$ stands for summing over stratum x sub-stratum level covariance at the domain of pooling.

2.1.4 Method laid down in para 2.1.1 and 2.1.2 requires calculation of estimate of variance of the estimates before pooling them. Reliability of estimate of variance should be ascertained with due consideration of sample size. Besides the complex calculations of variances and covariances for each cell of the table, one needs to address the issue of non-additivity of the component estimates with the estimate of marginal total. For e.g. pooled estimate of MPCE of FOOD and NON-FOOD may not add up to MPCE of TOTAL. To obviate this problem one may generate the pooled estimates of components first and then derive the estimate of total as sum of estimates of components.

$V(tc) + V(ts)$

2.2 Pooling by simple averageofthe estimates

2.2.1 ManyoftheStatesarenotfullyequippedwithcomplexcalculationofestimateof varianceespecially whencellsofthetablecontainsratio oftwocharacteristicswhichisusually presented inthe NSSreports. Whenthe State'sparticipationisequalmatching ofcentralsamples, thesimpleaverageoftwoestimatesmay bea way ofcombiningtheestimatesconsideringcentral and statesamples as independent samples. The pooledestimate will always lie between the estimates based on central and statesample separately.

2.2.2 When the State's participation is of unequal matching of central samples, the weightedaverageoftwoestimateswithweightsbeingmatchingratioofcentralandstatesample may be a better way of combining the estimates considering central and state samples as independentsamples.Forany characteristic,considerthestatesample[s]intheformoftwo independentsub-samples1ands2andthe centralsample[c]intheform oftwoindependentsub-sample c1andc2.Letmatchingratioofstateand centralsample bem:n.Basedonthis,the respectiveestimates forstate and central can be computed as:

$t_S=\sum(t_{S1}+t_{S2})/2andt_C = \sum(t_{C1}+t_{C2})/2$

//

Pooledestimateofthesetwoestimatesisgivenbyweighingwithmatchingparticipationratem:n. Thus the pooled estimateis given by:

In general $V(t_c)$ and $V(t_s)$ can be estimated as $\boldsymbol{V(t_c)= \sum (t_{c1}-t_{c2})^2/4}$

Thepooledestimatewillalwaysliebetweenthe estimatesbasedoncentralandstatesample separately.

2.3 Summingup: ForthosecharacteristicswhichareknowntobedistributedasNormal, poolabilityofthetwosetsofcentralandstatedatamaybetestedbystandardparametrictestssuch asZ-test.Forthosecharacteristics forwhich transformation makes them Normal, such methodology maybeadopted.Inmostofthesituationswherethedistributionisnon-normalandunknown,the twosetsofdatamay betestedthroughvariousnon-parametrictestssuchasthoselaiddowninpara 1 ofabove. For discrete data, Standard tests of equality of proportions based on binomial distribution maybeusedand for multinomial distributions relevant chi-squaretests maybeuse

Chapter-IV

Result of Poolability Test

State: MIZORAM Sector: RURAL			RUN TEST
Table-0.1 (R): District-wise result of run test of Average Floor Area (per household) for Pooled sample $Z_{0.01}$= - 2.33 [one sided test] reject if z-value >$Z_{0.01}$			
District Code	**District Name**	**Z-value**	**Accept**
1	Mamit	-11.87	Y
2	Kolasib	-9	Y
3	Aizawl	-13.71	Y
4	Champhai	-11.87	Y
5	Serchhip	-9.64	Y
6	Lunglei	-13.71	Y
7	Lawngtlai	-13.75	Y
8	Siaha	-9.64	Y

State: MIZORAM Sector: URBAN			RUN TEST
Table-0.1 (R): District-wise result of run test of Average Floor Area (per household) for Pooled Sample $Z_{0.01}$= - 2.33 [one sided test] reject if z-value >$Z_{0.01}$			
District Code	**District Name**	**Z-value**	**Accept**
1	Mamit	-6.71	Y
2	Kolasib	-9.64	Y
3	Aizawl	-23.94	Y
4	Champhai	-9.64	Y
5	Serchhip	-9.64	Y
6	Lunglei	-13.75	Y
8	Siaha	-6.71	Y

State: MIZORAM Sector: RURAL		MEAN TEST	
Table-0.1 (R): District-wise result of mean test of Average Floor Area (per household)for Pooled Sample$Z_{0.005}$= 2.575 [one sided test] reject if z-value >$Z_{0.005}$			
District Code	**District Name**	**Z-value**	**Accept**
1	Mamit	0.56	Y
2	Kolasib	1.01	Y
3	Aizawl	0.43	Y
4	Champhai	0.60	Y
5	Serchhip	0.81	Y
6	Lunglei	0.56	Y
7	Lawngtlai	0.69	Y
8	Siaha	0.49	Y

State: MIZORAM Sector: URBAN		MEAN TEST	
Table-0.1 (R): District-wise result of mean test of Average Floor Area (per household)for Pooled Sample $Z_{0.005}$= 2.575 [one sided test] reject if z-value >$Z_{0.005}$			
District Code	**District Name**	**Z-value**	**Accept**
1	Mamit	0.03	Y
2	Kolasib	0.55	Y
3	Aizawl	4.26	N
4	Champhai	0.31	Y
5	Serchhip	5.42	N
6	Lunglei	1.53	Y
8	Siaha	0.29	Y

State: MIZORAM Sector: RURAL			CHI - SQUARE TEST
Table-0.1 (R): District-wise result of chi-square test of Housing Condition (Structure Type)for Pooled sample $X^2_{0.01}$= 9.21 [one sided test] reject X^2-value>$X^2_{0.01}$			
District Code	**District Name**	**Z-value**	**Accept**
1	Mamit	1.36	Y
2	Kolasib	6.63	Y
3	Aizawl	7.7	Y
4	Champhai	0.38	Y
5	Serchhip	0.19	Y
6	Lunglei	7.99	Y
7	Lawngtlai	0.09	Y
8	Siaha	1.27	Y

State: MIZORAM Sector: URBAN			CHI - SQUARE TEST
Table-0.1 (R): District-wise result of chi-square test of Housing Condition (Structure Type)for Pooled sample$X^2_{0.01}$= 9.21 [one sided test] reject X^2-value>$X^2_{0.01}$			
District Code	**District Name**	**Z-value**	**Accept**
1	Mamit	12.89	N
2	Kolasib	17.5	N
3	Aizawl	4.11	Y
4	Champhai	1.19	Y
5	Serchhip	1.09	Y
6	Lunglei	0.27	Y
8	Siaha	0	Y

Chapter- V
Pooled Results of Schedule 1.2

State: MIZORAM Sector: RURAL **Pooling method: MATCHING RATIO**

Table-(R): District-wise estimated no. of household by Types of structure

District Code	Pucca			Semi-Pucca			Katcha		
	Central	State	Pool_mr	Central	State	Pool_mr	Central	State	Pool_mr
1	461	620	548	367	206	279	172	174	173
2	806	573	677	116	221	174	78	206	149
3	731	813	771	217	165	192	52	22	37
4	836	888	858	134	96	118	30	16	24
5	836	903	869	164	97	131	0	0	0
6	449	472	460	168	112	141	383	415	399
7	281	303	292	259	275	267	460	422	441
8	513	580	547	231	200	215	256	220	238
All	574	609	591	213	178	196	213	213	213

State: MIZORAM Sector: URBAN **Pooling method: MATCHING RATIO**

Table-(U): District-wise estimated no. of household by Types of structure

District Code	Pucca			Semi-Pucca			Katcha		
	Central	State	Pool_mr	Central	State	Pool_mr	Central	State	Pool_mr
1	383	949	662	387	51	221	230	0	117
2	717	957	840	283	43	160	0	0	0
3	955	991	972	45	9	28	0	0	0
4	759	885	820	241	105	175	0	10	5
5	992	1000	996	8	0	4	0	0	0
6	884	920	900	98	66	84	17	15	16
8	1000	1000	1000	0	0	0	0	0	0
All	892	969	929	97	28	64	11	3	7

State: MIZORAM Sector: ALL									Pooling method: MATCHING RATIO
Table-(A): District-wise estimated no. of household by Types of structure									
District Code	**Pucca**			**Semi-Pucca**			**Katcha**		
	Central	**State**	**Pool_mr**	**Central**	**State**	**Pool_mr**	**Central**	**State**	**Pool_mr**
1	441	690	574	372	173	265	187	137	160
2	751	793	773	219	119	166	30	88	61
3	899	947	922	88	48	69	13	5	9
4	810	887	845	169	99	138	20	14	17
5	913	948	930	87	52	70	0	0	0
6	637	655	645	138	93	117	225	252	238
7	281	303	292	259	275	267	460	422	441
8	690	682	686	147	151	149	163	166	165
All	729	778	753	156	108	133	115	114	114

State: MIZORAM									Sector: RURAL
Table-(R): District-wise estimated average floor Area of one dwelling and their RSE for Central, State and Pooled Sample.									
District Code	**District Name**	**Average Floor Area**				**RSE of Average Floor Area per dwelling**			
		central	**state**	**Pool_mr**	**Pool_iv**	**central**	**state**	**Pool_mr**	**Pool_iv**
1	Mamit	51.05	54.87	53.14	51.38	3.96	11.99	6.48	3.76
2	Kolasib	77.07	66.67	71.3	70.23	10.82	9.02	7.21	6.95
3	AizawlCham	50.73	54.76	52.68	53.80	16.16	8.35	8.91	7.42
4	Champhai	61.63	56.02	59.18	61.39	3.19	16.44	7.96	3.13
5	Serchhip	51.72	59.15	55.42	55.58	12.80	10.77	8.29	8.26
6	Lunglei	41.74	43.87	42.75	42.94	6.81	5.71	4.43	4.38
7	Lawngtlai	70.27	59.53	64.88	63.04	18.29	15.05	12.07	11.66
8	Siaha	98.89	107.03	103.10	102.27	10.93	11.97	8.13	8.08
All		60.50	60.39	60.45	60.44	5.33	4.76	3.57	3.55

State: MIZORAM						Sector: URBAN			
Table-(U): District-wise estimated average floor Area of one dwelling and their RSE for Central, State and Pooled Sample.									
District Code	**District Name**	**Average Floor Area**				**RSE of Average Floor Area per dwelling**			
		central	**state**	**Pool_mr**	**Pool_iv**	**central**	**state**	**Pool_mr**	**Pool_iv**
1	Mamit	51.40	56.44	53.88	51.40	0.30	16.32	8.55	0.30
2	Kolasib	47.80	80.37	64.45	54.82	7.42	8.42	5.93	5.73
3	AizawlCham	61.64	64.26	62.91	64.00	12.89	4.12	6.66	3.92
4	Champhai	54.45	62.86	58.48	62.00	2.70	0.79	1.33	0.76
5	Serchhip	49.09	46.38	47.81	46.43	3.58	0.50	1.85	0.50
6	Lunglei	47.98	50.37	49.06	49.13	12.13	11.98	8.54	8.53
8	Siaha	83.57	73.43	79.74	81.31	4.42	9.38	4.90	4.00
All		58.14	62.98	60.45	62.33	7.92	2.88	4.09	2.71

State: MIZORAM						Sector: ALL			
Table-(A): District-wise estimated average floor Area of one dwelling and their RSE for Central, State and Pooled Sample.									
District Code	**District Name**	**Average Floor Area**				**RSE of Average Floor Area per dwelling**			
		central	**state**	**Pool_mr**	**Pool_iv**	**central**	**state**	**Pool_mr**	**Pool_iv**
1	Mamit	51.14	55.20	53.31	51.42	2.96	10.03	5.38	2.84
2	Kolasib	59.06	74.52	67.24	68.18	9.72	6.42	5.56	5.39
3	AizawlCham	58.93	61.91	60.37	61.55	10.94	3.83	5.69	3.62
4	Champhai	59.26	58.55	58.94	59.22	2.55	10.10	5.18	2.47
5	Serchhip	50.43	53.23	51.79	51.88	6.91	6.31	4.67	4.66
6	Lunglei	44.44	46.53	45.41	45.44	6.53	6.53	4.63	4.62
7	Lawngtlai	70.27	59.53	64.88	63.04	18.29	15.05	12.07	11.66
8	Siaha	93.33	98.83	95.94	95.16	7.54	10.07	6.35	6.04
All		59.35	61.61	60.45	60.96	4.67	2.85	2.71	2.43

Abbreviations used in this Report

RSE	: Relative Standard Error
IV	: Inverse of Variance
MR	: Matching Ratio
R	: Rural
U	: Urban
A	: All