Mark: Good morning and good afternoon everyone who’s on the call today. It’s my honor and pleasure to introduce Doctor Libby Dismuke-Greer, Health Economist at the VA Health Economics Resource Center. Her expertise and interests include economic evaluations, statistical modeling, and analysis of \_\_\_\_\_[00:00:16]population disparities and a variety of clinical areas.

She has experience with combining and analyzing VINCI administrative data with prospectively collected clinical trial data and is actively working on combining VINCI admin data with the DOD data for analysis. She is funded as a principal investigator on the long-term impact of military relevant brain injury consortium, chronic effects of neurotrauma economic study and on a number of other VA, DOD, and NIH studies in the areas of traumatic brain injury, spinal cord injury, mental health, diabetes, and lupus. I’m excited at this presentation and it is my honor to hand things over to you Libby.

Dr. Dismuke-Greer: Thank you so much Mark. It is really a pleasure to be here today and I’m grateful to HERC for allowing me to present on I think a very important tool in the area of regression called interval regression that I discovered a while back when I was looking for a way to examine the association of different factors with income for individuals with spinal cord injury and so the outline for today is we’re going to be talking about Stings in the Tails. I loved this title. This comes from a reference, which I’ll be using quite a bit in this talk. It’s actually a paper that gives some great conceptual background about interval regression and also how to use it for those people who use R. So we’ll talk about some conceptual facts about interval regression using the Stings and the Tails manuscript. We’ll also talk about different types of interval data, income, as I mentioned being one of them. We’ll talk about the bias when you use OLS with interval data. So why you can’t just take the midpoint of an interval, for example, and use an OLS regression and get unbiased results and then we’ll look at examples that I have used using Stata, Stata intreg for simple interval regression with normal distributions. Stata eintreg for sample selection or endogeneity and other Stata intreg extensions. We’ll talk about the R-package and SAS who also have interval regression commands and then I’ll present an example using earnings for individuals with spinal cord injury, which is a study that I participated in and then an example using wait times for primary care in 10 OECD countries.

So we’re going to start out with our first poll question so we can find out who our audience is. So I’ll turn this over to Maria.

Maria: Hi, the poll is currently open. What experience do you have with interval data? Select A for no experience with interval data or interval E-models estimation, B, experience with interval data but not interval models estimation, or C, experience with interval data and interval models estimation and the responses are coming in. So once, it slows down a bit I’ll go ahead and close the poll. And it’s starting to slow down. So I’m about to close the poll. So we’ll close that poll. And the results are 48% say A, no experience with interval data or interval models estimation, 39% say B, experience with interval data but not interval models estimation, and 7% say C, experience with interval data and interval models estimation. Back to you Libby.

Dr. Dismuke-Greer: Thank you Maria. Well that’s very helpful because that lets me know that there are quite a few people who already have experience with interval data but they haven’t used the interval model regression. So I’m really happy that I’m able to present on that today.

So for those of you who’ve had the challenge of trying to work with interval data then you did feel the Stings and the Tails. You knew that unlike variables that are reported continuously and points, you’ve got a situation where you’re deep in a variable is now actually an interval. So it’s got a lower bound and it’s got an upper bound, which is observed and the true value lies between those bounds but is unknown. So instead of measuring the dependent variable on a continuous scale, the scale is divided into some number of intervals, which we represent here as in subscript K where K indicates in which of the in K intervals and observation falls.

This then leads to information loss, as the distribution shape within their intervals is unknown. So this is something I’m sure that you all felt aware of and maybe you took the midpoint because that was the best you knew how to do to try to get some sort of an estimate.

Why does this happen? Well, it often happens because in the survey statistics field especially among government surveys, requesting some data such as income and intervals has been shown to reduce item nonresponse because it offers a higher level of privacy protection. I think surveyors have figured out that if they ask people what is your income, fill it in please, people can be very hesitant about that, about giving an exact number. However, if they ask people well, what is your income in intervals people are much more willing to respond to that and here’s an example from the different types of interval data.

So income reported in health surveys that are very commonly used in the health area, the behavioral risk factor surveillance system or BRFSS, the national intervals, I should say interview survey, health interview survey, I’m sorry I put interval up, been saying interval too much here. NHIS and the Medicare current beneficiary survey, the MCBS are all reported in intervals. So once again, that’s the National Health Interview Survey and I apologize for not catching that error instead of the National Interval Survey. Also I did find a beyond income being the most common, I did find a study, which used wait times as reported in intervals and we’ll see an example of that.

So here’s an example from the BRFSS from 2019. As you can see, the income here is being requested in intervals starting with less than $10,000.00 going to $75,000.00 or more and BRFSS is giving us frequencies and percentages and so forth. So if you want to estimate, use income as a dependent variable using the BRFSS data or any of those other commonly surveyed databases then it is a challenge to use OLS and we’ll see that in just a moment.

So why can’t we use OLS? Well, to use OLS you would have to guess a point estimate between the two, the high and low interval and people have done that in the past. I have done that in the past before the interval regression came along and while [audio interruption 00:09:50]regression on the midpoints is easily applied, it comes with a disadvantage of giving biased estimation results. Why, because this approach disregards the uncertainty stemming from the unknown true distribution of the data within the intervals and, therefore, leads to bias perimeter estimates. Its performance relies on the number of intervals and estimations are only comparable to more advanced methods when the number of intervals is very large. So there is an issue with using OLS and just a point estimate.

So that leads us to the next poll question. Maria, if you’d like to take over again.

Maria: The poll is now open. Which statistical package do you use and please check all that apply. A for Stata, B for SAS, C for R, D for SPSS, and E other. And those results are coming in quickly and it’s starting to slow down so I’m going to go ahead and close that poll. Okay and we have 44% say A, 52% say B for SAS, 38% use, 18% use SPSS and 11% say other. And that’s closed. Back to you Libby.

Dr. Dismuke-Greer: Well, thank you Maria. Well it does sound like the majority of individuals are either using more commonly SAS or Stata with some people also followed closely by R and then a relatively small number using SPSS. Well, for the individuals who use SPSS I am sorry to say I could not find any commands for SPSS, however, for the individuals who use Stata, as I do, there are many commands. For those who use SAS there are also commands and R as well. So we’ll talk a little bit about that.

So let’s talk a little bit about Stata and the most basic of the commands in Stata for interval regression. So the Stata has a command called intreg interval regression and intreg fits a linear model than outcome measured as point data, interval data, less-censor data or right-sensor data and as such it is a generalization of the model commonly known as tobit, which has existed way before interval regression came along and many of you who are familiar with econometrics may be familiar with the tobit model.

So what you do with Stata intreg is you have a regression on an interval measured dependent variable with a lower endpoint, which can be y\_lower and upper endpoint y\_upper and so basically the command is intreg y\_lower,y\_upper and then you include your independent variables. X1, X2, and so forth and the beauty of, what I really love about interval regression is the coefficients are interpreted directly as you would in OLS model. You don’t need any conversions or any other type of adjustments. You can directly interpret these coefficients, which is really, really nice.

Now there will be cases where it’s not appropriate just to use a simple interval regression model by intreg. You may run into an issue where you got sample selection or endogeneity and I am going to present an example of that. For example, if you are talking about income and we all know that some individuals will report zero income because they are not working. They’re not in the workforce and so we’ve got a sample selection problem there and when you have a sample selection issue then you need to have an adjustment for that and so Stata, fortunately, has given us eintreg, eintreg fits an interval regression that accommodates any combination of endogenous covariant's, non-random treatment assignment and indigenous sample selection and we can put in any kind of covariant’s, continuous, binary, or ordinal and the treatment assignment can be endogenous or exogenous. So I will be presenting later on an example using eintreg.

There are other extensions such as xteintreg and xteintreg fits a random effects interval regression model. So from those of you who feel the need to include random affects you can have this command and it uses the same principal as eintreg but also accounts for correlation of observations within panels or within groups. So if you’re worried about clustering within let’s say a group of individuals then you can adjust for that using xtintreg. There are also other extensions now, which have come up recently. For those of you who like Bayesian analyses you’ve got a Bayesian interval regression, which is Bayes:intreg. For those of you who might want to use finite mixture model you’ve got FMM intreg. For those you may want to use a multi-level mixed effects interval regression, you’ve got MEM intreg. For parametric models for interval censored survival time data you’ve got STD reg. And finally for the random effects interval data regression models, you’ve got xtintreg, that one is the one I had already gone through in the previous slide. So as you can see Stata has a wide range of commands to accommodate any kind of model that you may want to estimate using intreg.

For those of you who prefer to use R and SAS and forgive me I’m not a user of R but I can tell you that there is an R package that uses Kdalgo, which estimates statistical indicators and its standard errors from interval censor data and the reference that I’m giving here that talks about Stings and the Tails with the title Stings and the Tails that you’ll see at the end of this slide. The author does a beautiful job of all the conceptual justification for interval regression, as well as, giving you very intense description of using an R package. So I really recommend you read that reference.

SAS also does have a command for those of you who use SAS called PROC LIFEREG and here’s just an example of some of that SAS code.

So I’d like to now give you an example of using Stata with intreg and xtintreg from my own experience and studies and so we have a cohort of individuals with spinal cord injury. This is a civilian study not a VA study and we were very interested in examining the effects of characteristics of the individuals with spinal cord injury, as well as, issues surrounding pain and pain medications on all types of employment outcomes. We’re looking at employment status, hours working, and earnings after spinal cord injury and we wanted to look at the effect of pain, prescription medications for pain, and non-prescription opioid use. The participants in our study included 4,670 adults with traumatic spinal cord injury of at least one-year duration who were enrolled in this study of health and longevity.

Earnings were measured through 16 categories ranging from a low of less than 10,000 to a high of greater than 175,000. Very similar to what you saw in the BRFSS intervals.

So we used two types of interval regression for the earnings part of the study. We talk about when we do income or earnings estimates conditional and unconditional earnings. So conditional earnings are earnings conditional on being employed. So for individuals who said yes, they were employed that is one type of estimate and in that case we use the simple intreg because we’re only looking at individuals who are employed. We then also did a second type of estimate using the xtintreg and this was using the full sample and would take into account the sample selection as I mentioned before.

So I’m going to zoom in a little bit on this one. You may also, I don’t think you see my zoom but you can zoom in as well because I want to highlight the differences in these two types of models. So you can see from the top if you compare the results of the unconditional earnings with the conditional earnings what you see is that injury severity, C5, C8 starts out as insignificant in the conditional earnings but become significant in the unconditional earnings. So that’s our C5, C8 severity measure. We also see those types of changes in the time since onset. So time since onset between 20 and 19 years become significant. We see also all the age categories become significant in the unconditional earnings that using the xtintreg. Also we see changes in significance for painful days, 0 to 5 and all painful conditions, which become significant as well.

Finally, one of our main questions was looking at pain medications. We see pain medications become significant in the unconditional earnings with [audio interruption 00:24:07] being associated with the highest earnings. So this had a very important policy implications. So you can see that even within the intreg family of commands it’s very important that you use the correct model. It can vastly change the results. So this is a result, an example from using income, using Stata, and using the intreg, and extintreg command.

The next example I’d like to show you is the wait time example. The wait time example is a study that was done comparing wait times for primary care across 10 Organization for Economic and Cooperation and Development countries. The wait time was measured by time reported to see an MD or an RN from the Common Wealth Fund Survey and the authors took those wait time responses and created intervals from them. So the responses were same day, next day, two to five days, six to 17 days, eight to 14 days, more than two weeks, and never. Those were the possible intervals, which they created based on the responses and they estimated a separate model for each country.

Here are the results from their analyses. So you can see some important differences depending on the country the significance is reported at 10%, 5%, and 1% level in their regression analyses and you can see the differences across the different countries. We see that there are big effects for those who have private insurance in reducing the wait times. You can see here in Australia you can see significance for introducing private health insurance in Germany and France and Switzerland. You can also see differences by the year. So it’s possible then to run a different model for each country using the intreg command and they did not go beyond the simple intreg command here. They just used the simple intreg command. They did not talk about any issues related to selection or endogeneity.

So what are the main points? Well, the main points are when data is reported in intervals of ordinary least squares is going to be biased. Intreg and many extensions are available in Stata. The R package estimate CD is available in R and the SAS has a package called PROC LIFEREG and the great thing about interval regression is that the coefficients are interpreted directly. So these are the main points that I wanted to present today. There is a lot more in the Conroy Stings and the Tails. This article really goes into a much more detail regarding the conceptual model of interval regression. Why you need it, when you need it, as well as, presenting a great detailed on the R package itself.

If you want to know more about the Martin, Siciliani, and Smith article on wait times then you can look at that. That’s a Social Science and Medicine Publication in 2020 to get a really good idea of how to apply interval regression to a very important health question such as wait times and then if you want to look at our study where we looked at the association of income for individuals with spinal cord injury and how they relate to pain indicators, pain medications, and including non-prescription opioid use then you can look at our study, which was published in 2020 in Spinal Cord. I do also have a few other studies using interval regression in various spinal cord injury and multiple sclerosis so if you Google me or Google Scholar or in PubMed you can find some of those other studies if you want to see more examples but today I just really wanted to give you an overview of when to use interval regression, why it can be such a great tool, why you shouldn’t use OLS and just use a point in the interval, and now that it’s so well presented for tools in Stata with so many extensions ranging from sample selection to random effects to Bayesian to multi-level models, mixture models, and also it’s availability in SAS and R then I think it really is a very good tool that is now available to those of us working in the health area.

So I’m available now, of course, to take questions and at any time if you want to email for the studies for any other information I’ll be happy to take questions.

Mark: Thank you Libby. That was a fantastic presentation. I’ve never really used interval regression myself but this offers a great alternative to scenarios where you don’t have actual on the UNISCALE. There are a couple of questions that came through chat. First one’s more of an administrative one. Maybe Maria, you can help me with us or Whitney. Someone’s asking about slides being made available. As I understand you don’t usually these are made available once the recording has been, \_\_\_\_\_[00:32:56] it up on the \_\_\_\_\_[00:32:58]Seminar.

Maria: So I just submitted, if you look in the chat section there’s a hyperlink there. If you copy and paste that link those are today’s slides. They’re also in the reminder email but I’ll go ahead and post it one more time.

Mark: Thank you and this question’s for Libby. The question is my survey outcome is the number of days of missing school. For example, zero, one through three days, four to 10 days, 11 to 29 days, 30 plus days. Would it be okay to use intreg for this type of outcome?

Dr. Dismuke-Greer: So it’s the number of days of missing school. Yes, I think definitely if it’s reported in intervals then you should definitely use intreg. I’m trying to think if there’s any reason why you would want to use any of the extensions. I guess, I don’t if the person is still able to respond to me but what are you looking at in terms of association with missing school?

Mark: And while we’re waiting for that we can go on to the next question and this is in regards to your wait time example you presented. How would you then interpret the coefficients from the model and the context the example?

Dr. Dismuke-Greer: I’m going to go back up to that. These are interpreted directly. So that’s the beauty of interval regression. So for example, this, well let’s find one that’s significant. So here -0.363, that is saying that in Australia private health insurance is associated with a reduction of 0.363 days of wait time. It is a direct interpretation that you don’t have to do any conversions.

Mark: That convenience [simultaneous talking 00:35:25]?

Dr. Dismuke-Greer: Absolutely. Right and similarly back up in my regression and I apologize if I didn’t make this clear. For example, if we look at the non-prescription opioid, excuse me, the pain medication daily use, those who never used compared to daily use the individuals who’ve never used pain medications have an earnings of $23,916.00 higher. That’s the marginal impact. So they are directly interpreted. This is in dollars, the wait time example is in days.

Mark: And just a follow up Libby, this is in regards to the question regarding the number of days missing from school as the outcome and…

Dr. Dismuke-Greer: Yes.

Mark: …intervals. There was response to your question of what is the association that you’re trying to look for and the association they were looking for was between mental, a student’s mental well-being and the number of days missing from school.

Dr. Dismuke-Greer: Students mental well-being, okay. That does sound like a straight interval regression unless you think there would be any reason there would be sample selection or any other kind of endogeneity, which I’m not thinking of right off the bat but it sounds like you could just do the straight intreg but if you do discover that there is a reason for sample section then you know you can go ahead and use that extension of extintreg as I did with income. But yes, definitely. I mean it sounds like a intreg is the perfect model for that and then you should be able to interpret those coefficients directly. Good luck.

Mark: Yeah, thank you for that. If anyone has any other questions regarding examples please feel free to type them into the chat or the question and answer box. This question is from me actually. Regarding the extensions, if you don’t mind going back to that. One of the concerns that I always have whenever I construct models is sort of the model specifications and in this case what if you’re looking at count data where traditionally we would use a Poisson or negative binomial model. Are there extensions for those types of distributions or does it really matter if they have different distributions that are not normal?

Dr. Dismuke-Greer: Mark my understanding is that other, intreg, so the basic intreg does assume a normal distribution. That’s why you have all these other extensions. For account, so what are thinking of? What are thinking of as a dependent variable in this case?

Mark: Yeah, this is kind of where it gets, this is my, I’m very naïve regarding interval regression model but it does seem to fit such a mold in terms of the outcomes and a lot of the outcomes that have been presented are with the exception of cost, have been like, you know, days missing from work for example and that’s usually just you would sort of count for that in terms of either a continuous scale or maybe I need count data and I’ll use the example where you’re trying to see a number of refills in a prescription and you have intervals for that. Does it really matter if it’s count data \_\_\_\_\_[00:39:35] intreg, it seems like it doesn’t matter but I kind of trying to figure out if there are extensions that would sort of make fine tune adjustments if necessary for those types of an outcome data. Maybe it’s not needed but I didn’t know if those types of questions have come up before and whether or not there was any attempt to sort of adjust those?

Dr. Dismuke-Greer: I do recall in the Stings and Tails paper seeing some reference to count models as an alternative to intreg when you know, I guess the count, right. In that case I mean I’m not a econometrician, I’ll be the first to say so I don’t want to say one is better than the other. When I think of interval regression I think of it as being, you don’t know the exact number, right. So if you’ve got already a report, Mark of the number of refills of a medication but I don’t know why you would want to create intervals from that, right. Am I understanding you right?

Mark: Yeah, I think I’m thinking more of just like if you don’t have the actual raw data where you can actually see the counts in some continuous manner and you only have the intervals would intreg still be appropriate for like say count data especially if when you like a lot of zero’s…

Dr. Dismuke-Greer: Oh, yes.

Mark: …across, yeah like a zero inflated.

Dr. Dismuke-Greer: Yeah, well, okay. With the zero’s a lot of zero’s then I think you may want to go to the extintreg like I did so with the income data remember we had to go to the extension because income was only reported for people who are actually in the workforce, right. So if we wanted to include the sample of individuals including those with zero earnings we had to use the ex, the extended intreg to take into account that sample selection issue. So if there’s a lot of zero’s I think that would be analogous don’t you?

Mark: Yeah, yeah I’m starting to see how powerful this type of modeling would be for researchers when you only have the intervals of like say costs or refills or whatever count data you’re looking at.

Dr. Dismuke-Greer: Yeah.

Mark: And it sort of nicely addresses some of those model specification problems we usually struggle with whenever we actually have the raw data. So it almost seems like why aren’t more people using this in those situations? I just [simultaneous talking 00:42:44].

Dr. Dismuke-Greer: I know.

Mark: This is a very useful tool.

Dr. Dismuke-Greer: It is and, you know, when I was creating this PowerPoint I was looking for studies that used it and I guess I was surprised there weren’t more. I mean it wasn’t, I had to really search to find this wait time, you know, I think a lot of people have used it for income and maybe I missed it in other areas but I do think it has so much potential for other areas of research or other dependent variables beyond income or wait times reported intervals. I think it does. I don’t know, I think it is an interesting question as to whether if you actually have your count reported it would be better to just estimate a Poisson model with your count, right or create intervals for it. I don’t know. I guess depends on what makes conceptual sense, right. There may be times when you want to turn those counts in intervals because they make some sort of sense conceptually. I think the wait time data did. Like you want to know who got it the same day. You want to know who got it within a couple days. You want to know who got it within, you know, two weeks kind of thing. They’re intervals that make sense there. But I can’t say right off that myself, how that would compare with Poisson model, other than, you know, being able to interpret directly I think is really nice too. Those coefficients.

Mark: Right.

Dr. Dismuke-Greer: Direct interpretation is nice, is good, so. Yeah, and the fact that you’ve got all these extensions. I’ve only used the intreg and the extended intreg but we now have all these extensions too for all kinds of models.

Mark: Yeah, I think you may have a good point. What would be sort of the rules if you had the actual data versus the interval data and you want to make intervals factual data. Is it preferable to use the actual data and then use the Poisson or whatever, negative binomial distribution model specification purposes or the intreg alternative approach? I don’t know the answer to that but that could be and it’s the paper to write, compare the two methods [simultaneous talking 00:45:26]…

Dr. Dismuke-Greer: It is.

Mark: …gives you better answers.

Dr. Dismuke-Greer: It would. It would. It would. As I said especially if putting that count data in intervals made sense conceptually that there was something about, you know, like the wait times, you know, where it was important that you separate the one day from multi, you know, two to five days. There is some meaning in that. Some special meaning in that. I think that could be a good question for some econometrician out there to answer for us.

Mark: Absolutely. Maybe something HERC HEC may want to take the challenge to do one day.

Dr. Dismuke-Greer: Absolutely.

Mark: Well, I don’t see any more questions in the chat even thought this is a very, very unique and doesn’t seem like a very unapproachable alternative to data sets where you don’t have intervals. I don’t see any more questions in the chat but I do have one more…

Maria: We have one Mark.

Mark: …question. Oh, sorry. Yes, Maria.

Maria: I was going to say I just received a question in chat and it’s says for conditional estimates only employed people are used in the analysis and the estimates. Are those different from unconditional analysis. Is that correct?

Dr. Dismuke-Greer: That is correct. So going back to the methods for the income, so we estimate two earnings models here. One is what we call conditional earnings. Conditional earnings means it’s conditional being employed. So that we use your regular intreg but we also want to know about the individuals who are not in the labor force and we called those unconditional earnings and there is a sample selection to that. So if you go into the labor market literature you can see that there is a whole ton of literature about selection into the labor market. There are many reasons people may or may not be in the labor market and for that we use the extintreg because it takes into account that selection process. There are characteristics of individuals that determine whether they are or not in the labor market and there we use the full sample so that when we go to look at the differences in Table five and Table six here in this study you’ll see Table five has 11,070 individuals with spinal cord injury. Table six has 4,255 individuals with spinal cord injury. So you can see there are only 11,070 individuals of the 4,255 were employed. Does that answer that question?

Maria: I think so.

Mark: Thank you for that Maria. \_\_\_\_\_[00:49:01]. I think we have time for one more question and if you don’t mind Libby for me this is a unique and novel…

Dr. Dismuke-Greer: Sure.

Mark: …do you know of any data sets or websites that would, if you really want to practice using this for ourselves, do you have any recommendations where we can go for that?

Dr. Dismuke-Greer: Yes. Stata has some great websites and there is some detailed code. Let me see if can I find out here and put it in the chat. Maria, would that be possible for me to put something in the chat?

Maria: Let’s see. If you send something to the chat for me I can forward it to the audience.

Dr. Dismuke-Greer: Okay. I’m going to get it for you right now.

Mark: And if you can’t find now maybe we can put it in the description when we post the video so that we people can \_\_\_\_\_[00:50:08] if they want to.

Dr. Dismuke-Greer: Oh, no I’m getting it for you right now.

Mark: Okay. Yeah, I mean I would probably like to, I mean I would like practice this and kind of see how this compares to some of the data that I have but it’ll be nice to be able \_\_\_\_[00:50:25] set the data that we could use to practice.

Dr. Dismuke-Greer: Let’s see. Okay. I’m sending this to Maria and she can share this. This is from Stata. The intreg command that goes in and it gives you a lot of examples too and I believe the R paper does as well. The R paper if you go for that reference, the R paper.

Mark: Well, this is helpful. Thank you very much Libby. I hope the audience, the members of the audience are able to get that.

Dr. Dismuke-Greer: Right.

Mark: This is a very good document to have.

Dr. Dismuke-Greer: Yeah, as I said, you know, I love this intreg not just because it is so wonderful to have something that you can use with any variable reported in intervals but also because it’s so easy to interpret the coefficients. You know, you don’t have to do a lot of rigmarole and conversion and worry about loss of information when you’re doing that. You can interpret everything directly from it. It’s very friendly or easy to code.

Mark: Yeah, I can definitely see that. A lot of advantages with this \_\_\_\_\_[00:52:15]method. All right. I don’t see any more questions on the chat and we are approaching noon. So Maria I think this is a good time for us to stop.

Maria: Okay. Libby do you have any final remarks regarding interval regression?

Dr. Dismuke-Greer: I just want reiterate what I said before that it is I think relatively neutral out there and based on my research I don’t see it being used a whole, whole lot. I’m not sure if it’s because people aren’t familiar with it or just the—I mean obviously based on our poll response there were a lot of people who had already worked with or were familiar with interval data who were not using interval regression so I what I encourage you to do is now when you see intervals as your dependent variables that you consider using interval regression because it is a much better tool than OLS where you will have bias and it is easy to use, easy to interpret and I’ve given you these references but please reach out to me if you’d like me to send you my other, we have probably four or five income studies from spinal cord injury and multiple sclerosis where we’ve used interval regression that I’d be happy to share with you.

Maria: And Libby can you click the the status, your last line so you can share your email with the audience if they have any questions or if they…

Dr. Dismuke-Greer: Yes.

Maria: …are looking for anything else? There we go. So if you have any other questions for Libby you can email her at Clara.Dismuke@VA.gov or her website and thank you so much Libby and Mark for participating and putting this presentation together and I want to thank everyone else for taking the time to attend today’s HSR and \_\_\_\_\_[00:54:31] seminar.