SMALL AREA ESTIMATION OF UNEMPLOYMENT

Maria Elena Gonzalez, Office of Management and Budget
Christine Hoza, Bureau of the Census

Unemployment statistics for small areas, such as States, Standard Metropolitan Statistical Areas (SMSA's) and counties, are needed for intercensal periods as well as at the time of the decennial census. Not only are unemployment statistics requested by the user population at large, but the Department of Labor is required by the Comprehensive Employment and Training Act of 1973 to prepare annual unemployment estimates for States, SMSA's and even smaller areas such as those of 50,000 population; these data are used for funding special manpower programs.

It is recognized that the techniques being used at present for small area estimates of unemployment need to be improved. This paper will analyze two alternative techniques which might be used to obtain small area estimates of unemployment. The methodology developed here might well be applied to obtain statistical estimates other than unemployment estimates.

Research on alternative methodologies for intercensal estimates of unemployment

Based on the 1970 Census of Population, we derived alternative synthetic estimates of unemployment for all counties in the United States. The synthetic estimate of the unemployment rate for a county is a weighted sum of the unemployment rates of the geographic division where the county is located; the weights correspond to the distribution of the labor force in the given county. A synthetic estimate for county i, u_i^*, is defined as follows:

$$u_i^* = \sum_{j=1}^{G} p_{ij} \, u_{.j} \qquad (1)$$

where

p_{ij} is the proportion of the labor force of county i that corresponds to cell j (j= 1,..., G). The population is classified into G mutually exclusive and exhaustive groups. This estimate is based on the 1970 census data.

$u_{.j}$ is the unemployment rate for population cell j based on the geographic division in which the county is located. For the 1970 synthetic estimates computed, these estimates were based on the 1970 census data; however, for intercensal estimates the data from the CPS could be tabulated to produce the desired estimates.

Synthetic estimates are a particular kind of regression estimate, where the regression line passes through the origin. The specific regression equation would use the p_{ij}'s as independent variables and $u_{.j}$ would be the coefficients obtained by fitting a weighted least squares regression to the unemployment rate for each county within the geographic division. The weight used for the regression would be the size of the labor force in each county.

Synthetic estimates are biased estimates. For small areas, such as counties, bias occurs because the divisional unemployment rates by race and sex differ from the county rates for most of the counties although, of course, the division rates are the weighted averages of the county rates. Also, the proportion of the labor force in each category may have changed since 1970, introducing an additional bias for intercensal synthetic estimates. That is, while the CPS estimates for the division will be unbiased estimates of the weighted county average unemployment rates, the weights should be the current numbers of the labor force and not the 1970 numbers.

For synthetic estimates referring to the time of the census the bias for the individual areas can be computed as well as the distribution of these biases. The mean square error of the synthetic estimates can be estimated and analyzed to see if the biases are approximately normally distributed.

The mean bias of the county synthetic estimates of unemployment for 1970 is -0.3 percentage points. (The weighted mean bias for all counties would be zero.) The root mean square error of the biases is 1.9 percentage points. If we assume that the biases of the synthetic estimates are approximately normally distributed, then we would expect that about two-thirds of the synthetic estimates would differ by less than 1.9 percentage points from the mean bias. In fact, about 77 percent of the synthetic estimates differ by less than 1.9 percentage points from the mean bias. Table 1 gives the distribution of the biases of the county synthetic estimates. The synthetic unemployment estimates analyzed in Table 1 are based on occupational, sex, and race categories.

Disregarding the sign of the bias, Table 1 shows that the estimated bias for about 45 percent of all counties is less than 0.9 percentage points, and for about three quarters of the counties it is less than 1.7 percentage points. For the counties in SMSA's the mean bias is 0.1 percentage points and the root mean square error is 1.1 percentage points. For about 62 percent of the counties in SMSA's the absolute value of the bias is less than 0.9 percentage points and about 90 percent of these counties have an absolute bias of less than 1.7 percentage points.

Table 2 gives the weighted correlation between alternative synthetic estimates of unemployment and the 1970 census estimate of unemployment for counties and SMSA's. The weights used are the 1970 census estimate of the labor force for the corresponding area. The correlation increases as the labor force of the area increases in size. For the synthetic estimate based on occupation-sex-race categories the correlation for all

counties in the U.S. was 0.68. If we limit the analysis to counties within SMSA's the correlation increases to 0.79. If we look at the counties with a labor force of at least 50,000 the correlation increases slightly to 0.80. Therefore, for areas with larger population the ability to predict unemployment using synthetic estimates is improved.

The correlations among the alternative synthetic estimates shown in Table 2 vary slightly. Correlations are generally somewhat higher for the estimates based on race-sex-occupation or race-sex-occupation-income than for those based on race-sex-marital status-age and race-sex-industry. Adding income does not make any appreciable change over the correlations that obtain for the race-sex-occupation classification. However, Table 3 shows a high correlation between the alternative synthetic estimates. Therefore, there will be no great difference in results depending upon which synthetic estimate is used.

Synthetic estimates of unemployment can be computed in a straightforward manner, but the biases of these estimates are not insignificant. The effect of synthetic estimates is not uniform since synthetic estimates tend to give expected values nearer the (division) mean than the true expected values for the county. Thus, the biases will tend to be greater for those counties whose unemployment rates are farther from the division mean, that is, the extreme values. 1/ For example, the standard error of the synthetic unemployment estimate based on occupation-race-sex categories for all counties is 1.0 percentage point, while the standard error of the 1970 census county estimates is 1.6 percentage points. The smaller variation of the synthetic estimates determines a significant number of large biases; Table 1 shows that for 6.7 percent of all counties the magnitude of the estimated bias of the synthetic estimates is larger than 3.3 percentage points. Since the average unemployment rate in the 1970 census was 4.4 percent, the estimated error for these counties was substantial.

Regression Estimates of Unemployment

The use of synthetic estimates in predicting unemployment is limited by the method's inability to account properly for local factors. This difficulty may be somewhat mitigated by introducing additional variables into the regression. The approach we will discuss here will be that of using the synthetic estimate as one of the independent variables in a regression equation with the CPS estimate of unemployment for individual primary sampling units (PSU's) as the dependent variable.

The independent variables to be considered are:

1. Synthetic estimates based upon the following categories--

   a. occupation-sex-race

   b. marital status-age-sex-race

2. Insured unemployment estimates for March-April 1970 taken as a percent of the estimated total unemployed reported in the 1970 census. 2/ and

3. The "70-step" annual estimate of unemployment as published in the Manpower Report of the President.

Currently, the insured unemployment data and the "70-step" estimates of unemployment are only available for 150 SMSA's in addition to the 50 States. They are available on a monthly and an annual basis.

The CPS, which is currently being revised and expanded, is a monthly survey to obtain estimates of employment and unemployment and other characteristics of the general labor force. The CPS estimates which we used are an average of five montly estimates, spaced at quarterly intervals and centered around April 1970. By matching the CPS-PSU areas with the 150 SMSA's, we identified 122 common areas and obtained regressions for these areas. The regressions were weighted by the 1970 census labor force estimate. The resulting regression equation to estimate the unemployment rate is:

$$\hat{Y} = .008 - .201\, X_1 + .680\, X_2 + .404\, X_3$$

$$\bar{R}^2 = .546$$

$$\text{Residual Mean Square} = .868 \times 10^{-4}$$

$$\text{Standard Error of Estimate} = .932 \times 10^{-2}$$

where

- Y is the average of 5 monthly CPS unemployment estimates spaced at quarterly intervals, centered on April 1970.
- X_1 is the insured unemployment as a percent of the total unemployment.
- X_2 is the final annual "70-step" estimate of unemployment rate published in the 1974 Manpower Report of the President.
- X_3 is the synthetic estimate of the unemployment rate based on marital status-age-sex-race categories.

The corresponding regression equation using the 1970 census unemployment estimate as the dependent variable is:

$$\hat{U} = .009 + .012\, X_1 + .586\, X_2 + .540\, X_3$$

$$\bar{R}^2 = .859$$

$$\text{Residual Mean Square} = .213 \times 10^{-4}$$

$$\text{Standard Error of Estimate} = .461 \times 10^{-2}$$

where

- U is the 1970 census unemployment rate estimate.

The procedure used in calculating the estimates published in the 1974 Manpower Report of the President has been revised. The new procedure developed for calculating the "70-step" estimate includes benchmarking the unemployment estimates for the 30 largest SMSA's by the CPS estimates,

our dependent variable. Therefore, we have obtained the unbenchmarked data and generated the following regression equation:

$$\hat{Y}' = .012 - .252\ X_1 + .299\ X_3 + .708\ X_4$$

$$\bar{R}^2 = .565$$

Residual Mean Square = $.833 \times 10^{-4}$

Standard Error of Estimate = $.912 \times 10^{-2}$

where

X_4 is the new final annual "70-step" estimate of unemployment before benchmarking the estimates by CPS data.

The corresponding regression equation using the 1970 census unemployment estimate as the dependent variable is:

$$\hat{U}' = -.006 + .005\ X_1 + .477\ X_3 + .564\ X_4$$

$$\bar{R}^2 = .849$$

Residual Mean Square = $.228 \times 10^{-4}$

Standard Error of Estimate = $.478 \times 10^{-2}$

Now the length of time between when an 11-month average is first available and when the final estimate (after all revisions) is available is about two years. Using the 11-month average as a preliminary "70-step" estimate, X_5, and using X_6, the synthetic estimate based on occupation-sex-race instead of X_3. we get the following regression equation:

$$\hat{Y}'' = .009 - .210\ X_1 + .640\ X_5 + .444\ X_6$$

$$\bar{R}^2 = .539$$

Residual Mean Square = $.883 \times 10^{-4}$

Standard Error of Estimate = $.939 \times 10^{-2}$

And the corresponding regression equation using the 1970 census unemployment estimate as the dependent variable is:

$$\hat{U}'' = -.008 - .011\ X_1 + .532\ X_5 + .617\ X_6$$

$$\bar{R}^2 = .872$$

Residual Mean Square = $.194 \times 10^{-4}$

Standard Error of Estimate = $.440 \times 10^{-2}$

The analysis above reflects the higher sampling variability of the CPS estimates and the lower explanatory power of the regression using these estimates, 54-56%, as compared with 85-87% using the census estimates. It also shows that by using the preliminary 11-month average "70-step" estimate of unemployment, less than 3% of the explanatory power of the regression is lost Not shown in the above analysis is the use of the one month--April 1970--CPS estimate as the dependent variable, which has an even higher sampling variability and lower explanatory power,27-30%, than the five-month average CPS estimate used.

The data in Table 4 show that the "70-step" estimates have the highest correlations with both the census unemployment estimates and the CPS estimates, excluding the correlations between equivalent variables (i.e., the two synthetic estimates and the three "70-step" estimates). A synthetic estimate and an insured unemployment variable are two variables which have low correlations between themselves, as well as relatively low correlations with the "70-step" estimates. Therefore, by adding a synthetic estimate and an insured unemployment variable as additional independent variables, the predictive power of the regression estimate is increased for the 122 SMSA's included in this analysis.

Analysis of the residuals for areas of different labor force size is shown in Table 5. The residuals analyzed correspond to two sets of regressions: in one the independent variables are X_1, X_3, X_4, and in the other set the independent variables are X_1, X_5, and X_6. For each of these sets of independent variables three alternative regressions were computed: first, the 1970 census estimate was the dependent variable; second, the CPS five-month average unemployment was used and third, the CPS April 1970 unemployment estimate was the dependent variable.

From Table 5, one can see that the prediction is better for areas with a larger labor force than for areas with a smaller labor force. With the exception of the regressions based on the 1970 census unemployment rate the standard error of the residual is monotonically increasing as the size of the labor force decreases. The standard error of the residual for the census regressions was more than twice as large for the SMSA's with a labor force under 100,000 than for the areas with a labor force of over a million. However, a similar comparison for the regressions based on CPS data shows an increase in the standard error of the residual by a factor of about five. One will also notice that the standard errors associated with the regressions based on the CPS five-month average unemployment estimates are considerably lower than those associated with the CPS April 1970 estimate. In fact, if we compare with the census regression the standard error of the residual for areas with a labor force of over a million, the standard error of the residual increased slightly, by a factor of 1.1, for the five-month CPS unemployment regression and by a factor of 1.6 for the regression based on the April 1970 CPS data. If we consider the increase in the standard error of the residual for the areas with a labor force of under 100,000, the standard error of the residual increased by a factor of about 2.5 over the census regression estimate for the five-month CPS regression and by a factor of about 4.0 for the April 1970 CPS regression

The distribution of the differences between the 1970 census unemployment rate and the regression estimates based upon the 1970 census unemployment estimates, the CPS average of five monthly estimates spaced at quarterly intervals centered around April 1970, and the April 1970 CPS estimate, is shown in Table 6 for the independent variables (X_1, X_5, X_6) as defined above.

Table 6 shows that the distribution of the differences for census unemployment is more symmetric than for either of the CPS estimates. Looking at the three different regressions between ±1 percentage points we find that for the census regression, 91.9% of the differences fall in this interval, whereas only 75.4% of the five-month CPS and 73.0% of the April 1970 CPS fall in this interval. Also, the CPS regressions tend to have a large percentage falling below -.5 percentage points--62.2% for the five-month average CPS and 59.8% for the April 1970 CPS.

The accuracy of the regression estimates of unemployment for 1970 can be tested by computing the errors of the regression relative to the 1970 census. In intercensal years one would have to modify the procedure since census figures are unavailable; however, we have estimates for the individual CPS PSU's which are subject to a high variance, but which could be used to obtain a measure of accuracy. The estimate of the mean square error of the regression relative to the true, but unobserved value is made by subtracting a multiple of the estimated within-PSU error from the mean of the squared deviations of the regression estimates. It is, therefore, important to have a good estimate of the within-PSU error, i.e., the difference between the CPS sample estimates and that which would be obtained in a census. The mean square error (MSE) of the regression estimates can be obtained by the formula:

$$MSE = E\left[\frac{(Y_o - \hat{Y})' \quad (Y_o - \hat{Y})}{n}\right] - \frac{(n-2p-2) \quad \sigma_w^2}{n}$$

where

Y_o = observed values of Y

n = number of observations

p = number of independent variables

σ_w^2 = the within-PSU error

A particular method of estimating σ_w^2 was used based upon research of Ericksen. 3/ The results obtained were:

Variables	MSE
$X_1\ X_2\ X_3$	$.405 \times 10^{-4}$
$X_1\ X_3\ X_4$	$.369 \times 10^{-4}$
$X_1\ X_5\ X_6$	$.419 \times 10^{-4}$

However, these figures for the MSE are just rough estimates since the correlations among the symptomatic indicators are higher than desirable for this particular technique of estimating σ_w^2.

Future implications for work done in small area estimation of unemployment

The work on small area estimation of unemployment presented here is based on 1970 data. At the time of a decennial census one would not seek alternative estimates of unemployment for small areas, since direct measurements are available. However, the methodology is important for making estimates in an intercensal period.

In creating synthetic estimates one must decide what characteristics of the population should be selected for the particular statistic being estimated and the number of cells to be used to obtain the estimates. Both of these questions were approached in an empirical manner in the research described in this paper. Alternative synthetic estimates based on race, sex, and on alternative characteristics such as age, marital status, income, occupation and industry were computed. The number of cells used to compute the estimates was determined empirically, trying to minimize the number of counties in which the cells would be zero. More research needs to be done in this area to determine an optimal solution to the problem.

The county synthetic unemployment estimates analyzed here were based on unemployment rates for the nine geographic divisions of the United States. Would other groupings of counties produce better results? This is an area where additional work should be done to investigate possible gains through more efficient groupings of counties.

The data suggest that the annual estimates of unemployment published by the Department of Labor might be improved by using a regression model in which the dependent variable would be the CPS PSU estimates of unemployment accumulated over different sets of months. The independent variables would include, in addition to the 70-step estimate of unemployment, insured unemployment data and synthetic estimates based on a combination of decennial census and CPS data. An additional independent variable which might be used in intercensal years is the 1970 census estimate of unemployment.

An area which must be investigated is whether quarterly estimates, based on the accumulation of three months of CPS data, would produce sufficiently reliable estimates. The number of months of CPS data to be accumulated to obtain regression estimates of unemployment should also be investigated. The analysis presented in this paper is based either on one month of CPS data (April 1970) or on the average of five months of CPS data spaced at quarterly intervals and centered on April 1970. The results show a much higher variability for the estimates based on one month of CPS data than for those based on the five-month average; furthermore, when the 1970 census data are compared with the five-month average of CPS data, the latter shows a higher variability.

The expansion of the CPS will make data available for a greater number of PSU's. In order to use this methodology, we need independent variables for the same areas. Synthetic estimates can be obtained for any area intercensally; however, the bias intrinsic to these estimates will be increased as the composition of the labor force changes in years further removed from the census year. The insured unemployment data are collected by counties within the various States;

at present, they are not summarized by individual counties. It would be necessary to expand the program to cover areas other than the 150 SMSA's if insured unemployment data were to be used. There are some technical problems in increasing the number of areas for which insured unemployment data are summarized. The other independent variable used, the 70-step estimate of unemployment prepared by the Bureau of Labor Statistics, relies heavily on the insured unemployment data. The preparation of these estimates for a great number of local areas might be a difficult program to implement.

Regression estimates of unemployment for intercensal years should be considered as viable alternatives for local area estimates of unemployment. The results of the investigations carried out with 1970 data show that the methodology gives good results. It is necessary, however, to investigate the methodology for intercensal years to determine the feasibility as well as reliability of the suggested estimation procedure.

Footnotes

1/ In a seminar given at the Bureau of the Census in March 1975, William G. Madow suggested a combination of synthetic estimates and observed values for the primary sampling units included in the CPS. The synthetic estimation procedure reduces the variance and increases the bias for these areas, but leads to a lower mean square error. A combination will give values for both variance and bias in between those for the synthetic estimate and the observed value. By proper selection of the weights in the combination, the mean square error can be made lower than for either.

2/ This estimate was chosen rather than the insured unemployment rate because when regressing the CPS estimates on our set of independent variables of interest better results were obtained using the variable described in 2 above.

3/ Ericksen, Eugene P., "Population Estimation in the 1970's: The Stakes are Higher," Institute for Survey Research, Temple University, May 1975 (unpublished report), pp. 8-16.

Acknowledgments

Robert E. Fay of the Statistical Research Division of the Bureau of the Census and Eugene P. Ericksen of Temple University contributed many ideas to the research presented here. The computational work was carried out under the leadership of George M. Heller by Quentin Ludgin, Zigmund F. Krivitsky and Diane P. Beall of the Statistical Research Division of the Bureau of the Census. The authors assume responsibility for the analysis presented in this paper.

Bibliography

Ericksen, Eugene P., "A Regression Method for Estimating Population Changes of Local Areas," Journal of the American Statistical Association, December 1974, pp. 867-875.

_____. "Population Estimation in the 1970's: The Stakes are Higher," Institute for Survey Research, Temple University, May 1975 (unpublished report).

Gonzalez, Maria Elena, and Joseph Waksberg, "Estimation of the Error of Synthetic Estimates," unpublished paper presented at the first meeting of the International Association of Survey Statisticians, Vienna, Austrial, August 18-25, 1973.

Gonzalez, Maria Elena, "Use and Evaluation of Synthetic Estimates," Proceedings of the Social Statistics Section of the American Statistical Association, 1973, pp. 33-36.

Table 1 - DISTRIBUTION OF THE BIAS OF SYNTHETIC ESTIMATES FOR COUNTIES: 1970

Size of bias (Percentage points)	Number of counties	% of counties	Counties in SMSA's	% of counties in SMSA's
Under -4.9	92	3.2	1	0.2
-4.9 to less than -4.1	39	1.3	1	0.2
-4.1 to less than -3.3	60	2.1	0	0.0
-3.3 to less than -2.5	105	3.6	6	1.3
-2.5 to less than -1.7	192	6.6	16	3.4
-1.7 to less than -0.9	333	11.5	56	12.0
-0.9 to less than -0.5	242	8.3	41	8.8
-0.5 to less than -0.3	138	4.7	26	5.6
-0.3 to less than -0.1	133	4.6	32	6.9
-0.1 to less than 0.1	159	5.5	30	6.4
0.1 to less than 0.3	164	5.6	45	9.7
0.3 to less than 0.5	144	5.0	37	7.9
0.5 to less than 0.9	317	10.9	78	16.7
0.9 to less than 1.7	506	17.4	79	17.0
1.7 to less than 2.5	220	7.6	17	3.7
2.5 to less than 3.3	58	2.0	1	0.2
3.3 to less than 4.1	5	0.2	0	0.0
4.1 to less than 4.9	1	*	0	0.0
4.9 and over	0	0.0	0	0.0
Total	2,908**	100.00	466	100.00

* Less than 0.05 percent. ** Counties with less than 5,000 population in the 1970 Census of Population were merged with a neighboring county. SMSA counties were never merged with non-SMSA counties; counties in the 1960 or 1970 CPS design were merged only with counties in the same PSU.

Table 2. WEIGHTED CORRELATION BETWEEN CENSUS AND SYNTHETIC ESTIMATES OF UNEMPLOYMENT
(The abbreivation "LF" stands for labor force.)

Area	Number of areas	Weighted correlation with synthetic unemployment estimate based on race, sex, and			
		Occupation	Marital Status-Age	Occupation-Income	Industry
All counties in U.S.*	2,908	0.682	0.569	0.685	0.588
Counties with 5,000 + LF	1,907	0.705	0.601	0.707	0.612
Counties with 10,000 + LF	1,166	0.729	0.642	0.730	0.641
Counties with 50,000 + LF	280	0.796	0.741	0.792	0.722
Counties in SMSA's **	466	0.786	0.723	0.780	0.706
SMSA's **	226	0.793	0.731	0.784	0.718

* Counties with population of less than 5,000 in the 1970 census were merged with a neighboring county. SMSA counties were never merged with non-SMSA counties; counties in the 1960 or 1970 CPS design were merged only with counties in the same PSU.

** The SMSA's analyzed include 218 SMSA's outside New England defined in August 1970. In addition, eight major New England SMSA's are included in this analysis; there were 17 smaller SMSA's in New England not included in this analysis.

Table 3. WEIGHTED CORRELATION BETWEEN SYNTHETIC UNEMPLOYMENT ESTIMATES BASED ON ALTERNATIVE CATEGORIZATIONS OF THE LABOR FORCE

Race-Sex and: / Race-Sex and:	Occupation	Marital Status-Age	Occupation-Income	Industry
Occupation	1.000			
Marital Status-Age	0.916	1.000		
Occupation-Income	0.952	0.841	1.000	
Industry	0.937	0.953	0.854	1.000

Table 4. WEIGHTED CORRELATION MATRIX BETWEEN THE VARIABLES

	X_1	X_2	X_3	X_4	X_5	X_6	Y	U
X_1	1.000							
X_2	.676	1.000						
X_3	.285	.512	1.000					
X_4	.682	.961	.574	1.000				
X_5	.666	.995	.477	.959	1.000			
X_6	.369	.584	.974	.633	.548	1.000		
Y	.372	.692	.577	.720	.682	.599	1.000	
U	.554	.851	.756	.868	.835	.810	.741	1.000

Table 5. RESIDUALS FROM REGRESSIONS: MEAN AND STANDARD ERROR

1970 census labor force	Number of SMSA's	Census unemployment		CPS-five month average unemployment		CPS-April 1970 unemployment	
		Mean residual	Standard error of residual	Mean residual	Standard error of residual	Mean residual	Standard error of residual
		(Percentage points)					
(X_1, X_3, X_4)*							
1,000,000+	9	-.18	.31	-.01	.39	-.00**	.54
500,000-999,999	17	-.02	.54	-.06	.66	.24	.88
250,000-499,999	21	.15	.36	.15	1.17	-.21	1.23
100,000-249,999	51	.14	.66	.03	1.55	.10	2.77
< 100,000	24	.37	.78	.41	1.83	-.46	2.83
(X_1, X_5, X_6)*							
1,000,000+	9	-.07	.34	.07	.38	.06	.55
500,000-999,999	17	-.10	.49	-.16	.75	.10	.90
250,000-499,999	21	-.06	.39	.06	1.23	-.28	1.37
100,000-249,999	51	.10	.61	.03	1.57	.14	2.80
< 100,000	24	.11	.71	.19	1.75	-.63	2.86

* See text for explanation of independent variables used in regressions.
** Magnitude less than .005.

Table 6. DISTRIBUTION OF DIFFERENCES BETWEEN 1970 CENSUS UNEMPLOYMENT AND REGRESSION ESTIMATES FOR 122 SMSA's

Difference classes	Census unemployment		CPS - 5-month average unemployment		CPS - April 1970 unemployment	
	No. of SMSA's	Percent of SMSA's	No. of SMSA's	Percent of SMSA's	No. of SMSA's	Percent of SMSA's
(Percentage points)						
Greater than 3	0	0	0	0	0	0
Greater than 2 to 3	1	.8	1	.8	1	.8
Greater than 1.5 to 2	0	0	0	0	0	0
Greater than 1 to 1.5	6	4.9	0	0	2	1.6
Greater than .5 to 1	14	11.5	4	3.3	5	4.1
Greater than .25 to .5	15	12.3	5	4.1	8	6.6
Greater than .1 to .25	19	15.6	1	.8	3	2.5
Greater than -1 to .1	23	18.9	9	7.4	6	4.9
Greater than -.25 to -.1	10	8.2	11	9.0	8	6.6
Greater than -.5 to -.25	15	12.3	15	12.3	16	13.1
Greater than -1 to -.5	16	13.1	47	38.5	43	35.2
Greater than -1.5 to -1	3	2.5	25	20.5	23	18.9
Greater than -2 to -1.5	0	0	2	1.6	5	4.1
Greater than -3 to -2	0	0	2	1.6	2	1.6
Less than or equal to -3	0	0	0	0	0	0