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EVALUATING THE QUALITY OF IOWA INSHIPMENT DATA, by Mark A. Apodaca, Ohio Applications Research Section, Survey Research Branch, Research Division, National Agricultural Statistics Service, United States Department of Agriculture, Washington, DC 20250-2000, July 1994, Report No. SRB-94-09.

ABSTRACT

Health certificates for all incoming cattle that are shipped into Iowa are processed by representatives of the State Department of Agriculture. Data on these certificates are summed to a state total by use. This information is used in State Statistical Offices as an administrative check for monthly cattle on feed placements. Results in Iowa suggest that the individual inspection certificates are accurate. Therefore, the monthly sum of these certificates provides an accurate administrative check for the number of incoming feeder cattle. However, results also indicate that not all of the incoming feeder cattle are being placed on feed, which means the total is an overestimate of monthly placements. Additionally, the disposition of the incoming feeder cattle are not the same for the four survey months.

KEY WORDS

Animal Health Unit (AHU); Chi-Square Test; T-Test; Monthly Cattle on Feed Surveys.

<p>This paper was prepared for limited distribution to the research community outside the U.S. Department of Agriculture. The views expressed herein are not necessarily those of NASS or USDA.</p>

ACKNOWLEDGEMENTS

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SUMMARY

The National Agricultural Statistical Service (NASS) conducts Cattle on Feed (COF) surveys in 13 states (seven on a monthly basis and six on a quarterly basis) representing approximately 85 percent of the U.S. inventory. In January an estimate is made for 50 states. The cattle on feed estimate is composed of three components; inventory, disappearance including marketing, and placements.

This paper examined the quality of inshipment certificates processed by the Iowa Animal Health Unit (AHU). These certificates are summed each month and the state total is used as an administrative check of monthly cattle on feed placements. These records were sampled systematically from the feeder cattle files contained by the Iowa AHU. All available information was captured from these certificates. Respondents were contacted by state office enumerators of the Iowa SSO and asked to verify the actual number received and the disposition of these feeder cattle.

Results from this study showed that the totals supplied by the State AHU are accurate indications of the number of head that are shipped into the state each month. Approximately 92 percent of the respondents sampled agreed with the inspection certificates. Additionally, the total number of cattle actually received represented approximately 98 percent of the inspection certificate total for each survey month. However, the disposition of these cattle were not the same for the four survey months. Since not all of the incoming cattle were placed on feed, the monthly total supplied by the state is an overestimate of the number of placements.

INTRODUCTION

The National Agricultural Statistical Service (NASS) conducts Cattle on Feed (COF) surveys in 13 states (seven on a monthly basis and six on a quarterly basis) representing approximately 85 percent of the U.S. inventory. In January an estimate is made for 50 states. A cattle on feed estimate is composed of three components; inventory, disappearance including marketing, and placements.

The sampling population for these surveys consist of operations on the List Sampling Frame (LSF) having cattle on feed control data. The January 1 survey is the base survey for all COF surveys during the remainder of the calendar year.

Depending on the response on the January 1 survey the sample for the remainder of the year will be those operations reporting on the base survey or a subset of those operations. Inventory is the primary estimate and is based on indications provided by direct expansion, ratio to base expansions and ratio to capacity expansions.

Many producers and agri-businesses rely heavily on the accuracy of these estimates. These numbers directly impact the available supply of beef cattle, the price producers will receive at market and the price the consumers will pay for beef. Inconsistencies in these estimates can cause decisions made by the data users to be inconsistent with actual market conditions, and therefore, costly to them. Several studies have shown that the cattle on feed estimates were not as reliable as desired.

The use of alternative sources of data such

as administrative data can provide an inexpensive data set that can supplement the operational survey program in establishing estimate levels. It has been shown by Apodaca & Brown (1993) that the use of administrative data in regression models can be used effectively to model monthly milk estimates. Several states currently use administrative data supplied by State Veterinarian's Office or other comparable government units as an administrative check to its cattle on feed placements.

Representatives from the State Veterinarian Office process these health certificates, certifying that the animals are free of disease for all incoming livestock into the state. The animals are identified as breeding beef, slaughter beef, dairy, feeder cattle, feeder pigs, etc.. This office captures the totals for each specie, and these numbers become public document. Each month the number of feeders shipped into each state based on these certificates are summed to a state total. State Statistical Offices use these monthly inshipment of cattle as an administrative check of the number of cattle that were placed on feed during the month.

Many questions have been raised by members of the Livestock Dairy and Poultry Branch and the Iowa SSO about the quality of this inshipment data which has direct impact on its use as an administrative check for monthly cattle on feed placements. This report discusses the procedures and analysis used to investigate the quality of the inshipment data. Two approaches will be used to investigate the quality of these data. The first will test the accuracy of the individual inshipment records. The second will test whether the

disposition of these incoming feeders is the same for all survey months, specifically, are all these incoming feeders actually being placed on feed. Additionally, the origination of feeder cattle used in Iowa feedlots and some additional characteristics of the survey data will be discussed.

was incorporated into each interview through a Blaise instrument during the telephone interview. The Blaise instrument was updated each survey month so that appropriate dates and months were referenced accordingly.

METHODS

Sample Design

The study was conducted exclusively in Iowa. Four different time periods (Table 1) were selected representing both high and low periods of inshipment activity. A different sample was selected each month, and focused on a different month of inshipment data. All available information was captured from these inspection certificates, including the number of feeders purchased, state of origin, seller of the feeder cattle and if present, average weight. This information

In Iowa, the office that processes the inshipment information is called the Animal Health Unit (AHU). The inshipment records at the Iowa AHU identifies each type of animal as breeding beef, slaughter beef, dairy, feeder cattle, etc.. Each group is sorted by state of origin and filed separately by month. The samples were selected systematically from the feeder cattle files, which allowed adequate representation of the majority of incoming feeders into Iowa, by state of origin. The four survey months, corresponding feeder certificates and the number of usable records after screening, review and interviewing was conducted each month, are contained in Table 1.

Table 1. Survey month, date of inshipment records and usable records for each survey month.

Survey Month	Inshipment Records	Usable Records
Sep 1, 1993	May 1993	59
Nov 1, 1993	July 1993	77
Feb 1, 1994	October 1993	107
Mar 1, 1994	November 1993	82

Questionnaire and Interviewing

The questionnaire used for this study was developed by representatives from the Livestock Section in the Livestock, Dairy and Poultry Branch, the Iowa SSO and the Ohio Application Research Section. The final version was reviewed by the Questionnaire Design Section in Washington D.C. Refer to Appendix A for an example of the questionnaire. The questionnaire consisted of two parts. The first set of questions asked respondents about a specific shipment of feeder cattle that they had purchased. The second set of questions pertained to the respondents entire operation.

The information captured from the certificates, number of head, seller, city and state of origin was provided to the respondent before any questions were asked. The first question asked the respondent if they received this particular shipment. If the respondent disagreed with the inspection certificate number of head, the enumerator asked how many they actually did receive. This value was captured and accepted as the "truth". The ensuing questions pertained to the disposition of these feeder cattle received. The disposition was categorized into the number on feed as of the first of the survey month, number marketed, number of head placed in their cow/calf herd, number of head sold, number of head that died and an additional category for all other dispositions.

The second set of questions probed for information about the respondents entire operation. The respondents were asked how many cattle and calves they normally feed at any one time during the year (size

of operation). Of that total they were asked to give a percentage breakdown on the origination of these feeder cattle. The origination options included percent placed on feed from their cow/calf herd, percent purchased from auctions in Iowa, percent purchased from auctions outside Iowa and an additional category for other sources of origination.

ANALYSIS

Accuracy

The number of incoming feeder cattle provided by the Iowa AHU to the Iowa SSO is the sum of all the individual inspection certificates. If this total is an accurate indication of the number of incoming feeder cattle into the state, the individual inspection certificates must be accurate. The accuracy of these inspection certificates was examined by two methods.

First, a record was classified as accurate or inaccurate depending on whether the respondent agreed or disagreed with the number of feeder cattle that was recorded on the inspection certificate. Overall, the respondents agreed with the inspection certificates 299 out of 325 selected for review or 92 percent of the time. Of the 8 percent that disagreed (26 respondents), only 2 respondents said they actually received more than the inspection certificate indicated and the others received less. Table 2 shows the results for each month and the overall totals.

A chi-square test was performed to test whether the accuracy of the inspection certificates are independent of the month the certificates were selected. The test

statistic is calculated by:

$$\sum_{i=1}^2 \sum_{j=1}^4 \frac{(O_{ij} - E_{ij})^2}{O_{ij}}$$

where O_{ij} = observed frequency
for row i (month)
column j (class)

E_{ij} = expected frequency
for row i column j

and

$$E_{ij} = \frac{(i^{\text{th}} \text{ row total}) \cdot (j^{\text{th}} \text{ column total})}{\text{grand total}}$$

Large differences between the observed frequency and the expected frequency causes the test statistic to be large, which leads to the rejection of the null hypothesis of independence. Tables 3 and 3a show the contingency table and test statistic for the chi-square test. The test statistic was 1.965, which was insignificant (p -value = 0.580). Thus, there is not enough evidence to reject the null hypotheses of

independence and claim the accuracy of the certificates is dependent on the month they were selected. Therefore, the accuracy of the inspection certificates is consistent from month to month.

The second method used to test the accuracy of the inspection certificates focused on the number of feeder cattle actually received. A monthly total of incoming head was obtained by summing the number of head on each certificate. This total was compared to the sum of the actual number received. For all survey months, the total received was less than the total of the inspection certificates. However, the magnitude of this difference was small. The total received accounted for approximately 98 percent of the total of the inspection certificates for each survey month. November had the lowest percent of coverage at 97.5 percent, while March had the highest at 99.3 percent. Summing these totals across all months, the actual number received represented 98.3 percent of the inspection certificate total. Table 4 summarizes these totals and the calculated percentage for each month

Table 2. Record Accuracy Classification.

Frequency	Survey Month				
	Sept	Nov	Feb	March	Total
Agreed	56	70	96	77	299
Less	2	7	11	4	24
More	1	0	0	1	2

Table 3. Contingency table: Record accuracy.

Frequency Expected Col %	Survey Month				
	Sept	Nov	Feb	Mar	Total
Accurate	56	70	96	77	299
	55	71	98	75	
	94.9	90.9	89.7	92.9	92.0
Inaccurate	3	7	11	5	26
	5	6	9	6	
	5.1	9.1	10.3	7.1	8.0
Total	59	77	107	82	325

Table 3a. Chi-Square statistics for the record accuracy test.

Statistic	DF	Value	P-value
Chi-Square	3	1.965	0.580

Table 4. Total number of head indicated by inspection records, actual number received, and percent received to inspection records.

Survey Month	Total # of Head		% Received to Insp Records
	Inspection Records	Actual # Received	
September	5,312	5,226	98.4
November	6,912	6,740	97.5
February	10,903	10,694	98.1
March	6,148	6,107	99.3
Total	29,275	28,767	98.3

Assuming that the paired differences between the inspection certificates and the actual value received are distributed normally, a paired t-test was performed to test the hypothesis that the mean paired differences were equal to zero for each survey month.

An analysis variable was created by subtracting the actual number received from the number on the inspection certificate for each record. The SAS procedure PROC MEANS was used to test whether the mean difference for each month was equal to zero. Table 5

Table 5. Paired T-Test statistics for each survey month:

Month	Mean Diff	Std Error	P-Value
September	1.46	1.78	0.4158
November	2.23	1.72	0.1989
February	1.95	0.99	0.0520
March	0.50	0.41	0.2359

shows the mean difference the standard error and the appropriate p-value for each survey month.

February was the only month that could be considered statistically significant (p-value = 0.052). The mean difference of 1.95 however, is a relatively small difference when relating it back to the overall total. From a practical sense, there is not enough evidence to support that significant differences exist for February between the number of head indicated on the inspection certificate and the number of head received. Consequently, the monthly sum of these inspection certificates is an accurate representation of the total number of incoming feeder cattle into Iowa.

Disposition

Based on the previous information and analysis, there is not enough evidence to suggest that the inshipment records are inaccurate. The next step was to examine the type of disposition that is occurring from these incoming feeder cattle. If all, or a high percentage of these incoming

feeder cattle are being placed on feed each month, then the total supplied from the Iowa AHU would be a good administrative check of monthly placements. On the other hand, if the percentage of incoming cattle being placed on feed is "low" or varies considerably from month to month, then the total supplied by the Iowa AHU would not be a good indication of monthly placements.

The respondents were asked to account for the disposition of all the feeders they received for that particular inshipment certificate selected. The six disposition options were combined into two categories for analysis. Feeders that were on feed as of the first of the survey month and feeders that were already marketed were categorized as cattle that were placed on feed. The four other options (feeders placed in the operators cow calf herd, feeders resold, feeders that died, and other disposition) were categorized as cattle not placed on feed. Table 6 shows the disposition distribution before the categories were combined.

Table 6. Disposition of incoming feeder cattle for the four survey months. All categories included.

Frequency Col %	Sept	Nov	Feb	Mar	Total
On Feed	4,700 89.9	4,407 65.4	8,922 83.4	4,789 78.4	22,818 79.3
Marketed	68 1.3	330 4.9	223 2.1	158 2.6	779 2.7
Cow/Calf Herd	144 2.8	0 0.0	0 0.0	59 1.0	203 0.7
Resold	161 3.1	1,301 19.3	896 8.4	361 5.9	2,719 9.4
Died	7 0.1	1 0.0	57 0.5	37 0.6	102 0.4
Other	146 2.8	701 10.4	596 5.6	703 11.5	2,146 7.5

A Chi-square test was performed to test the hypothesis that the disposition of incoming feeder cattle is independent of the month they are shipped. The main objective is to determine if the incoming feeder cattle are being placed on feed. Therefore, the feeders were combined into two categories. The Chi-square test was based on this new distribution. Table 7 shows the contingency table of the disposition of feeder cattle for the four survey months. The top number of each cell is the observed frequency, the middle value is the expected frequency

assuming the hypothesis of independence is true, and the bottom value is the column percentage. Table 7a contains the Chi-Square statistics for this test.

The test statistic of 1024 was highly significant ($p\text{-val} < 0.0001$) which leads to the conclusion that the disposition of incoming feeder cattle is not independent of the month they are shipped. Therefore, the disposition of incoming feeder cattle is not distributed the same across the four survey months.

Table 7. Contingency table for the disposition of incoming feeder cattle: classified as either on feed or not on feed.

Frequency Expected Col %	Sept	Nov	Feb	Mar	Total
On Feed	4,768	4,737	9,145	4,947	23,597
	4,287	5,529	8,772	5,009	
	91.2	70.3	85.5	81.0	82.0
Not on Feed	458	2,003	1,549	1,160	5,170
	939	1,211	1,922	1,098	
	8.8	29.7	14.5	19.0	18.0

Table 7a. Chi-Square statistics for the disposition test.

Statistic	DF	Value	P-value
Chi-Square	3	1024	0.0001

ADDITIONAL COMMENTS AND ANALYSIS

The main purpose of this research was to investigate the quality of administrative data collected by the Iowa AHU. The majority of the analysis up to this point focused on this aspect. The following analysis and comments are based on the second part of the questionnaire, which dealt with the size of the operation and the origin of the feeder cattle. Since the Iowa AHU only furnishes inshipment totals each month, there is no way to correlate the accuracy of the records and disposition characteristics to the size of the individual operations. However, the analysis and comments that follow provide additional information about the characteristics of the survey data collected during the study.

Size of Operations

Each operator was asked how many head of cattle they normally place on feed at any one time throughout the year. The size of the operations were classified based on the reported number of head: operations who normally feed less than 1000 head of cattle at any one time, and operations which feed more than 1000 head. The SAS procedure PROC FREQ was used to calculate frequencies. Approximately 77 percent of the operations who responded maintained inventories of less than 1000 head; the remaining 23 percent were large operations. The distribution of feedlots in Iowa is similar to these characteristics. The majority of the feedlots in Iowa are farm feeder operations who normally feed less than 1000 head.

Thus the sample selected for this project was representative of the population of interest.

Size, Accuracy and Disposition

The accuracy of the inspection certificates and the disposition of the feeder cattle were calculated for each type of operation. Due to differing responses between the two sections of the questionnaire, the usable counts differed from those in the first section of the questionnaire. Therefore the percentages and number of inshipments will differ slightly from the previous analysis.

Table 8 summarizes the accuracy of the inspection records for each type of operation. Overall, the accuracy of the

inspection certificates, and comparison of the number of head received versus the inspection certificates were similar for the two types of operations. The disposition of feeders placed on feed by type of operation is summarized in Table 9. Feeders that were on hand as of the first of the survey month and feeders that had already been marketed were categorized as feeders placed on feed. The larger operations had a higher percentage of placements than the smaller operations for all survey months. Additionally, the percentages of placements of the larger operations were less variable than the percentages of the smaller operations. Since the usable samples for this portion of the analysis differs from the earlier analysis, the overall percentage of actual placements for each month differ slightly from Table 7.

Table 8. Accuracy of inshipment records by size of operation.

Size of operation	usable n	% Accurate	# of Head		% Rec to Insp Rec
			Insp Records	Actual # Received	
< 1000 head	203	92.1	17,344	17,101	98.6
1000+ head	62	93.6	7,946	7,728	97.3
Total	265	92.5	25,290	24,829	98.2

Table 9. Percent of incoming cattle placed on feed by type of operation.

Survey Month	Percent Placed on Feed				
	usable n	Operations < 1000 head	usable n	Operations 1000+ head	Total
September	35	91.8	16	99.0	95.0
November	39	74.0	17	100.0	83.8
February	69	92.3	20	97.3	93.8
March	60	87.5	9	90.0	87.9

Origination of Feeders

Finally, the respondents were asked to give a percentage breakdown of the origination of their feeder cattle. The options included cattle being placed on feed from their cow/calf herd, cattle purchased from auctions in Iowa, cattle purchased from auctions outside of Iowa and an additional category for other sources of origin.

Rather than calculate an average percent across all records, which would ignore

operation size, a weighted estimate was calculated. This percentage was weighted by the reported number of cattle normally fed (previous question). As shown in Table 10, the majority of feeders originated from auctions and producers outside of Iowa. Summing across all months, approximately 75 percent of the incoming feeders originated from auctions and producers outside of Iowa, 22 percent from auctions and producers in Iowa and the remaining 3 percent of the inventory originating from the operations' cow calf herds.

Table 10. Estimated percentages of feeder origination for the four survey months. Percentages weighted by size of operation.

Origin	September		November		February		March	
	# of Head	% of Total	# of Head	% of Total	# of head	% of total	# of head	% of total
Cow/Calf Herd	1,019	2.0	1,052	2.1	1,675	3.0	2,246	6.7
Auct/Prod inside Iowa	7,980	15.8	14,970	30.1	14,137	25.3	4,737	14.1
Auct/Prod outside Iowa	41,543	82.2	33,750	67.8	40,166	71.7	26,634	79.2
Total	50,542		49,722		55,978		33,617	

DISCUSSION AND RECOMMENDATIONS

This paper examined the quality of inshipment certificates processed by the Iowa Animal Health Unit. These certificates are summed each month and the total is used as an administrative check of monthly cattle on feed placements. The records were sampled systematically from the feeder cattle files contained by the Iowa AHU. All available information was captured from these certificates. Respondents were contacted by state office enumerators of the Iowa SSO, and asked to verify the actual number received and the disposition of these feeder cattle.

The accuracy of the individual inspection certificates are vital if the monthly sum supplied by the state is to be used as an administrative check of monthly placements. Results strongly support that the inspection certificates are accurate. This is supported by the high percentage of respondents, roughly 92 percent, who agreed with the number of head recorded on the inspection certificates. Also, the actual number of head received versus the sum of the inspection certificates accounted for 98 percent of the inspection certificates across all months. The individual paired T-tests supported the accuracy of the inspection certificates, with all months showing no strong evidence of significant differences.

Some nonsampling errors did occur in the initial analysis. The inspection certificates are completed in pencil or pen and because of the legibility of handwriting, some of the inspection certificate numbers were interpreted incorrectly. These records were reverified and corrected if necessary.

Similar errors can occur when the state officials sum the certificates to arrive at a monthly total.

The disposition of the feeder cattle was not consistent from month to month. Overall, the percent of incoming cattle placed on feed averaged approximately 82 percent. However in November only 70.3 percent of the sampled feeders were placed on feed, where as in September 91.2 percent of the cattle were placed on feed. The Chi-square test performed on these data indicated that the disposition of the cattle is dependent on the month the shipments are received. Thus, the disposition of the incoming cattle was not the same from month to month.

It is not too surprising that the disposition of incoming cattle is dependent on the month the cattle are received. The placement of cattle is dependent of the amount of feed that is available. Unfortunately, Iowa had a very abnormal agricultural year during 1993. The summer floods played havoc on the entire state. Also the corn crop was harvested later than normal, which delayed the number of cattle placed in the corn fields to feed on the roughage remaining after harvest. All of the inshipment records selected were 1993 records, and these events may have influenced some of the results presented in this paper.

The goal of this research project was to determine the quality of the inshipment data supplied by the state. Based on the data analyzed, the totals supplied by the state is a good indication of the number of incoming head into the state. The disposition of these cattle was not the same for the four survey months. Since not all

of the incoming cattle were placed on feed, the monthly total is an overestimate of the number of placements. This must be taken into account when these data are used as an additional indication of monthly placements.

The cattle on feed estimates in recent years have not been as reliable as expected. The research of additional sources of data is a step in the right direction in trying to improve the quality of the cattle on feed estimates. Since the disposition of the incoming cattle was dependent on the month they were received, I suggest that additional studies be conducted where the percentage breakdown by month can be determined. Possibly, some regression models can be developed to effectively estimate monthly placements using the inshipment totals as the predictor variables.

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APPENDIX A - QUESTIONNAIRE USED IN STUDY



833 Federal Building
210 Walnut Street
Des Moines, Iowa 50309
515-284-4340

CATTLE ON FEED INSHIPMENT RESEARCH PROJECT

SEPTEMBER 1, 1993

Form Approved
OMB Number 0535-0140
Expiration Date 05/31/94
QID-110026R
Project Code 154

Hello, my name is _____ and I am calling for the Iowa Agricultural Statistics Service. I would like to talk to the person who would normally report information about cattle on your operation.

The purpose of this survey is to study the disposition of cattle that were shipped into Iowa. I would like to ask about one shipment that you received in May.

Veterinary inspection records show that _____ (number) head of cattle and calves for feeding from _____ (farm name, in City, State) were shipped to your operation on May ____, 1993.

Did you receive those _____ (number) cattle?

Yes - Continue

No - How many did you receive? _____ Number

200

The following questions pertain only to the cattle received in that shipment.

1. How many of these **CATTLE AND CALVES** were **ON FEED SEPTEMBER 1, 1993** and will be shipped directly from your feedlot(s) to slaughter market? _____ Number

201

Cattle on feed are those being fed a ration of grain, silage, hay and/or protein supplement for slaughter market. **INCLUDE** cattle being fed by you for others. **EXCLUDE** any of your cattle being custom fed in feedlots operated by others and cattle being "backgrounded only" for sale as feeders or later placement on feed in another feedlot or to be returned to pasture.

2. How many of these **CATTLE AND CALVES** were shipped directly from your feedlot(s) to slaughter market **BEFORE SEPTEMBER 1, 1993**? _____ Number

202

3. How many of these **CATTLE AND CALVES** were **NEVER PLACED ON FEED** but instead.

a. Were placed in your cow/calf herd? _____ Number

203

b. Were sold to another operator? _____ Number

204

c. Died? _____ Number

205

d. Had some other disposition? _____ Number

206

Over Please

How I need to ask some questions about your entire cattle operation.

How many **CATTLE AND CALVES** do you normally feed at any one time that are shipped directly from your feedlot(s) to slaughter market? Number

Of the total number that you feed during the year what **PERCENT** are **PLACED ON FEED** from:

a. Your cow/calf herd?	Percent	208
b. Purchases from auctions or other producers in Iowa?	Percent	209
c. Purchases from auctions or other producers outside of Iowa?	Percent	210
d. Other sources? Explain _____	Percent	211
		100 PERCENT

Public reporting burden for this survey is estimated to average 5 minutes per response, including the time for reviewing instructions, gathering and maintaining the data needed, and completing the questionnaire. Send comments regarding this burden estimate or any other aspect of this survey, including suggestions for reducing the burden, to the Office of Management and Budget, Paperwork Reduction Project (0535-0140), Washington, D C 20503 Do not mail questionnaire to this address.

REPORTED BY: _____ DATE: _____

NUMERATOR: _____

Respondent		Response Code		Sup/Enum	Eval	Jul Date
1 Op	101	2-Tel	910	098	100	987
2 Sp		3-Int				
3 Oth		7-TR				
4 Est R		8-IR				
5 Est Nr		9-Inac				