

UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLUMBIA

ELOUISE PEPION COBELL, : Civil Action 96-1285  
et al. :  
Plaintiffs :  
 : Washington, D.C.  
V. : Tuesday, June 17, 2008  
 :  
DIRK KEMPTHORNE, Secretary :  
of the Interior, et al. :  
 :  
Defendants : MORNING SESSION

*TRANSCRIPT OF EVIDENTIARY HEARING  
DAY 6  
BEFORE THE HONORABLE JAMES ROBERTSON  
UNITED STATES DISTRICT JUDGE*

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by computer-aided transcription.

## C O N T E N T S

<u>WITNESS</u>	<u>DIRECT</u>	<u>CROSS</u>	<u>REDIRECT</u>	<u>RECROSS</u>
DR. EDWARD ANGEL				
By Mr. Siemietkowski	--	--	918	--
By Mr. Smith	--	900	--	--
DR. FREDERICK (FRITZ) SCHEUREN				
By Mr. Warshawsky	926	--	--	--
By Mr. Dorris	--	979	--	--

## E X H I B I T S

NUMBERADMITTED

## Defendant Exhibit:

460 - 464	978
500	978
505 - 506	925

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**P R O C E E D I N G S**

COURTROOM DEPUTY: This is Civil Action 96-1285, Elouise Cobell, et al. versus Dirk Kempthorne, et al.

THE COURT: Dr. Angel was on the stand, and he may resume his position there. And Mr. Smith, I think you're still cross examining.

MR. SMITH: Yes, Your Honor.

THE COURT: You may continue.

MR. SMITH: Good morning, Your Honor.

**(DR. EDWARD ANGEL, DEFENDANT witness, having been previously  
duly sworn, testified as follows:)**

**CONTINUED CROSS-EXAMINATION**

BY MR. SMITH:

Q. Good morning, Dr. Angel.

A. Good morning, Mr. Smith.

Q. Dr. Angel, were you involved at all in the preparation of what has been referred to in this trial as AR-171?

A. I supplied Ms. Herman with some documentation, we've chatted about it.

Q. Okay. If we could look at Exhibit 68, which is the May 30th version of AR-171, and as you can tell, we've highlighted the period prior to 1972. Do you see that?

A. I do.

Q. And that's the period that you were involved in with your investigation and the documents you supplied. Is that correct?

1 A. That's correct.

2 Q. Now, as you can see on the bottom left-hand corner, it says,  
3 "as of May 30th, 2008." Do you see that?

4 A. I do.

5 Q. Okay. And we notice that the numbers pre-1971 -- or excuse  
6 me, 1972, when we get to the June 4 version, it changed  
7 significantly. If we could look at Exhibit 69. In fact, you  
8 have hard copies there if you want to compare them.

9 A. Thank you.

10 Q. We're now looking at the June 4th version, and as you can  
11 see, the numbers have changed fairly significantly.

12 A. Yes, sir.

13 Q. I'm not going to ask you specifically about those numbers,  
14 but my question is: Is there any information that you provided  
15 Ms. Herman or Dr. Scheuren or anybody else at Interior from  
16 May 30th to June 4th which to your knowledge would have caused a  
17 change in those numbers?

18 A. No.

19 Q. So any information that you provided them would have been  
20 prior to May 30th?

21 A. Correct.

22 Q. Okay. Thank you.

23 Dr. Angel, yesterday you mentioned -- you were  
24 criticizing the model prepared by the plaintiffs, or critiquing  
25 it. And you discussed Osage, and I want to make sure I

1 understood your comments. You were concerned about the use of  
2 the number 2,229 in the calculation of the Osage revenue. Do  
3 you recall that?

4 A. That's correct.

5 Q. And was your concern about the use of that number prior to  
6 1906?

7 A. That's correct.

8 Q. And my question is, did you ever discuss that at all with  
9 Ms. Herman or anybody at FTI, the concern about using that  
10 number prior to 1906?

11 A. I did.

12 Q. Okay. And do you recall what Ms. Herman's comment was to  
13 you?

14 MR. SIEMIETKOWSKI: Objection, Your Honor. Calls for  
15 hearsay.

16 THE COURT: Overruled.

17 A. I do not.

18 BY MR. SMITH:

19 Q. If we could look at DX 372-165. And Dr. Angel, I'll  
20 represent to you that this is the document -- one of the  
21 documents that was provided to us by FTI. And do you see at the  
22 top it says "Osage Annuity Payment Per Headright"?

23 A. Yes.

24 Q. And it starts in 1880 and then goes down through the 1800's.  
25 And if we could roll down to the bottom, and at the bottom of

1 the page it says, "Calculated Annuity Per Share Payment, 2,229  
2 Shares"?

3 A. I am aware that Ms. Herman did use that figure, and I  
4 believe NORC used that figure as well.

5 Q. So you're aware that both parties used the identical figure?

6 A. I am.

7 Q. And my question is, if that figure was not used, have you  
8 determined what figure should be used for that pre-1906 period?

9 A. As we've looked at the documentation and taken a look at  
10 total payments - mostly these are annual reports of the  
11 Commissioner of Indian Affairs - what we've seen is that the  
12 payees range between around 1,500, to, by 1906, around 2,100.

13 Q. 1,500 to 2,100, that range?

14 A. Roughly.

15 Q. Okay. Thank you. One other comment or question about Osage  
16 before I move on.

17 You had used the phrase "direct pay" at one point in  
18 your testimony in connection with Osage. Is my understanding  
19 that you use that term because money at times goes directly from  
20 the Tribal Trust to headright owners? Is that your  
21 understanding of direct pay?

22 A. I don't know if that was Tribal Trust or not. These were  
23 payments prior to 1908 that were made as a result of treaty  
24 obligations of the United States, but my understanding was, from  
25 reading the documentation, that, yes, money was paid directly to

1 individual Osage Indians.

2 Q. Okay. So when you were using the word "direct pay," you  
3 were using that in the context of prior to 1906, when the Osage  
4 statute was enacted?

5 A. That's correct. In this instance I'm using it prior to  
6 1906.

7 Q. Okay. Thank you.

8 If we could look at DX-483, and I think there's a hard  
9 copy there in front of you which you testified was the chart you  
10 prepared. And let me ask you this: When you were preparing  
11 this chart, if you had two or more data points for the same year  
12 and they were in conflict, how would you decide which one to  
13 use?

14 A. I believe we addressed that yesterday, and I tried to use,  
15 to the best of my ability, both. The one instance we had talked  
16 about yesterday was, gee, in the late 1960's, I believe, I had  
17 used the GAO report for the total, but I had the other component  
18 parts listed as well.

19 Q. Okay.

20 A. So where I could use -- where I did use more than one  
21 document per year, where I could, I did.

22 Q. Okay. Good. Let me give you an example. If we could look  
23 at on DX-483, page three, and I've highlighted on there the  
24 years 1952, '53, and '54. Do you see that?

25 A. I do.



1 Q. And under "IIM System Funds Invested in Government  
2 Securities," we have the numbers 35 million 425;  
3 33 million, 183; and 31 million, 831. Do you see that?

4 A. I do.

5 Q. And if we could look at DX-64 at 64-5, and this appears to  
6 be a document from your records. The "MA" designation is yours  
7 on the Bates stamp. Is that correct?

8 A. That's correct.

9 Q. And if we could -- it appears to be trust funds and certain  
10 other accounts of the federal government, holdings of federal  
11 securities by government agencies in accounts June 30, 1952 to  
12 '60.

13 If you could see the first three columns are the  
14 identical time period, 1952, '53, and '54. Do you see that?

15 A. I do.

16 Q. And if we could scroll down to the second half of the page  
17 and focus in, it says "Individual Indian Money Deposit Fund in  
18 Trust Funds." And it looks like for those periods, the first  
19 number, 3-5-4-2-5 is the same --

20 A. Uh-huh.

21 Q. -- less a few dollars, and then the number you use is  
22 3-3-1-8-3-2-5-5, which is roughly \$900,000 less than what is on  
23 the chart. Do you see that?

24 A. I do.

25 Q. And then the following year, 3-1-8-3-1 is the exact same

1 number that you use.

2 Can you tell me why in this particular case you used a  
3 number that was roughly \$900,000 less than what was on the  
4 exhibit?

5 A. No. It was not intentional.

6 Q. Okay. Was there another document that you looked at that  
7 had a lower number on it?

8 A. Could you tell me again which DX this is, please?

9 Q. Sure. This is DX-64.

10 A. I did not. I used DX-61 -- 59, 60, and 61 to derive these  
11 figures, so no, I can't tell you.

12 Q. Okay. Would this be one difference that perhaps you were  
13 not aware of today and you hadn't discussed with Dr. Scheuren or  
14 Ms. Herman?

15 A. This would be.

16 Q. Okay. Thank you.

17 If we could go back to DX-483 and look at page four,  
18 which is -- and focus in on 1972. And just looking at this  
19 period on this page, you have numbers for funds in banks,  
20 numbers for government securities, but you have nothing for  
21 funds held in Treasury. Is that correct?

22 A. That's correct.

23 Q. And does that mean that there was no money in Treasury, or  
24 you just couldn't find numbers to fill in the blank?

25 A. May I see the document?

1 Q. Well, let's give an example, DX-77. This appears to be the  
2 document that you used for that particular point in 1972, and  
3 correct me if I'm wrong, but it seems to be a document that  
4 discusses the status of investments as of June 30, 1972.

5 A. That's correct.

6 Q. And that particular document would not discuss what funds  
7 were actually held in Treasury and not invested. Is that fair?

8 A. That's fair.

9 Q. So this is one place where you were not able to determine  
10 what funds were held in Treasury and were not able to fill in  
11 that particular blank. Is that correct?

12 A. That's correct.

13 Q. Okay. When we're looking at funds that are invested, were  
14 you able to determine how they value these bonds? Are they  
15 valuing them at face value, at purchase price? Were you able to  
16 determine that?

17 A. I took the information directly from the chart.

18 Q. Do you know how they valued them?

19 A. No, I don't.

20 Q. And obviously we're looking at, for example, Treasury  
21 securities at one point time, on one day during a whole year.  
22 Is that fair?

23 A. These are supposed to be year-end account balances, correct.

24 Q. And during that intervening year, presumably securities were  
25 being purchased and redeemed?

1 A. Correct.

2 Q. And were you able to ever tell, during the intervening  
3 period, the volume of purchases and redemptions of securities?  
4 Did you find any documents on that?

5 A. I did not analyze those documents, but I did see there's  
6 very heavy documentation in Central Office Albuquerque records  
7 that are currently at the American Indian Records Repository. I  
8 believe I've reviewed them at the Office of the Trust Records in  
9 Albuquerque when they were there.

10 But there's fairly heavy documentation on that. I  
11 didn't feel qualified, obviously, to analyze it. That's not a  
12 specialty of mine.

13 Q. Are those documents that you copied and brought with you, or  
14 did you leave them at the repository?

15 A. There's many, many boxes. No, those aren't ones. I  
16 certainly may have copied a sample document or two, but I made  
17 no effort to collect a whole run.

18 Q. So those are documents that to your knowledge nobody has  
19 reviewed today?

20 A. I don't know whether anyone has or not.

21 Q. Okay. Good.

22 By the way, the AR-171 has an interest column. Were  
23 you involved at all in the determination of what the interest  
24 factor was that was used?

25 A. We had documentation on the interest factors, which, you

1 know, I sent to Ms. Herman, but I don't know how much of it she  
2 used in AR-171.

3 Q. Okay. Is it fair to say that for most of the life of the  
4 trust, individual Indian funds earned interest?

5 A. For the most part. Sometimes they did not, but for the most  
6 part that was the goal.

7 Q. Right.

8 A. There were years that we know that cash sat in Treasury.

9 Q. Okay. But basically, since the inception of the trust, for  
10 the most part Individual Indian Trust funds were invested in --

11 A. Yes.

12 MR. SIEMIETKOWSKI: Objection, Your Honor. Asked and  
13 answered.

14 THE COURT: I'll allow it.

15 A. Yes.

16 BY MR. SMITH:

17 Q. One final line of questions. You were asked yesterday  
18 regarding internal controls, and I believe you testified in your  
19 opinion as a historian, the processing seemed reasonable?

20 A. Yes.

21 Q. And you've actually written a paper on the audit procedure  
22 at Interior. Is that fair?

23 A. I wrote a --

24 THE COURT: A what?

25 MR. SMITH: On the history of the audits at --

1 THE COURT: Oh, the audits.

2 A. That's correct. In 2000.

3 BY MR. SMITH:

4 Q. Just briefly, my recollection is you looked at the history  
5 of the audits from roughly 1910 through 2000. Is that correct?

6 A. 1940, I believe, was when the report started.

7 Q. Okay. My recollection is that back in 1910 there was a  
8 commissioner by the name of Valentine. Is that correct?

9 A. That's correct.

10 Q. And Commissioner Valentine at that time determined that  
11 there were problems with the accounting system. Is that  
12 correct?

13 A. That's correct.

14 Q. And that he asked Congress to fund money to do a study of  
15 the accounting system?

16 A. That's correct.

17 Q. And that led to what we've referred to as the 1914 report  
18 done by the New York Bureau of Municipal Research. Is that  
19 correct?

20 A. That's correct.

21 Q. And they found significant problems with the accounting  
22 system. Is that correct?

23 A. That's correct.

24 Q. And so they created a new accounting system under  
25 Cato Sells' administration. Is that correct?

1 A. Yes. In 1917.

2 Q. And is it fair to say, then, by the 1920's, they found  
3 problems with that system as well? Is that correct?

4 A. It's under review continually. I mean, it's being audited  
5 by -- the system itself is under frequent review, through its  
6 history, by GAO, internal reviews for Interior Department. It's  
7 a system of audit, reform, audit, reform.

8 Q. Right. So you go through these cycles; they put in a new  
9 system, they find problems with it, they put in a new system,  
10 they find problems with it?

11 A. Or refine -- you know, address the problems that have been  
12 found, correct.

13 Q. Are you aware of a single independent evaluation prior to  
14 1953 that said BIA's accounting system with respect to the  
15 IIM Trust was working effectively?

16 A. I'm aware of a number of reviews that found some problems  
17 with it, but nothing between 1917 and '53 that saw irresolvable  
18 problems. I know that, for example, in the '30s and '40s, the  
19 Bureau of Indian Affairs worked with the General Accounting  
20 Office in revising its regulations; I know that in the '40s the  
21 General Accounting Office said that there were problems, and  
22 then I know that by I believe 1953, the General Accounting  
23 Office approved the BIA accounting system.

24 Q. Okay. And my question was specifically an independent  
25 audit, an audit by a third party that up to 1953 said that the

1 systems were working effectively?

2 MR. SIEMIETKOWSKI: Objection, Your Honor. Asked and  
3 answered.

4 MR. SMITH: Your Honor, I don't think he answered that.

5 THE COURT: Overruled.

6 A. Again, I wasn't seeing them with major problems, I was  
7 seeing audits that were -- you know, that were addressing  
8 individual issues and specific issues, and attempting to reform  
9 the system.

10 BY MR. SMITH:

11 Q. Perhaps I'm not being clear enough. When I'm referring to  
12 an independent audit, someone other than Interior or someone not  
13 associated with the government. Are you aware of an independent  
14 audit prior to 1953 that said the systems were working  
15 effectively?

16 A. I'm sorry, by independent audit you mean one that wasn't a  
17 federal audit?

18 Q. Yeah.

19 A. No, I'm not aware of an independent audit prior to the  
20 Andersen audit, I don't believe.

21 Q. Okay. Other than the one in 1914?

22 A. Yes.

23 Q. Now, you've talked a little bit about the GAO studies that  
24 were done in the 1920's to the 1950's. And if we could look at  
25 Exhibit 95, and you've seen this document before, it's the



1 Comptroller General's report from 1929.

2 A. That's correct.

3 Q. And if we could look at page six of that document, please,  
4 and look at the highlighted language.

5 A. (Witness complies.)

6 Q. Have you had a chance to look at that?

7 A. Yes.

8 Q. So at this point in time in 1929, the comptroller said that  
9 "no detailed check could be made of all revenues accruing to the  
10 individual Indians to determine that each received all to which  
11 he was entitled." Is that correct?

12 A. Yes, that's what the document says.

13 Q. Right. And that's during the period that you contend that  
14 the GAO was doing their audits?

15 A. Yes. May we scroll down a bit?

16 Q. Sure.

17 A. If you look at the next paragraph, certainly the next  
18 paragraph beginning, "The Indian fiscal agents render to the  
19 General Accounting Office a monthly accounting for all funds,"  
20 that looks to me to be a fairly detailed, a fairly detailed  
21 analysis.

22 "Schedules of monies collected and all disbursements  
23 are supported by vouchers or other documents showing the  
24 expenditure to have been properly authorized. These accounts  
25 are audited by the General Accounting Office, and the balances

1 reported verified."

2 Q. Right. Okay. You are aware, are you not, of the letter  
3 from Gene Dodaro, the principal assistant to the comptroller,  
4 regarding the GAO studies?

5 A. Yes, I've read it.

6 Q. If we could show Exhibit 96, and look at page two.

7 MR. SIEMIETKOWSKI: Objection, Your Honor. Relevance.

8 THE COURT: Well, I was waiting for that objection.

9 Mr. Smith, you know, the reason we're here today is  
10 because of all these old reports that say that the Indian  
11 accounting system was no good. I think that's been established  
12 from the get-go. What we're trying to do in this proceeding is  
13 fix a number. I'm not sure what this quotation of a paragraph  
14 from this report and that report and another report is doing for  
15 us in that regard.

16 MR. SMITH: Your Honor, if this is of no benefit to the  
17 Court, I'll move ahead.

18 THE COURT: I won't say no benefit. I would never say  
19 that to you, Mr. Smith.

20 MR. SMITH: Thank you, Your Honor.

21 THE COURT: I would say limited benefit.

22 MR. SMITH: I understand.

23 BY MR. SMITH:

24 Q. Is it fair to say that in the 1940's, BIA was complaining to  
25 Congress that they didn't have enough money to do audits? Do

1 you recall that?

2 A. There have been reports to that effect. I have seen  
3 Congressional hearings to that effect.

4 Q. And they complained that their audits were seriously in  
5 arrears. Is that correct?

6 A. Please say that again.

7 Q. They complained that their audits were seriously in arrears  
8 because of lack of money?

9 A. They wanted -- I remember specifically requesting more  
10 auditors.

11 Q. Because they were in arrears, they were behind?

12 A. Correct.

13 Q. And it was in the 1950's that they started -- let's say they  
14 increased the internal audits, the audits by BIA?

15 A. Yeah. BIA audit division began making annual trips to every  
16 agency beginning in 1956.

17 Q. And you've noted in your own writing a lot of the problems  
18 that were encountered during those audits. Is that fair?

19 A. That's fair.

20 Q. Unauthorized payments, balance problems. Correct?

21 A. That's correct.

22 Q. And is it fair to say that the audit division of BIA  
23 expressed its dismay over the fact that they were finding the  
24 same problems over and over again?

25 A. That's correct.

1 Q. And then by the 1960's, any audits the GAO had done stopped.  
2 Is that correct? The GAO discontinued any audits in 1960. Is  
3 that fair?

4 A. I believe that they made occasional -- I know they slowed  
5 down very much in the 1960's, but I don't believe that they  
6 stopped until some point after that. But I can't remember.  
7 They've slowed down very, very much.

8 Q. Okay. One last question. Is it fair to say, in all the  
9 documents that you've reviewed, that money in fact was being  
10 caught up in the system and was not being disbursed to  
11 beneficiaries?

12 MR. SIEMIETKOWSKI: Objection, Your Honor. To the form  
13 of the question.

14 THE COURT: That's a pretty broad question, Mr. Smith,  
15 but I'll allow it. If the witness wants to answer it, he can  
16 answer it.

17 "Is fair to say, in all the documents that you've  
18 reviewed, that money in fact was being caught up in the system  
19 and was not being disbursed to beneficiaries?"

20 THE WITNESS: Well, yes. Because money is entering the  
21 system that's not meant for beneficiaries. That's the point of  
22 the buckets that we've talked about.

23 THE COURT: I don't think that's what he meant.

24 BY MR. SMITH:

25 Q. Let me ask the question differently. That money intended

1 for disbursement for beneficiaries wasn't going to them. Isn't  
2 that reflected in the audits you've reviewed?

3 A. There have been audits that have talked about that.

4 Q. Let's look at one. If we could look at DX-10, please. And  
5 again, this appears to be a trust fund task force study compiled  
6 May 20, 1975. Do you see that?

7 A. I do.

8 Q. If you look at the bottom of the page, does it have your  
9 Bates stamp on it?

10 A. I know it's one of our documents.

11 Q. Okay. If we could look at I believe it's 10-9, and if you  
12 could look at the highlighted language.

13 A. (Witness complies.)

14 Q. Do you recall reading that language when you were looking at  
15 the audits?

16 A. I do.

17 Q. In fact, it indicates that as of 1975, they were still  
18 retaining checks in the millions going back to the 1880's?

19 A. Could we scroll up, please?

20 Q. Sure.

21 MR. SMITH: If you could scroll up.

22 A. All right. Yes. Thank you.

23 BY MR. SMITH:

24 Q. And my question is simple. This would be one example, would  
25 it not, where trust funds were intended for beneficiaries, but

1 for whatever reason they were not being distributed. Is that  
2 fair?

3 A. That would be, yes.

4 MR. SMITH: Your Honor, I have no further questions.

5 THE COURT: All right. Thank you. Redirect,  
6 Mr. Siemietkowski?

7 MR. SIEMIETKOWSKI: Yes, Your Honor. Good morning,  
8 Your Honor.

9 THE COURT: Good morning.

10 **REDIRECT EXAMINATION**

11 BY MR. SIEMIETKOWSKI:

12 Q. Good morning, Dr. Angel.

13 A. Good morning, Mr. Siemietkowski.

14 Q. Dr. Angel, how long have you been reviewing Indian  
15 documents?

16 A. About 25 years, total.

17 Q. And how many Indian documents are in Morgan Angel's  
18 collections?

19 A. Literally thousands. There's 10,000 in our Cobell  
20 collection.

21 Q. I'm sorry, how many?

22 A. There's about 10,000, roughly, in our Cobell collection.

23 Q. I'm going to show you DX-72, Dr. Angel, and specifically  
24 page four from DX-72. Once enlarged, I'll ask if you recognize  
25 that from your cross-examination of yesterday.

1 A. I do.

2 Q. Now, do you recall Mr. Smith asking you why you did not  
3 include the \$121 million per year on your total IIM chart for  
4 1968?

5 A. I do.

6 Q. And do you recall saying something along the lines that you  
7 missed that one?

8 A. I do.

9 Q. Now, looking at the language as highlighted there, is there  
10 anything about that language that would explain your not  
11 including that for 1968 or any year on your chart?

12 A. I reviewed that last night at my office, and in reviewing  
13 it, it appeared to me that it was an average over years; in  
14 other words, cash receipts running at a rate of 121 million per  
15 year.

16 Q. Having had a chance to reflect on that in your office last  
17 night, would you use that figure now if you were updating your  
18 chart today?

19 A. No.

20 Q. Do you recall Mr. Smith yesterday, Dr. Angel, showing you a  
21 1915 CIA report and asking you where direct pay was addressed in  
22 that report?

23 A. I do.

24 Q. Now, do you recall whether direct pay was addressed in that  
25 1915 CIA report?

1 A. It wasn't.

2 Q. Were there any earlier years, Dr. Angel, in which direct pay  
3 was addressed in CIA reports?

4 A. There were. Last night I went back to my office and I found  
5 a 1912 annual report of the Commissioner of Indian Affairs and a  
6 1913 annual report of the Commissioner of Indian Affairs, which  
7 broke out direct pay from -- which broke out the issue of direct  
8 pay on allotted lands.

9 MR. SIEMIETKOWSKI: May I approach the witness, Your  
10 Honor?

11 THE COURT: Yes.

12 MR. SIEMIETKOWSKI: Your Honor, I'm handing the witness  
13 what will be marked as Defense Exhibits 505 and 506, and I would  
14 ask permission to provide hard copies to the Court as well as to  
15 opposing counsel. I'll hand the court clerk copies, as yet  
16 unmarked, of 505 and 506, and do the same for opposing counsel.

17 BY MR. SIEMIETKOWSKI:

18 Q. Dr. Angel, 505 is going to be marked the 1912 report. Do  
19 you have that in front of you?

20 A. I do.

21 Q. Could you please identify that report for the Court?

22 A. That's the annual report of the Commissioner of Indian  
23 Affairs for the fiscal year ended June 30, 1912.

24 Q. In this report, which is DX-505, have you been able to  
25 identify any particular page that indicates direct pay?



1 A. Pages 247 to 251, table 60 -- excuse me, table 50, "Allotted  
2 Lands Under Lease During Fiscal Year Ended June 30, 1912,"  
3 you'll see that the reservation is listed, or I'm sorry, the  
4 agency is listed, and then they discussed how leased. And  
5 you'll see that much of it is through departmental control, but  
6 you'll also see "By Indian Direct With Departmental Permission,"  
7 and you'll see also "By Indian Direct."

8 There's a recapitulation on page 251.

9 Q. On page 251 of the 1912 report, DX-505, where do you see an  
10 indication specifically there of direct pay?

11 A. "By Indians Direct Without Permission."

12 Q. And Dr. Angel, just for the record, since we don't have this  
13 on the screen, could you please direct the Court to the left or  
14 the right side of the chart?

15 A. I beg your pardon. At page 251 you'll see total lease  
16 through departmental control by Indians direct with permission  
17 to lease, and by Indians direct without permission from the  
18 department.

19 Q. And what do those two lines mean, Dr. Angel?

20 A. That means that leases were made directly without money  
21 coming into the department.

22 Q. Turning your attention next to DX-506, which is the 1913  
23 report, do you recognize that document?

24 A. I do. It's the annual report of the Commissioner of Indian  
25 Affairs for the fiscal year ended June 30, 1913.

1 Q. Using DX-506, Dr. Angel, are you able to point the Court to  
2 any place in this particular document that indicates direct pay?

3 A. Pages 216 to -- pages 216 to 219, table 49, "Allotted Lands  
4 Under Lease."

5 Q. Table 49 is on page 219?

6 A. I beg your pardon. Table 49 is from pages 216 to 219.

7 Q. And which particular language in those pages, Dr. Angel,  
8 indicates a direct pay?

9 A. "By Indians direct with permission to lease without  
10 departmental control; by Indians direct without permission  
11 without departmental control."

12 Q. Now, to your knowledge, Dr. Angel, when did this breakdown  
13 of direct pay in the CIA reports end?

14 A. I found it just for these two years.

15 Q. These two years. And do you recall which years, again, that  
16 Mr. Smith showed you the CIA report?

17 A. I believe almost 1915.

18 Q. Now, Dr. Angel, do you recall yesterday in cross-examination  
19 Mr. Smith showing you investment statistics prior to 1928?

20 A. I do.

21 Q. Do you recall him asking you why you did not include the  
22 statistics on your chart?

23 A. I do.

24 Q. Do you recall whether those statistics he showed you prior  
25 to 1928 were aggregate for the IIM system or for a particular

1 agency?

2 A. Could you please repeat that?

3 Q. Yes. The statistics that Mr. Smith showed you yesterday in  
4 cross-examination regarding investments --

5 A. Uh-huh.

6 Q. -- do you recall whether those were aggregate statistics or  
7 just for a particular agency?

8 A. I don't recall. I know that we've not found aggregate  
9 statistics on an annual basis that we would have been able to  
10 put into the chart prior to 1928.

11 Q. Thank you.

12 MR. SIEMIETKOWSKI: And if I could please have DX-483  
13 on the screen.

14 BY MR. SIEMIETKOWSKI:

15 Q. And once on the screen, I'll ask Matthew to show DX-583,  
16 which is your total IIM chart, Dr. Angel, and to take a look  
17 specifically at 1953.

18 MR. SIEMIETKOWSKI: If Matthew could zoom in a bit on  
19 the far right column for 1953, if that's possible.

20 THE COURT: Good solution, Matthew.

21 MR. SIEMIETKOWSKI: Well done, Matthew.

22 BY MR. SIEMIETKOWSKI:

23 Q. During your cross-examination this morning by Mr. Smith,  
24 Dr. Angel, do you recall Mr. Smith showing you your figures for  
25 1952, 1953, and 1954?

1 A. I do.

2 Q. Do you recall him showing you a different figure for 1953  
3 taken from DX-64?

4 A. I do.

5 Q. Would you please indicate to the Court whether DX-64 was the  
6 basis for your figure for 1953?

7 A. No, the basis for my figure was DX-61.

8 Q. Is it true, as Mr. Smith asked you, that at times you chose  
9 the better data when several data points existed?

10 A. No, that's not true. That's not true. I tried to make this  
11 as representative as possible, which is another reason why I  
12 included that 1922 receipt and disbursement figure that we've  
13 talked about. I've tried to be as complete as possible with  
14 this chart.

15 Q. Well, that's what I want to ask you last about, Dr. Angel,  
16 the 1922 disbursement figure. Do you recall talking about that  
17 yesterday with Mr. Smith?

18 A. I do.

19 Q. Do you recall him asking you about the 1922 CIA report?

20 A. I do.

21 Q. Do you recall telling Mr. Smith that you viewed that data  
22 point for 1922 as an outlier?

23 A. I do.

24 Q. What did you mean by that?

25 A. Statistical anomaly, something that didn't strike me as

1 making sense in view of what I had seen before that period and  
2 what I saw after that period.

3 Q. Now, on your direct yesterday you had discussed at times  
4 examples of qualified data that you had found. Do you remember  
5 that?

6 A. I do.

7 Q. Is this 1922 outlier an example of qualified data?

8 A. Yes.

9 Q. And did you convey this outlier qualification for 1922 to  
10 NORC?

11 A. I did.

12 Q. Thank you, Dr. Angel.

13 MR. SIEMIETKOWSKI: No further questions, Your Honor.

14 THE COURT: All right. Dr. Angel, I think that  
15 completes your testimony. You're excused, sir. You may step  
16 down.

17 THE WITNESS: Thank you.

18 MR. SIEMIETKOWSKI: Your Honor, I would like to move  
19 the admission of DX-505 and 506. Those are the two CIA reports  
20 that we just discussed.

21 THE COURT: 505 and 506 are received.

22 (DEFENDANT EXHIBIT Numbers 505, 506 were moved into  
23 evidence.)

24 THE COURT: Mr. Warshawsky?

25 MR. WARSHAWSKY: Good morning, Your Honor. Our next

1 witness will be Dr. Fritz Scheuren, and he's being taken out of  
2 the witness room right now.

3 (Oath administered by Courtroom Deputy.)

4 MR. WARSHAWSKY: May I approach the witness?

5 THE COURT: Yes.

6 **(DR. FREDERICK SCHEUREN, DEFENDANT witness, having been duly**  
7 **sworn, testified as follows:)**

8 **DIRECT EXAMINATION**

9 BY MR. WARSHAWSKY:

10 Q. Good morning, Dr. Scheuren.

11 A. Hi.

12 Q. Would you please state your name for the record?

13 A. Frederick, usually go by the name of Fritz, Scheuren.

14 Q. And Dr. Scheuren, where do you reside?

15 A. I live in Alexandria, Virginia.

16 Q. What do you do for a living?

17 A. I'm a statistician.

18 Q. And with whom are you employed?

19 A. I work for National Opinion Research at the University of  
20 Chicago.

21 MR. WARSHAWSKY: Your Honor, just to give a brief  
22 synopsis of Dr. Scheuren, as the Court requested. As the Court  
23 is aware from Dr. Scheuren's testimony from last October, he is  
24 one of the leading statisticians in the world -- maybe the  
25 world, certainly in the United States. I don't know.

1           But in any event, he is a senior fellow and vice  
2 president with the National Opinion Research Center affiliated  
3 with the University of Chicago, and he's been there since 2001.  
4 He's the author of numerous books, articles, papers about the  
5 subject of statistics; former president of the American  
6 Statistical Association; well decorated, highly honored, all of  
7 that, in the field of statistics for his work in pro bono human  
8 rights efforts.

9           Dr. Scheuren is going to be offered as an expert today  
10 to provide opinions in the area of statistics, and specifically  
11 in two areas; first with regard to the results of a multiple  
12 imputation effort undertaken by NORC; and the second thing will  
13 be to provide some analysis of Dr. Cornell's single variate  
14 model which the plaintiffs provided in their case-in-chief.

15           THE COURT: All right. He may certainly give that  
16 testimony. He was qualified previously.

17           MR. WARSHAWSKY: And just for the record, would you put  
18 up Defendant's Exhibit 458?

19 BY MR. WARSHAWSKY:

20 Q. Dr. Scheuren, do you recognize DX-458?

21 A. I do.

22 Q. Would you please tell Judge Robertson what it is?

23 A. That's my resume', updated slightly since last fall.

24 Q. And can you summarize very briefly how it's been updated  
25 since you testified in October?

1 A. Well, since last fall I actually have produced two more  
2 books than I had here. I'm very busy in other things, but I  
3 haven't produced any more papers at this point.

4 Q. Dr. Scheuren, would you provide a general overview of what  
5 NORC did in connection with the analysis prepared for this  
6 hearing?

7 A. Certainly. We took to heart the judge's request for  
8 providing information about inputs and outputs, how much -- cash  
9 in, cash out, I guess is the phrase that I believe the judge has  
10 used. And we attempted to look at the results that we had  
11 obtained from Dr. Angel and from Michelle Herman's team,  
12 Michelle particularly, in order to try to make an assessment of  
13 what we would be able to conclude about that matter using our  
14 statistical tools.

15 Q. Now, you referred to information that you received from FTI  
16 and Dr. Angel's group. Did they provide you complete data?

17 A. Well, no, they didn't. They couldn't. We carefully  
18 examined what they gave us to make sure that it was the final  
19 numbers insofar as they could give them to us. We were very --  
20 wanted to take -- did not want to take the -- have them do any  
21 imputation at all because we were attempting to do that.

22 Q. Now, so I take it from your answer there was missing data  
23 in --

24 A. Yes, quite a bit.

25 Q. Just so we don't have problems with the court reporter,



1 please let me finish my question and I'll let you finish your  
2 answer. Okay, sir?

3 A. (Indicating.)

4 Q. Excellent. Thank you.

5 Is missing data a problem statisticians deal with  
6 periodically?

7 A. Yes, very common problem.

8 Q. And is it unusual to encounter missing data when you're  
9 dealing with an issue dating back, say, several decades?

10 A. Well, no, I wouldn't have thought it was unusual, and it  
11 isn't in this case unusual.

12 Q. Well, how do statisticians deal with the issue of missing  
13 data?

14 A. Well, you develop an understanding of the data set and the  
15 environment the data was in, as this court is doing, and then  
16 you employ your past experience with similar situations, you let  
17 the data speak to you and suggest to you how it might be filled  
18 in.

19 Q. Are there any techniques, terms --

20 A. Well, yes --

21 Q. I'm sorry. Are there any statistical techniques utilized in  
22 your field that --

23 A. There are quite a few techniques utilized. The one that we  
24 thought would be appropriate here was a technique called  
25 multiple imputation.

1 Q. What are some of the other techniques that you could utilize  
2 to supply missing data?

3 A. Well, you can use some forms of substitution, which turn out  
4 to be what was done in the earlier data that Michelle talked  
5 about a couple of days ago. Those kinds of techniques don't  
6 allow you to see the uncertainty in the data. The multiple  
7 imputation technique was specifically developed so you could see  
8 the uncertainty.

9 Q. And when you're referring to substitution, that was with  
10 respect to the Chavarria Dunne --

11 A. That's correct. Yes, we looked at that data, again, once it  
12 was pointed out to us. We had not known about that until it was  
13 brought up in cross-examination. We looked at that, and it does  
14 affect the uncertainty in the data, and I'll come back to how I  
15 think -- to what degree I think it affects the uncertainty at  
16 the end.

17 Q. Very good. Substitution, is there anything improper about  
18 using substitution as a means to supply missing data input?

19 A. It's very common. When I was at the IRS, I used to head the  
20 statistics operation at the IRS for many years, and we used  
21 substitution there when we didn't get late returns from  
22 taxpayers.

23 THE COURT: Do you let taxpayers fill in the blanks the  
24 same way?

25 THE WITNESS: No, sir.

1 THE COURT: Sauce for the goose, huh?

2 THE WITNESS: No, let me explain. My particular  
3 operation at the IRS was to produce statistics which could be  
4 used for the national accounts in the U.S., and for tax policy  
5 simulation. And they had to be in some sense representative.  
6 If we were missing some major corporations, for example, because  
7 they were late filers, then we had to find a way to introduce  
8 that information in order to produce the records for that year.  
9 Not that they didn't file eventually. They did. But we usually  
10 used data from a previous year.

11 BY MR. WARSHAWSKY:

12 Q. Dr. Scheuren, I would like to have you look now at --

13 MR. WARSHAWSKY: Would you put up Defendant's  
14 Exhibit 459?

15 BY MR. WARSHAWSKY:

16 Q. And I'm actually holding a copy of a book called "Rubin  
17 Multiple Imputation For Nonresponse in Surveys." The cover page  
18 is displayed as DX-459. Are you familiar with this book, sir?

19 A. Oh, yes, I am.

20 Q. And is this book considered a reliable authority in the  
21 field of statistics?

22 A. I think it is, yes.

23 Q. Who is Professor Rubin?

24 A. Well, he is a professor at Harvard. He just was the chair  
25 at the statistics department at Harvard, now passed on. Chairs

1 rotate at places like that. He's really well-known. All your  
2 nice things about me earlier really do apply to him. He's an  
3 outstanding individual.

4 Q. Well, why don't we refer to page two of DX-459. There's  
5 Dr. Rubin. And then move on to page four.

6 MR. WARSHAWSKY: And why don't you blow up the preface  
7 section that we've got highlighted here?

8 BY MR. WARSHAWSKY:

9 Q. In the first paragraph, first two sentences, Professor Rubin  
10 wrote, quote, "Multiple imputation is a statistical technique  
11 designed to take advantage of the flexibility in modern  
12 computing to handle missing data. With it, each missing value  
13 is replaced by two or more imputed values in order to represent  
14 the uncertainty about which value to impute," end quote.

15 Dr. Scheuren, do you understand what Professor Rubin is  
16 talking about there?

17 A. Yes, I do.

18 Q. And do you agree with that statement?

19 A. Absolutely. That's why it was developed. There were a lot  
20 of good techniques to fill in missing data or to impute data,  
21 but there were very few techniques at that time, and still very  
22 few, that really allow you to see the uncertainty once you have  
23 to deal with missing data.

24 Q. And do you have an understanding as to why Professor Rubin  
25 referred to the flexibility of modern computing in that

1 statement?

2 A. Amazingly -- that was a long time ago. Amazingly, he  
3 anticipated the day we're in now, where computing is virtually  
4 free and we can do many, many imputations. He was looking at  
5 only a handful in those days because nobody thought it could be  
6 done.

7 Q. Now, in the second sentence, Professor Rubin talks about  
8 doing this imputation process, quote, "in order to represent the  
9 uncertainty about which value to impute," end quote.

10 Why is Professor Rubin -- based on your understanding,  
11 why is he referring to uncertainty with respect to multiple  
12 imputation?

13 A. Well, that was the issue that I brought to him - and you  
14 will get us to that next paragraph - because there are a lot of  
15 good techniques used at the Census Bureau, hot deck being one of  
16 them, and many others --

17 Q. I'm sorry, you referred to hot deck?

18 A. Hot deck is a technique, I think it really started -- I  
19 think it started in the 1940 census, but became widely used in  
20 the 1950 census to replace or fill in data that -- and complete  
21 data that individuals had not completed on their census  
22 questionnaires.

23 Q. So getting back to the earlier question, explain why  
24 uncertainty is relevant when you're talking about multiple  
25 imputation.

1 A. Because it affects the variance of your estimates. You have  
2 to widen the confidence intervals that you're using to represent  
3 the phenomenon. It's not free. Missing data is not free.

4 Q. What does that mean, I'm sorry, "it's not free"?

5 A. Let's suppose that you have a sample -- I'll use a polling  
6 example, since I just finished a book on exit polling. If you  
7 have a sample of 1,500, and there's no missing data, and you're  
8 trying to make an estimate of what the proportion -- of a  
9 50 percent proportion, then the margin of error, as you see in  
10 the newspapers all the time, all of you, is plus or minus three  
11 percent.

12 But if in fact you didn't have 1,500, you had a much  
13 smaller number, perhaps because the data was missing, then that  
14 margin of error would be much wider.

15 Q. Now, you sat in the gallery during Dr. Cornell's testimony?

16 A. I did.

17 Q. And was Dr. Cornell's analysis one where you could  
18 utilize -- one that you could predict or provide estimates of  
19 uncertainty for?

20 A. He didn't do that. He -- I think he had a good approach in  
21 a lot of ways. There were some issues with the data he used,  
22 but we'll come back to that later. But I thought he  
23 fundamentally did not address this issue of uncertainty.

24 Q. If we can get to the second paragraph now on page four, it  
25 states that "the real impetus for multiple imputation, however,

1 came from work encouraged and supported by Fritz Scheuren," and  
2 continues on. That's you. Right?

3 A. Yes, it is.

4 Q. And how did you provide the impetus for multiple imputation?

5 A. Well, I had a problem that I was looking at the Census  
6 Bureau data, where -- we working, so long ago now, working on  
7 the war on poverty, and I was just after that looking at how to  
8 deal with missing income data. And I saw the techniques that  
9 the Census Bureau had advocated back in the '50s but were no  
10 longer using, and which were in any case only of limited value,  
11 and I felt we needed to look at that because it was very  
12 important to understand the uncertainty in the data.

13 Q. And getting back to the first paragraph in that second  
14 sentence, Professor Rubin spoke about replacing a missing value  
15 with two or more imputed values.

16 A. Correct.

17 Q. How does that work, generally?

18 A. Well, what you want to do is you want to -- one of the  
19 things that we do in statistics, we operate nearly all the time  
20 as if we had complete data sets. In introductory statistics  
21 courses, in many advanced courses we don't assume that we have  
22 any missing data, we assume that we have all the data we need.

23 And what Don said was, let's complete the data to  
24 complete the data matrix, as he called it, and then use the  
25 standard techniques that we all learned long ago. And in order

1 to -- but in order to deal with that, the missing data part, we  
2 have to correct the variance estimate, the uncertainty measures,  
3 and then we can in fact use all our tools that we've learned way  
4 back, both in intermediate courses, advanced courses, and so  
5 forth. It was a great idea.

6 Q. What did you mean about completing the data matrix?

7 A. Well, I think in a few minutes we're going to look at the  
8 data matrix from this data set that we're examining for this  
9 trial, and we'll talk about how multiple imputation completed  
10 that.

11 Q. But just on a very general level, what does it mean to  
12 complete the data matrix?

13 A. Let's say I have five variables and I have them for  
14 100 observations. So 100 observations; each observation has  
15 five things that I want to get from that person or that  
16 organization or whatever it is. And so I just look at it as an  
17 array, 100 rows long, five columns wide, okay. And some of  
18 those values are missing. They're not there. They're blank.  
19 Okay? And they shouldn't be blank.

20 And so what Don said was, well, we'll come in and find  
21 a way to fill in those missing -- fill in those holes, and then  
22 we'll have a complete data set and then we can go on and do what  
23 we intended to do with a complete data set, whatever that was.

24 Q. How do you fill in those holes?

25 A. Well, we use an imputation technique. There are lots of



1       them, but we use an imputation technique that in this context  
2       comes out of a Bayesian approach to statistics, B-A-Y-E-S-I-A-N.

3       Q.   And what is a Bayesian approach?

4       A.   A long time ago, a minister in England, an Anglican minister  
5       in England wrote about an idea of using information that he had  
6       as a prior, and bringing that prior information along with data,  
7       and constructing a way of doing an analysis with the prior and  
8       the data itself into what has been called now a posterior  
9       distribution.

10               So we constructed posterior distributions using  
11       information that we either knew about the data but wasn't in the  
12       data itself, plus the data, the incomplete data we had, to  
13       develop posteriors.

14       Q.   So you're taking information that you know and using it to  
15       predict the unknown, or the missing information?

16       A.   And that allows --

17       Q.   Is that correct?

18       A.   That's correct.   And that allows us to go outside of the  
19       data set, the incomplete data set, to complete it, and to  
20       complete it not just in a way that, say, subject matter experts  
21       would complete it, but to complete it in a way that would allow  
22       us to measure its uncertainty as well.

23       Q.   Dr. Scheuren, have you written any articles about multiple  
24       imputation?

25       A.   I have done a lot of work on missing data problems, and I

1 recently wrote an article in November 2005 on the experience of  
2 working with Don Rubin in those days.

3 MR. WARSHAWSKY: And Your Honor, I'm going to refer to  
4 this very briefly. I have not marked it as an exhibit, but if I  
5 may approach the witness?

6 THE COURT: Yeah, it's a little late for me to announce  
7 the rule. I thought I had done it before. You never need  
8 permission to approach a witness in my courtroom, as long as  
9 you're doing it for a benign purpose.

10 THE WITNESS: Thank you, Your Honor.

11 MR. DORRIS: Your Honor, since I don't know how benign  
12 it is, I would ask that it at least be marked so we can refer to  
13 it in the record as we move forward.

14 BY MR. WARSHAWSKY:

15 Q. Dr. Scheuren, I've placed before you what's been marked  
16 Defendant's Exhibit 507. Would you describe what this is,  
17 please?

18 A. This is a recollection of the work I did with Don and others  
19 in those days long ago which led to the book that you've  
20 referenced in this setting.

21 Q. You're referring to the Rubin book on multiple imputation?

22 A. That's right. And my recollection of how it began and how  
23 it continues. Because it does continue. The missing data  
24 problem is probably never going to end. When statistics ends,  
25 it will end. Until then, it won't.

1 Q. Dr. Scheuren, what types of missing data problems can be  
2 addressed through multiple imputation?

3 A. Well, arguably the proponents say there's nothing you can't  
4 do with this. My use of it is primarily in a survey setting  
5 formerly, the original setting, and now in this setting.

6 Q. Dr. Scheuren, I would like to have you look now what's been  
7 marked Defendant's Exhibit 460.

8 A. Yes.

9 Q. And could you generally describe what this document is,  
10 please?

11 A. This is an outline of the things that I think maybe I could  
12 describe to the Court about the approach we took.

13 Q. And so this is a summary of NORC's approach?

14 A. Yes. Yes. And how we examined the data provided by FTI and  
15 Morgan Angel, and how we applied multiple imputation and how we  
16 dealt with the problems of the reported data, too. Because the  
17 reported data has problems, as we've been hearing in this court  
18 I guess since the inception of this case. And how we calculated  
19 the difference between the collection and disbursements, which  
20 is the key central statistic in this case, and what uncertainty  
21 we calculated for that difference.

22 Q. Okay. Let's look at the first bullet point, please;  
23 "examine existing data, identify missing data, identify outliers  
24 and treating them as missing."

25 Again, which data did you examine? What are we

1 referring to in this bullet point?

2 A. I guess we'll have a picture of this pretty soon. But we  
3 had the data that Ed Angel provided and the data that Michelle  
4 Herman provided, and we looked at it from our perspective as  
5 statisticians to see if there were instances where some points  
6 just seemed not to fit within the time -- over time or in  
7 relationships to each other.

8 At the very end of my -- when I came back in here, I  
9 heard redirect on one of those points being mentioned, one of  
10 those years being mentioned, and Ed Angel acknowledging that I  
11 had asked him about this. Because I had. One always goes to  
12 the subject matter person.

13 MR. WARSHAWSKY: Why don't we pull up Defendant's 461?  
14 This is actually a three-page document. And just flip through  
15 all three pages real briefly. Okay. Why don't you go back to  
16 the first page?

17 BY MR. WARSHAWSKY:

18 Q. Okay, Dr. Scheuren. We see lots of blanks and lots of  
19 numbers. What's depicted on this exhibit?

20 A. Well, the rows are years.

21 THE WITNESS: Can you bring this up so I can read this?

22 A. The rows are years. The first row is fiscal year, the  
23 second -- the first column is fiscal year, the second column is  
24 a collection figure, which in this part that we've brought up is  
25 empty. There was no data we had in 1887 for that.

1           The second column is disbursements. Both of those are  
2 reported in millions. And the third column is the balances, and  
3 the fourth column is the Osage per share. And it's important  
4 that I emphasize the per share aspects of this. It is not the  
5 headright count, because the count of people who have headrights  
6 was not used by us. We brought the per share numbers up not  
7 because we were going to impute them, but because we needed them  
8 to help guide the work we're going to do later on. Okay?

9 Because, of course, as you can see by looking at this screen,  
10 there's nothing there. How can we possibly impute that?

11 Q. Dr. Scheuren, what is a multivariate model?

12 A. A multivariate model is one where we look at all the  
13 variables - in this case there are five of them - we look at all  
14 the variables together and we use the relationships between them  
15 to enhance our understanding of any one of them.

16 Q. Now -- go ahead.

17 A. In Professor Cornell's model he had a univariate model. He  
18 just looked at one variable.

19 Q. Now back on Exhibit 460, which we don't need to pull up, but  
20 your first bullet point talked about identifying missing data.

21 Is that what the yellow boxes are here?

22 A. The yellow was a color code. I'm actually close to color  
23 blind, but others are not, so it was a code to indicate that  
24 data was not available at all.

25           The other color, which I guess is purple --

1 Q. Good guess.

2 A. -- is to identify the outliers that we found in the data we  
3 were given, and that we decided to treat as missing.

4 Q. Now, just to bring us back, then, we were talking about  
5 multivariate models. What are the variables in your analysis?

6 A. The ones we have in this display, a year, which goes from  
7 1887 to 2007, and the collections, disbursements, balances, and  
8 the Osage per share figures.

9 MR. WARSHAWSKY: Would you move it back so we can see  
10 the whole page?

11 BY MR. WARSHAWSKY:

12 Q. Now, in some cases you've got cells or boxes with numbers in  
13 them?

14 A. Correct.

15 Q. And what do those represent?

16 A. That's the data that we obtained from, in this case, in this  
17 display, from Morgan Angel.

18 Q. And continuing through page two, page three, same story  
19 where you've got cells with numbers?

20 A. Correct. At a point in 1972 we shifted from Ed Angel's data  
21 to the data we got from Michelle Herman's team.

22 Q. Let's go back to the first page. There were some cells on  
23 the first page that have numbers in them and are colored. You  
24 correctly identified it as being the purple ones.

25 A. That's correct.

1 Q. What did you mean by outlier?

2 A. Well, we have a lot of methods in statistics for identifying  
3 something that doesn't look like it belongs in the same data  
4 set, and we used those methods here to identify something that  
5 looked like it could have been --

6 THE WITNESS: And I should make a distinction, Your  
7 Honor, between a representative and a nonrepresentative outlier.  
8 A representative outlier is something that is real, okay, but is  
9 unusual. A nonrepresentative outlier is something that's a  
10 mistake, a punch error, key punch error, very common in the old  
11 days.

12 A. So you look for the outlier and then you say, well, was it a  
13 representative outlier or a nonrepresentative outlier? And this  
14 is a long time ago, so we're not really able to determine  
15 whether it's a representative or nonrepresentative outlier. And  
16 what we did, because it's a more conservative thing, more  
17 favorable to the plaintiff, we treated it as missing.

18 Q. Let me ask you to look at the entries for 1922. Now, you  
19 weren't in the courtroom yesterday afternoon when Mr. Smith  
20 asked about the 1922 entries, were you, sir?

21 A. I left after the break or something. I was not here for the  
22 whole day, no.

23 Q. Well, during the cross-examination by Mr. Smith, Dr. Angel  
24 was asked about 1922 and a \$5.5 million figure.

25 A. Yes.

1 Q. Assuming that's the same \$5.5 million figure represented in  
2 your boxes here, did you have a conversation with Dr. Angel  
3 about these --

4 A. I did.

5 Q. -- numbers and whether they were outliers?

6 A. I did. We didn't use the word "outlier," because he's a  
7 complete human being and I'm just a statistician, but yes, we  
8 talked about that these were unusual.

9 Q. And what was it about those numbers that you felt --

10 A. Well, they don't fit in the time series, and this is the  
11 only instance where they're exactly equal between collections  
12 and disbursements.

13 Q. What did you mean when you said it doesn't fit in a time  
14 series?

15 A. Look at the years afterwards and look at what's going on  
16 with the balances at the end. These just don't look like they  
17 belong here. They look like the data is incomplete. There's  
18 something missing. I don't know what it was; Ed didn't know  
19 either, to my recollection.

20 But they don't look like they belong, and so we  
21 eliminated them. We treated them as missing.

22 Q. Okay.

23 MR. WARSHAWSKY: Would you show us the second bullet  
24 point now on DX-460?

25 BY MR. WARSHAWSKY:



1 Q. Sir, the second bullet point reads, "Use Multiple Imputation  
2 to Generate Estimates of Missing Data and to Assess Missing Data  
3 Uncertainties."

4 This refers to the process NORC undertook?

5 A. That's correct. To fill in the data matrix - I'll use the  
6 language again - the data matrix that you've just looked at.

7 Q. Okay. And what did you mean, or what does it mean here  
8 about assessing missing data uncertainties?

9 A. When we don't know the answer, we have to pay a price for  
10 that. Okay? And I'm talking about uncertainties in that sense.  
11 We produce a distribution of answers based on the information we  
12 have, and then we look at how widely apart the distribution is.  
13 And that is a way to look at the uncertainty.

14 And in the context of a government versus a plaintiff,  
15 the uncertainty has to be scored to the plaintiffs. If we  
16 cannot come up with a good point estimate, then that needs to be  
17 brought here and examined, and the judge needs to make a  
18 determination based on that.

19 Q. And that's your opinion as a statistician?

20 A. That is my opinion as a statistician.

21 Q. Now, how do you go about generating estimates, or how did  
22 you go about generating estimates in this case using multiple  
23 imputation?

24 A. Well, we'll use the word "Bayesian" for Reverend Bayes. We  
25 had a prior distribution and we made some assumptions about the

1 nature of the underlying processes. We assumed a multivariate  
2 normal, assuming multivariate normal is not a particularly  
3 serious weakness, because most things can be transformed into  
4 multivariate normal if you're looking at the details of this.

5 So we assumed -- I'm sorry, am I going into too much  
6 detail?

7 Q. Let me just interrupt you right there. What do you mean by  
8 a multivariate normal?

9 A. A multivariate normal is something that we take account of  
10 all the variables here.

11 Q. You're talking about the five variables --

12 A. That's correct. And we treat them -- in using the ideas  
13 of -- they come from normal distributions. Everyone who has  
14 taken a basic stat course knows about normal distributions, but  
15 the basic stat course they took is univariate normal, one  
16 variable. Here we are looking at a vector of five variables.

17 Q. How do you determine whether to utilize a particular  
18 variable in your analysis?

19 A. Well, we're obviously interested in the difference between  
20 collections and disbursements. We have to get to that point, so  
21 we have to include those two. The balances that are recorded in  
22 the system are enormously important, too, even though they don't  
23 seem to have been obtained -- or I'm not sure why, but they  
24 don't always agree. They don't foot, in other words.

25 In an accounting system, the beginning balance plus

1 collections minus disbursements should equal the ending balance.

2 And that's not true until 1996, when the data were audited.

3 Q. Now, in this case you utilized these five variables. How  
4 did you make a decision that these five variables would be the  
5 ones that you would use for your analysis?

6 A. Well, there is an exploratory data analysis step that  
7 precedes what we're talking about here, which is classically  
8 called a confirmatory step where we actually calculate  
9 confidence intervals and do statistical inference. And the  
10 confirmatory step is usually, as I say, preceded by an  
11 exploratory step where we look at all the data, we talk to the  
12 experts. And there are a lot of experts here.

13 Q. Describe the exploratory step that you undertook in this  
14 case.

15 A. We looked at relationships between these variables.  
16 Typically you take two variables and you would calculate a  
17 scatterplot of those two variables. That's one word,  
18 scatterplot, S-C-A-T-T-E-R-P-L-O-T.

19 Q. And what is a scatterplot?

20 A. A scatterplot, in deference to the judge not wanting a board  
21 like last time --

22 THE WITNESS: Sorry, judge.

23 A. A scatterplot is -- you put collections on the vertical and  
24 disbursements on the horizontal for a year, one of these years,  
25 for each of the years you have the both of them, and you simply

1 plot the points, and you see what relationship there is between  
2 those two points, between those two ideas, collections and  
3 disbursements.

4 BY MR. WARSHAWSKY:

5 Q. How do you determine if there's a relationship?

6 A. Well, typically, when you live in my world, you use  
7 regression, you use correlation, you use other techniques like  
8 that. Those are ones that are familiar to I think nearly  
9 everyone here.

10 Q. Did you consider any other variables besides the ones listed  
11 on Defendant's Exhibit 461?

12 A. I think we looked at more widely than this, but one of the  
13 problems we had was that we wanted to use data -- we wanted to  
14 use variables that would support the imputation that we had for  
15 the whole period, and the Osage variable was really the main  
16 variable we had.

17 If you look -- excuse me.

18 Q. Let me ask you about that. Because there's been a lot of  
19 testimony during the trial about Osage, and you made a point  
20 early on in your testimony about the fact that you used per  
21 share.

22 A. Correct.

23 Q. Explain why you used per share in your multiple imputation  
24 analysis.

25 A. Because it had been represented to me that the headright

1 number, which includes not only the per share but how many  
2 people were getting it, was not always available. And so we  
3 didn't want to use that.

4 I don't want to -- I'm not trying to impute this  
5 number, but I don't want this number to have missing data  
6 problems in it. Then it adds to the uncertainty in a way that  
7 is not fair.

8 Q. Okay. So you weren't imputing the Osage per share number?

9 A. No, we did not.

10 Q. Obviously not imputing the fiscal year?

11 A. No.

12 Q. Did you impute the other numbers?

13 A. We did.

14 Q. Okay.

15 A. All of them that were missing.

16 Q. And what do you do after you determine that variables appear  
17 to be related? You were talking about the scatterplot and all  
18 that. What's the next step?

19 A. The next step is to employ techniques like -- any of them,  
20 to employ techniques to make estimates of what those  
21 relationships are. Okay? We did that.

22 And then once we made those estimates and  
23 relationships, we then used that model, okay, to do the  
24 imputation.

25 Q. And was this something you did on paper? Did you have a

1 computer?

2 A. Oh, no. Very intensive, very computer intensive.

3 Q. Took advantage of modern computing, did you?

4 A. Yes, I did.

5 Q. What did you utilize in your computing?

6 A. We used a procedure, PROC MI, which is a SAS procedure. SAS  
7 is a very well-known system for doing statistical analysis.

8 Q. And MI, is that the name of the application?

9 A. That's correct.

10 Q. By the way, do you know if that application was provided to  
11 the plaintiffs in this case?

12 A. We gave them all the data, yeah, all the imputations.

13 Q. Did you provide them a copy of the application --

14 A. And the software, yes.

15 Q. And when was that done, do you remember?

16 A. When did we provide that information?

17 Q. Yeah.

18 A. I think we provided it last Friday.

19 THE COURT: Last Friday?

20 THE WITNESS: Or last Thursday. Actually, we agreed to  
21 provide it last Thursday and we provided it last Friday about  
22 noontime.

23 BY MR. WARSHAWSKY:

24 Q. And can you generally describe what the SAS application does  
25 with the data?

1 A. What it does is it brings in the information that you've  
2 seen on the screen here within a model, the multiple imputation  
3 model that's been constructed by a prior distribution, sometimes  
4 called the non-informative prior, and the multivariate normal  
5 idea.

6 Q. Now, I have to tell you, you're talking over my head.

7 A. I'm sorry.

8 Q. What's a non-informative prior?

9 A. We have to have some kind of a prior distribution, okay, to  
10 say statements about the parameters, okay, and in order to begin  
11 the process of doing the imputation. The prior in the end  
12 doesn't usually become important at all, because we're going to  
13 do this thing over and over again, we're going to use the  
14 posterior. The posterior distribution is the thing that you get  
15 after you take the prior and the data itself, which we're  
16 assuming is multivariate normal, and calculate the posterior.

17 The posterior eventually becomes free, virtually free  
18 of the prior when you do it many, many times.

19 Q. Becomes free of what?

20 A. It becomes free of the prior. It doesn't matter very much.  
21 The process -- the whole machinery falls away at some point.  
22 Multivariate normal is a very friendly world to do this in. I'm  
23 sure if you use other methods, maybe it wouldn't fall away, but  
24 in the world we're in, we use multivariate normal.

25 Q. Well, you refer to multiple imputation. What's involved in

1 running an imputation or making an imputation?

2 A. What we do is we draw -- first of all we make a first, I'll  
3 use the word "guess," but it's an estimate, a first estimate of  
4 what we think the mean and the variants are for this data,  
5 relying only on the data that's available. And we use that  
6 guess plus this prior, which allows us to construct the  
7 posterior, we use that guess and the prior to develop a method  
8 of sampling from the prior.

9           Actually, the posterior is very hard to describe  
10 analytically, typically. But you can sample from it, and if you  
11 can sample from it, then you sample from it multiple times and  
12 then use the samples that you construct to look at the shape of  
13 the resulting data. And that's what we did.

14 Q. Let me ask you this: How many imputations did you run in  
15 this case?

16 A. 10,000.

17 Q. And is there a rule of thumb for how many imputations to  
18 run?

19 A. In the old days, when computing was expensive, three to five  
20 was what they were hoping to get people to do. Of course they  
21 were trying to sell an idea in an age when we didn't have the  
22 computing, didn't have PC's, didn't have anything like what we  
23 have today.

24           10,000 is a large number, probably larger than normal.

25 Q. Is there any value in running a larger number than a smaller



1 number of imputations?

2 A. The larger the number is, the simpler the analysis becomes  
3 later.

4 MR. WARSHAWSKY: And let's pull up Defendant's  
5 Exhibit 462, please. And why don't you flip through the three  
6 pages?

7 BY MR. WARSHAWSKY:

8 Q. Dr. Scheuren, what is Defendant's Exhibit 462?

9 A. This is the completed data matrix that I talked about awhile  
10 ago where we've put in averages for the imputed values. And  
11 we've also done something else here which we haven't described  
12 yet, which is we dealt with the problems in the reported data.

13 Q. Okay.

14 MR. WARSHAWSKY: Let's very quickly go back to 460, and  
15 let's pull up the third bullet point.

16 BY MR. WARSHAWSKY:

17 Q. The third bullet point on Defendant's Exhibit 460 reads,  
18 quote, "Identify Reported and Imputed Data to Be Modeled Because  
19 of Other Identified Uncertainties." What is that referring to,  
20 Dr. Scheuren?

21 A. Well, I've been working on this case for a long time, and  
22 I've been listening to the plaintiffs and I've been listening to  
23 the data, and there are uncertainties in this data that deserve  
24 attention.

25 And when we did the imputation, we're doing it - and

1 I'll use the word "conditional" - conditioning on the data we  
2 have that's reported, which is to say we're treating it as  
3 fixed. The data is fixed.

4 Well, the data has its own problems, and so it deserves  
5 to be -- those problems deserve to be addressed, too. And that  
6 uncertainty needs to be incorporated into this calculation as  
7 well, so we went ahead and did that.

8 Q. Now, what types of problems are you referring to when you  
9 say that the data have their own problems?

10 A. Well, you've asked me to -- and we've talked about these  
11 outliers already. Those would be the most obvious instances of  
12 that. But there are other instances that are not so obvious and  
13 may not be so easily grasped.

14 One of the things that -- one more moment. One of the  
15 things that is essential is to notice that the thing does not  
16 foot. Except for the years when it was audited, 1996 beyond, it  
17 didn't foot. That suggests there's some issues.

18 MR. WARSHAWSKY: Let's pull Defendant's 462 back up,  
19 then.

20 THE WITNESS: You're going to have to bring it up for  
21 me.

22 MR. WARSHAWSKY: He means blow it up a little bit.

23 I know I'm not supposed to ask, but if I may approach  
24 the witness.

25 THE WITNESS: I would love to have a paper copy. I'm

1 before cheap computing.

2 MR. WARSHAWSKY: Now, I'm going to depend on the  
3 TelePrompTer here, whatever we call this thing, the screen.

4 BY MR. WARSHAWSKY:

5 Q. Okay. Dr. Scheuren, referring to Exhibit 462, we'll go back  
6 to --

7 MR. WARSHAWSKY: Let's go to the first page, please.

8 BY MR. WARSHAWSKY:

9 Q. You've got numbers now in the yellow boxes --

10 A. Correct.

11 Q. -- for example, the 1887 entry.

12 What is represented -- what's the significance of the  
13 numbers that are --

14 A. Those are the averages of the 10,000 imputations after we  
15 have made a further adjustment for the fact that the reported  
16 data had its own problems. You remember what I said? We  
17 started out doing the imputations using the reported data as  
18 fixed. The word "fixed," if you've done regression analysis,  
19 you're fixing -- in order to estimate Y, the dependent variable,  
20 you fix X, which is the independent variable. But X could have  
21 error too.

22 So we started out with that, and then we went on -- and  
23 we haven't described this still yet. We then went on and did an  
24 adjustment for the reported errors as well.

25 And this results -- after we've done all that, this

1 results in these values, the yellow values.

2 Q. And just to be clear, then, multiple imputation, is that a  
3 form of regression analysis?

4 A. Oh, in a broad sense, I guess you could say that. I  
5 wouldn't say it that way. But we did a time series analysis  
6 after we did the imputation to get rid of our concerns about the  
7 remaining problems in the reported data.

8 MR. WARSHAWSKY: Show the full page, would you, please?

9 BY MR. WARSHAWSKY:

10 Q. So now you've got a number of different types of boxes. In  
11 addition to the yellow ones, I see the purple box for 1908 under  
12 "balance." Do you see that, sir?

13 A. Correct. Yes.

14 Q. That was one previously identified in --

15 A. As an outlier, yes.

16 Q. In 461 as an outlier?

17 A. Yes. And the original value was 4, I believe. That's now  
18 12.

19 Q. And you've got 461 in front of you. You might want to  
20 confirm that.

21 A. Correct. And that is confirmed, yes.

22 Q. How did it go from 4 to 12.7?

23 A. Well, we went through this process that I described of doing  
24 these imputations, of treating this value as missing, and  
25 because of the relationships that exist in the period -- we're

1 at a transition period here when we have some missing data --  
2 some data and then a lot of missing data. In this era here, we  
3 changed over from one method to another.

4 I have to correct myself. May I? The second time  
5 series analysis was only done on the collection and disbursement  
6 data, it was not done on the balances.

7 Q. So, for example --

8 A. Those are the values from the imputation.

9 Q. Let's look at the entries for 1909 to 1911, collections and  
10 disbursements. Do you see?

11 A. Yes.

12 Q. And those have a different type of box around them.

13 Correct?

14 A. That's correct. They were model adjusted, yes, by the  
15 model -- the time series model.

16 Q. Describe the time series model that you've been referring  
17 to.

18 A. We're looking at collections -- this time period, time  $T$ , is  
19 usually related to time  $T$  minus one,  $T$  minus two, and so forth.  
20 And disbursements similarly to itself in previous time periods.  
21 And collections and disbursements are also related to each other  
22 typically, especially in modern times when collections -- when  
23 disbursements have to be given out once a certain collection  
24 threshold has been met. But there was a relationship all the  
25 way back, too, although it's statistical and not procedural.

1                   In any event, we had -- we did an ARIMA model --

2           Q.   Which is?

3           A.   A model of -- a time series model which looks at how current  
4           time is related to past periods.

5           Q.   How many periods, prior periods, did you look at?

6           A.   We ended up using seven.  And if you look at the top of the  
7           chart, the chart on the first page here, we actually have Osage  
8           data that goes back earlier than this, okay, in this period, and  
9           we were able to use that to help us --

10          Q.   Approximately seven years back?

11          A.   Yeah, I don't remember how many years back that the Osage  
12          data goes, but we used seven years back.

13          Q.   And then what did you do with the seven years of data?

14          A.   We used it to start the process.  So the first data point  
15          was fit with -- the first collection and disbursement data point  
16          was fit with models that went back seven prior years and so  
17          forth, and in the more recent time, when we get down into the  
18          data itself after the starting point, we're using all the data  
19          that we have, imputed data and reported data.

20          Q.   Are you basically rolling down --

21          A.   That's correct.  That's the way to look at it.  It's kind of  
22          like a moving average, which I think is pretty well understood.

23          Q.   So you utilized the seven-year -- this time series analysis,  
24          you certainly did it, according to Defendant's Exhibit 462, for  
25          example, 1909, 1910, 1911, 1923 to 1926 -- we're on the first

1 page now.

2 A. Yes.

3 Q. Did you also do that for other periods on this page?

4 A. We did it for the imputed value, too. We just haven't  
5 re-marked those because -- we had to look at the whole series,  
6 because remember we had imputed the data conditional on the  
7 reported data? So the imputed data has the error or the  
8 uncertainty in the reported data carried forward into the  
9 imputed data. We had to deal with that, too. So we had to deal  
10 with both.

11 Q. Now, you were in the courtroom a few days ago when  
12 Ms. Herman was testifying on cross about the GLDL data.

13 A. That's right. I am familiar with that, yeah.

14 Q. Is the time series analysis that you're talking about  
15 relevant in any fashion to the data that you received from  
16 Ms. Herman?

17 A. We assumed that the data that we got from Ms. Herman was --  
18 did not have any missing data in it, but we did have this basic  
19 idea that there were issues with the data already. We didn't  
20 know what they were, we were rather cautious in our use of data,  
21 but when we found out about this issue, which we hadn't known  
22 about, we looked at it to see how much of it there was, how much  
23 missing there was in that period. It's relatively small, under  
24 five percent.

25 And then we went back to my usual example I gave

1 earlier about how we would handle this at the IRS, because this  
2 is the kind of approach we took at the IRS. But we have to  
3 score that decision for the uncertainty. There has to be some  
4 uncertainty added as a result of that. I think the estimates  
5 are probably sound the way they are. I'm very familiar with the  
6 way careful subject matter experts make these estimates. I have  
7 not gone back and rechecked those myself, I'm not an expert on  
8 subject matter, either, but I'm very sure that they're very  
9 good. The point estimates, in other words, are very good. The  
10 uncertainty, we have to factor that in.

11 Q. Let's look through real quickly -- we've looked at page one  
12 of Defendant's 462.

13 MR. WARSHAWSKY: Why don't you go to page two?

14 BY MR. WARSHAWSKY:

15 Q. Now, in this instance you have -- slightly over half of it  
16 is boxed as being model adjusted?

17 A. These were originally reported data, right.

18 Q. And under "collections and disbursements" on this second  
19 page, the yellow boxes, those are the imputed values?

20 A. Those are the imputed, but they've also been adjusted.

21 Q. Okay. That was my question.

22 MR. WARSHAWSKY: And then go to the third page of  
23 Defendant's 462.

24 BY MR. WARSHAWSKY:

25 Q. The same basic thing through 1995. Is that correct?



1 A. That is correct.

2 Q. So you did model adjust 1968 to 1971?

3 A. Uh-huh.

4 Q. Yes?

5 A. Yes, we did. The very area that you have been talking  
6 about, yeah.

7 Q. And then 1972 to 1995, why did you model adjust that data?  
8 That was already provided data. Right?

9 A. That's correct. But it had the general problems that this  
10 data set has, in that it's a system that was not designed for  
11 this analysis. And one has to be careful with such data. And  
12 we felt that it was irregular enough -- we had done this time  
13 series analysis and we looked for irregularity, deviations from  
14 the time series pattern, and we scored the deviations as  
15 uncertainties, and then we used that to add uncertainty to the  
16 process.

17 Q. How much did the reported and imputed data change after you  
18 modeled it?

19 A. I don't know exactly what that number is. We've changed  
20 everything. It changed it quite a bit. The uncertainty went up  
21 maybe about a third. About a third. I'm sorry, I don't have  
22 that number.

23 Q. Did the point -- were the point estimates changed much?

24 A. Not too much, no.

25 Q. Dr. Scheuren, you're aware that there was a Defendant's

1 Exhibit 371 version produced on May 30th, 2008?

2 A. Yes, I am.

3 Q. And then there was another version produced June 4th, 2008?

4 A. Yes, I know about both of those. Yes.

5 Q. And during this trial there's been some examination  
6 regarding differences between the May 30th and the June 4th  
7 numbers in your estimates.

8 A. That's correct.

9 Q. Do you have any insights as to why the numbers changed from  
10 May 30th to June 4th?

11 A. Actually, I'll give you three --

12 MR. DORRIS: Your Honor, I'm going to object until he  
13 ties a foundation that this man was involved in those  
14 calculations and personally knows why those numbers changed.

15 MR. WARSHAWSKY: I can do that.

16 BY MR. WARSHAWSKY:

17 Q. Dr. Scheuren, were you involved in the process that led to  
18 the generation --

19 A. Yes, I was.

20 Q. Let me get the question out. Process that led to the  
21 generation of estimates in the May 30, 2008 document?

22 A. Yes, I was.

23 Q. And how were you involved?

24 A. Well, we were looking at -- we're still trying to prove in  
25 our imputation model, and we thought we had something pretty

1 close at the end of May. It turned out that we couldn't prove  
2 and didn't prove it later. But we had not done at that point --  
3 introduced the uncertainties due to reporting issues.

4 Q. And when you say "we," you're talking about NORC?

5 A. The team of people I work with, yes.

6 Q. And were you a participant in that team?

7 A. I certainly was.

8 Q. Were you a participant on the team that generated the  
9 June 4th estimates?

10 A. Absolutely.

11 Q. And how were you a participant there?

12 A. Well, I'm the one who said, we have to do more. Okay? And  
13 we did do more, and I was involved in the analysis of that  
14 process. We looked at and added the outlier analysis. The  
15 outlier analysis was not in the May 30th estimate.

16 Q. What else was different about the May 30th estimates and the  
17 June 4th estimates, if you recall?

18 A. Well, we improved the model. We improved the model. We had  
19 taken an assumption from the plaintiffs that the world started  
20 in 1887, and we put a zero in for 1887. And that was not  
21 consistent with the Osage data, but we didn't notice that right  
22 away. And that led to very unstable estimates, and then we  
23 fixed that.

24 Q. Had you done your 10,000 imputations as of May 30th?

25 A. I don't think so. I think we did 1,000, but I don't

1 remember exactly how many we did. We hadn't done 10,000.

2 Q. Given that, do you have any insights as to why the numbers  
3 in the May 30th version of DX-371 changed to the numbers that  
4 are reflected in the estimates of June 4th?

5 A. Well, I just indicated to you that the uncertainty went up,  
6 okay, as a result of the difference in time periods. I don't  
7 have the May 30th numbers here, so if you want me to comment on  
8 them specifically, I will. But I've already made the point  
9 about the uncertainty. We did not complete the work until  
10 June 4th.

11 MR. WARSHAWSKY: Let's go back to exhibit --  
12 Defendant's Exhibit 460. We'll look at the fourth bullet point,  
13 please.

14 BY MR. WARSHAWSKY:

15 Q. Dr. Scheuren, the fourth bullet point reads, quote,  
16 "Calculate Difference Between Total Collections and Total  
17 Disbursements (Calculated Balance)," end quote.

18 Dr. Scheuren, why did you calculate the difference  
19 there?

20 A. This is the point of the trial, it seemed to me, is  
21 whether -- what is the amount of money that's in the system and  
22 how much of it is accounted for.

23 Q. How much?

24 A. How much of it has been accounted for by the existing  
25 records in the system.

1 Q. And is that what you meant by calculated balance?

2 A. What we did was of course we took these 10,000 data sets  
3 that we had created, and for each data set we calculated the  
4 collection and subtracted the disbursement, and with that  
5 difference we plotted the data. And I assume we're going to see  
6 a picture of that, a histogram, in a moment.

7 MR. WARSHAWSKY: Yeah, why don't we look at Defendant's  
8 Exhibit 463, please.

9 BY MR. WARSHAWSKY:

10 Q. Dr. Scheuren, what is Defendant's 463?

11 A. This is a histogram which plots one point for each of the  
12 10,000 imputations. Notice that it's based on the 10,000  
13 imputations and uncertainty adjustments. This "uncertainty  
14 adjustments" is a phrase that I use to deal with the fact that  
15 we had to address the reporting issues as well with the model.

16 Q. Now, is this a document that NORC prepared?

17 A. Yes.

18 Q. How did NORC go about preparing this histogram?

19 A. We simply took the collection value that we had obtained  
20 from the process for each of the 10,000, and we subtracted it  
21 from the disbursement value from the same run, and we took the  
22 difference. And then we plotted all the differences; you know,  
23 we binned them together. These are sometimes called bins, these  
24 slats. We bin them together from the smallest to the largest,  
25 and that's what we have here.

1 Q. Why does -- on the Y axis it reads "frequency"?

2 A. Correct. Counts, yeah.

3 Q. And what is that referring to?

4 A. We have 10,000 observations here, one for each of these  
5 calculations. And those are the counts -- those are what those  
6 counts are.

7 Q. So for example -- first of all, there's a red dashed line  
8 down the middle, and next to it it says "mean, \$583.6 million"?

9 A. That's the overall average, arithmetic average, of all the  
10 10,000 observations.

11 Q. And what is the bin - for example, the blue bin to the  
12 immediate left of that red line - what does that mean?

13 A. The bins are all the same width, and so you can make the  
14 visual connection between the count and the number in the bin.  
15 If the bins were different lengths, this wouldn't be a good  
16 display device.

17 Q. So I'm just eyeballing this, but would it be fair to read  
18 that one we were just referring to as meaning that the  
19 calculated balance in that bin was, I don't know, something less  
20 than \$600 million observed between six and seven hundred times?

21 A. That's a cumulative value. Okay? We're adding up all the  
22 values here, and it turns out that the mean shows up in that  
23 particular bin. It's not a count of what's in that bin, or not  
24 just in that bin.

25 Q. Now, what is the blue dashed line on the right-hand side?

1 A. This is a 95 percent upper confidence bound.

2 THE WITNESS: Your Honor will remember from last fall,  
3 when we were talking about the litigation support data, we  
4 provided 95 and 99 percent upper bounds to you because those are  
5 valuable in understanding the extent to which there's an  
6 uncertainty in this data. And 95 percent being the standard.

7 BY MR. WARSHAWSKY:

8 Q. Well, what inference do you want the judge to draw from  
9 what's on the left side of the blue dash versus what's on the  
10 right side of the blue dash?

11 A. That's a little too general for me. I would probably have  
12 to work on that a little bit. Let me ask a related -- answer a  
13 related question, which is: Where is the average, where is  
14 the -- what does the system say is the balance, which is a  
15 cumulative balance? What does the system say the cumulative  
16 balance is as of this point in time?

17 Q. To help you with that, why don't you pull up Defendant's  
18 Exhibit 464.

19 MR. WARSHAWSKY: And Your Honor, if I may, I would like  
20 to just give Dr. Scheuren a copy of DX-463.

21 BY MR. WARSHAWSKY:

22 Q. Dr. Scheuren, what is Defendant's Exhibit 464?

23 A. We're analyzing data that you've just seen displayed to  
24 calculate a difference, which is arguably unaccounted for, a  
25 difference between what we got when we did these 10,000

1 imputations and adjustments and the actual 2007 balance. The  
2 2007 balance is shown there as 423.7 million.

3 And the point estimate which was referenced by you in  
4 the red line a moment ago is the mean, and that's the, what's  
5 called point estimate here, and that was 583,000.86.

6 Q. 583.6 --

7 A. Point 6. Yeah, I have to put these on.

8 Q. So 583.6 million?

9 A. That's correct. And the difference, of course, is  
10 calculated as 159.9 million.

11 Q. By the way, in the 423.7 million, is that -- have you seen a  
12 copy of the final DX-371?

13 A. Yes, I have.

14 Q. And --

15 A. I believe that's the number, yes.

16 Q. Well, what number is it?

17 A. In millions it's 423.7.

18 Q. I beg your pardon?

19 A. I don't know that -- I would have to go back and look at the  
20 AR-171 to see if they actually calculate this variable. But I  
21 think they do.

22 Q. Why don't we just go ahead and --

23 MR. WARSHAWSKY: Can you pull up DX 371, please?

24 BY MR. WARSHAWSKY:

25 Q. Dr. Scheuren, do you recognize DX-371?



1 A. I do.

2 Q. And referring --

3 A. If you want me to read it, you have to bring it up some.

4 Q. I'm sorry?

5 A. If you want me to read it, you have to bring it up some. I  
6 actually had a copy with me but I didn't bring it forward.

7 MR. WARSHAWSKY: If I may, Your Honor, I'm going to  
8 provide a copy of DX-371.

9 THE WITNESS: Thank you, sir.

10 BY MR. WARSHAWSKY:

11 Q. And specifically now I'm referring you to the final page of  
12 DX-371.

13 A. Yes.

14 Q. The 2007 line, fiscal 2007 line.

15 A. Uh-huh.

16 Q. Under Column K, "Reported Ending Balance 423.7 million," do  
17 you see that?

18 A. Yes, I do. That's the number that we just looked at.

19 Q. So that's the same number as the one we were referring to on  
20 your implications --

21 A. Uh-huh. Exactly.

22 Q. -- DX-464 exhibit?

23 MR. WARSHAWSKY: So let's go back to 464, please.

24 A. Thank you. Thank you, John.

25 BY MR. WARSHAWSKY:

1 Q. You're welcome.

2 So Dr. Scheuren, the point estimate, the difference,  
3 159.9 million, what should Judge Robertson -- what is your  
4 opinion -- what opinions are you offering regarding that number  
5 to Judge Robertson?

6 A. There are a lot of things we can say here, and let me say  
7 one of them. I think another histogram in a minute will clarify  
8 why I'm saying this.

9 First of all, it looks like that our analysis suggests  
10 more data in this -- more money in the system than the balance  
11 shown in the reports. That's what it says.

12 Q. The 159.9 million?

13 A. Correct.

14 Q. Do you have an opinion -- does your information provide you  
15 with a basis for an opinion as to whether that is money owed to  
16 the plaintiffs in this case?

17 A. I can't answer that. Because, in fact, there's so much  
18 uncertainty in the data, that this is not inconsistent with the  
19 original 423 million.

20 Q. Why is that?

21 A. Because the missing data is so significant that the data --  
22 the values are spread so widely that you cannot reject in our  
23 hypothesis that the data could be -- that the real data, if we  
24 had it all, would be consistent with the 423 million.

25 Q. Well, Dr. Scheuren, then what is the significance of the

1       \$365.7 million figure shown in DX-464?

2       A.   This is an upper bound.  We do have a discrepancy here, and  
3       we do have to take account of the uncertainty in the data.  A  
4       mean does not directly do that.  A percentile, a 95 percent  
5       upper bound, which is in this picture that we were looking at a  
6       moment ago --

7       Q.   You're referring to -- I'm sorry, what's the exhibit number?

8       A.   463.

9       Q.   Okay.

10      A.   This does tell us how much of the data is -- how much  
11      uncertainty there is in the data at a 95 percent level.  One  
12      moment, if I could have it.

13                 THE WITNESS:  It is a decision of yours, Your Honor, to  
14      decide at what level of confidence you want to make your  
15      decision, whether it's the 95 percent level or some other level.  
16      That's a client issue, it's not -- I don't think it's a lawyer  
17      issue, either.  It's not a statistician's issue.  My role is to  
18      provide calculations for you; your role is to make decisions.  
19      And I know you know that.

20      A.   This 95 percent is very commonly used in many, many  
21      settings, including at the IRS, where I used to be, and at other  
22      places.

23      BY MR. WARSHAWSKY:

24      Q.   And I was just going to get to that.  When is it appropriate  
25      to use 95 percent as an upper bound?

1 A. Well, I think it's appropriate in business settings.  
2 Arguably this is a business setting. We have been providing to  
3 the Court and to our clients a 95 and a 99 percent upper bound.  
4 The 99 percent upper bound was originally developed in order to  
5 make sure that the samples were large enough -- this is way  
6 back. Were large enough so that the kind of concerns the  
7 plaintiffs had would be visible in the data.

8 And when we went to look at the data, the litigation  
9 support data, we found very, very small error rates. So we  
10 said, well, we were wrong about that. We didn't need as big a  
11 sample. But you can always calculate a 95 or a 99 percent upper  
12 bound from data.

13 Q. If you were designing this going forward with the  
14 information you already have, would you use 99 percent as an  
15 upper bound?

16 A. No. We are not using it -- in the trial last fall we put  
17 forward a plan where we're using a smaller sample size and a  
18 smaller confidence bound.

19 Q. But you did calculate it, the 99 percent upper bound --

20 A. It can always be calculated. Indeed, it's calculated here.

21 Q. And what number did you come up with when you did that?

22 A. I believe it's about 800 -- you have this number, actually,  
23 if you can help me. It's about twice the balance. No, that's  
24 not true. What is it, 860?

25 Q. How does 879.3 million sound?

1 A. Eight what?

2 Q. 879 --

3 A. That sounds right. I have trouble with numbers. I'm good  
4 on shapes but I have trouble with numbers.

5 Q. Okay. And you would subtract the 423.7 from that?

6 A. That's correct. And you would get another value here which  
7 would be about, what, 450 million.

8 Q. Something like it.

9 A. Yeah.

10 MR. WARSHAWSKY: Would you put up Defendant's  
11 Exhibit 500, please?

12 BY MR. WARSHAWSKY:

13 Q. Dr. Scheuren, what is Defendant's Exhibit 500?

14 A. This is the same data set, same histogram, but we've now  
15 laid on it a two-sided confidence interval. Still a 95 percent  
16 confidence interval, but it's two-sided. The other one was a  
17 one-sided confidence interval where the 95 percent was the upper  
18 bound.

19 Q. What's the difference -- sorry.

20 MR. WARSHAWSKY: Your Honor, if I don't need to go  
21 through this, please tell me.

22 BY MR. WARSHAWSKY:

23 Q. What's the difference between an upper bound and a  
24 confidence -- a two-sided and one-sided confidence interval?

25 A. They're both confidence intervals. A one-sided confidence

1 interval means that everything below a certain point you count  
2 whatever percentile you want, whatever percentage you want below  
3 a certain point. In the earlier case, 95 percent of the data  
4 fell below that value.

5 In this case we're looking at two-sided, which around  
6 the average, the red line, two and a half percent at the bottom  
7 would be left out and the two and a half percent at the top  
8 would be left out.

9 Q. And why did you have this histogram prepared?

10 A. Well, there were many reasons. The one I particularly  
11 wanted to use is to have you notice that the point estimate, the  
12 423 million that the system is reporting, falls within this  
13 95 percent confidence interval. It's on the low end, but it  
14 falls within it.

15 Q. Were there any other reasons that you had this prepared?

16 A. I think that the upper bound -- when I originally prepared  
17 this, I used the 95 percent upper bound. I did not have the  
18 information that the plaintiffs brought out about the missing  
19 data calculations that would have been made in data sets that I  
20 thought did not have missing data problems.

21 Q. Are you referring to the Chavarria Dunne --

22 A. Yes, I am. So I said, there has to be a way to adjust  
23 uncertainty up for that, and I haven't done a full analysis  
24 here, but I think that a 97.5 upper bound would be an  
25 appropriate adjustment. That is, we are increasing the

1       uncertainty to allow for that.

2                   And in a way that's consistent with having a 95 percent  
3 bound if there were no -- if that kind of uncertainty wasn't  
4 there.

5       Q.   Now, if we take 833.5 million, your upper bound there --

6       A.   Thank you.

7       Q.   -- and subtract 423.7 million, I did the math.

8       A.   Thank you.

9       Q.   It's \$409.8 million.

10      A.   Okay.

11      Q.   What opinions are you offering with respect to that number  
12 for Judge Robertson?

13      A.   This is a number which the systems work cannot be explained.  
14 The imputations we did and the adjustments we did lead us to  
15 this kind of uncertainty, and that uncertainty, of course, is  
16 actually connected to the system itself, okay, really. If we  
17 had better methods, we could have reduced this, perhaps. If we  
18 had more time and there were some issues around the early data,  
19 the GAO and Treasury data, that could allow us to reduce that  
20 uncertainty.

21                   But given where we are today, that's the amount of  
22 uncertainty that I believe the system has.

23      Q.   And let me ask you, is it fair to say -- would it be fair to  
24 say that with a 97.5 percent level of confidence, no more than  
25 \$409.8 million can be unexplained by the missing data?

1 A. That is correct. That is correct. Despite the weaknesses  
2 in this system and the length of time that these records have  
3 been produced, that's as bad as it gets.

4 Q. Dr. Scheuren, you referred earlier to observing  
5 Dr. Cornell's testimony. And did you have an opportunity to  
6 analyze Dr. Cornell's approach?

7 A. Yes, I did. We did.

8 Q. Describe what you did, please.

9 A. We first started out trying to understand the assumptions  
10 that he made, and basically what we did was we took our data --  
11 after all, remember, Professor Cornell did not have a lot of the  
12 data that Ed Angel had provided. Okay? He did not have that  
13 data. And we used his approach with the additional data we had.

14 THE WITNESS: Remember, Your Honor, he had interpolated  
15 between data points.

16 A. So we did that step and then we corrected the  
17 misunderstanding that exists in his data. He was using CP&R  
18 data when data from the Pacer system for electronic transfers  
19 was not incorporated, and so we added that in that belongs in,  
20 should be there, and then we calculated the disbursement rate.

21 And then we compared the average disbursement rate in  
22 that period with the average disbursement rate for the Ed Angel  
23 period, and they're not that different.

24 THE COURT: For the what?

25 THE WITNESS: The before 1972 period, the Ed Angel



1 period.

2 A. And they're not that different. As you know, if you would  
3 remember the world of the Depression, during the Depression,  
4 there was a lot of disbursements that exceeded collections.  
5 People were living off this money. But on the average they  
6 behaved about the same.

7 So there really wasn't -- one more second. There  
8 really wasn't a whole lot of, in my opinion, evidence to say  
9 that the data was earlier better than later better. Okay? And  
10 I'm open on that issue, and I assume I'll be crossed on that  
11 point.

12 BY MR. WARSHAWSKY:

13 Q. What did you do next?

14 A. So now we have a disbursement rate that we believe, we have  
15 the collection data which has now been adjusted in the way I've  
16 said; we then calculated the quantity that Professor Cornell  
17 calculated, and we developed, therefore, an estimate of what his  
18 estimate would have been if we had used our data and he had used  
19 the right disbursement data.

20 We did not -- importantly, we did not do any Osage  
21 adjustments. The Osage data is embedded in our data to the  
22 extent that it was in the system, but our use of the Osage data  
23 was entirely to adjust for the missing data, it wasn't really  
24 used in the way Michelle Herman described it. Nothing wrong  
25 with what she did, but it wasn't what we were doing.

1           So anyway, we did that, and now we have a system that  
2 has been -- and he testified to this, that is his methodology.  
3 And we came up with a small, about 30-some-million-dollar  
4 adjustment, to the reported data, upward adjustment.

5 Q. Compared to the 423.7?

6 A. That's correct. Yeah. Very small. And the reason it was  
7 so much smaller than ours is because he hasn't incorporated the  
8 uncertainty.

9           MR. WARSHAWSKY: Your Honor, if I could have just a  
10 moment.

11           (OFF THE RECORD.)

12 BY MR. WARSHAWSKY:

13 Q. Dr. Scheuren, just to be sure, the analysis that you've  
14 done, was that just for IIM beneficiaries or for the entire IIM  
15 system?

16 A. It's for the whole system.

17           MR. WARSHAWSKY: Your Honor, I have no more questions.  
18 Thank you, Dr. Scheuren.

19           And Your Honor, we will be moving Defendant's 460, 461,  
20 462, 463, 464, and 500.

21           THE COURT: All right. They're all received.

22           (DEFENDANT EXHIBIT Numbers 460 - 464 and 500 were moved  
23 into evidence.)

24           THE COURT: Mr. Dorris?

25           MR. DORRIS: Thank you, Your Honor.

**CROSS-EXAMINATION**

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BY MR. DORRIS:

Q. Good morning, Mr. Scheuren --

A. Hi, how are you?

Q. -- at least for a few more minutes.

Well, one thing we definitely agree on is that you were going to be crossed on the last part you were talking about. Since it's the freshest in our minds, let's start there.

A. Good idea.

Q. Now, what I'm referring to is this further analysis that you, and it sounds like others - you kept referring to "we" - have done with respect to Dr. Cornell --

A. Mr. Cornell's data.

Q. Right. Now, when was this analysis done?

A. When did Professor Cornell speak, last Wednesday, Thursday?

Q. Okay. I think that Dr. Cornell testified last Tuesday, but the days are beginning to run together.

A. Yeah, I'm sorry about that. As soon as we heard his testimony, we then understood what his attachment meant and we saw the data weaknesses that others have talked about. I'm not going to talk about those again. And we also saw the strengths of what he had done. Because he actually is, like a lot of people from the earlier period, before we dealt with model uncertainty and multiple imputation uncertainties, producing a reasonable model. It just doesn't take account of the

1       uncertainty.

2                       So we said, why don't we try --

3       Q.   My question is, when did you do the analysis.  I was not  
4       asking for the full explanation of what was done.

5       A.   I'm sorry.  I believe the analysis was done on Thursday or  
6       Friday of last week.

7       Q.   Okay.  Now, when I'm asking you a question, if you would  
8       please wait before you respond.  It makes it very difficult for  
9       the court reporter to take down when we're both talking.  Okay,  
10      sir?

11      A.   Absolutely.  My apology.

12      Q.   Thank you.  Now, this analysis that you've testified about  
13      today was done last Thursday or Friday, or both days.  Is that  
14      correct?

15      A.   We always check everything, so yes, we did it and then we  
16      did it again.

17      Q.   Okay.  And you indicated that you produced to the plaintiffs  
18      this database of these 10,000 observations on Friday night?

19      A.   Friday noon.  I thought it was noon, but maybe it was a  
20      little later.

21      Q.   And when those were produced, did you include anything about  
22      this analysis that you've just testified in court about?

23      A.   No, we did not.

24      Q.   Okay.  So the analysis that you're talking about that was  
25      done that you've just testified to without a single document in

1 front of us is something that no supporting documentation has  
2 ever been provided to the plaintiffs, to the best of your  
3 knowledge. Correct?

4 A. I'm sure that's true, yes.

5 Q. Do you have supporting analysis or documents that in any way  
6 support any of the testimony that you have just given regarding  
7 Professor Cornell's analysis?

8 A. As you know, since you looked at the multiple imputation and  
9 adjustment data, we do everything in the computer world and we  
10 can produce that data for you, that analysis for you, but not,  
11 probably, until tomorrow.

12 Q. And that is the analysis, then, that would permit us to  
13 begin to look behind the testimony that you've just given about  
14 your analysis of Dr. Cornell's materials. Correct?

15 A. Well, that is one way you can do it. But you got the data  
16 from us last Friday. You could have done this analysis  
17 yourself.

18 Q. Okay. I'm not asking about what analysis we can do, I'm  
19 asking about what you've done. Okay?

20 A. The answer is yes.

21 Q. Do you understand that?

22 A. The answer is yes.

23 Q. Now, let 's walk through it a little bit just so that we  
24 know what we're talking about. In overview, the analysis that  
25 you've just talked about of Professor Cornell's approach, you --

1 would it be fair to say that that's where you tried to come in  
2 and essentially take his method and make some changes to it for  
3 data that you had, to see what would happen?

4 A. That's correct.

5 Q. Okay. So it was essentially accepting his approach, and  
6 then what you would view as correcting some assumptions or some  
7 information to see what the answer would be using his approach.  
8 Correct?

9 A. Let me -- I'll be a little lawyerly with you. The word  
10 "accept" is a strong word here. We are looking at this as a  
11 hypothetical. I'm really a pretty experienced person, and once  
12 I understood what he had done, as he testified, I said, this  
13 will get us about the same answer, okay, as the system itself  
14 will get us, okay, if we make some adjustments.

15 And I then said, let's see if we can find out.

16 Q. Okay. So when I said "accept," you would agree with that in  
17 terms of at least accepting it just for the purpose of the  
18 analysis that you were doing?

19 A. That is correct.

20 Q. Now let's talk about what was done. Because we are going to  
21 ask you, if the Court will permit us, to produce that  
22 information so that we can review it.

23 But I want to concentrate for a second on what you did  
24 in terms of a disbursement rate.

25 A. Uh-huh.

1 Q. Did I understand you to say that you took the CP&R data  
2 about which Dr. Cornell testified, and about his analysis being  
3 based, and you added to that the EFTs, the Electronic Fund  
4 Transfers? Is that correct?

5 A. That's correct.

6 Q. And once you added those in, you then calculated a  
7 disbursement rate. Is that correct?

8 A. That's correct. For that period.

9 Q. For the same period that Dr. Cornell had?

10 A. Yes.

11 Q. And do you recall about what that -- approximately what that  
12 disbursement rate was?

13 A. 95, 96 percent, when you add in the EFT, yeah.

14 Q. And where did you get the EFT numbers?

15 A. From the Pacer system.

16 Q. Okay. From the Pacer system?

17 A. Uh-huh.

18 Q. You need to say yes or no.

19 A. Yes.

20 Q. And who provided that to you?

21 A. We had it already, but Michelle Herman.

22 Q. Okay. Michelle Herman provided to you the EFTs for those  
23 same years?

24 A. Yes.

25 Q. And that then is reflected in the analysis and workpapers

1 that you have. Correct?

2 A. It's reflected in the analysis that we did, yes.

3 Q. And then I understand that you also took some of the  
4 additional data points that you had been given by either Morgan  
5 Angel, Ed Angel, or Michelle Herman, and put those into  
6 Professor Cornell's model. Is that correct?

7 A. You use words like "some" in an interesting way, like the  
8 word "accept." So can I go back and rephrase your question and  
9 answer the question as I rephrase it?

10 Q. Well, I tell you, let me try to ask the questions. If you  
11 need --

12 A. I can't answer that question.

13 Q. Okay. Good. Let me try to rephrase it.

14 Can you tell us what changes you made to the data  
15 points that Professor Cornell used in his analysis?

16 A. As you heard testimony from Dr. Angel, there was data on  
17 receipts and disbursements for many years besides the years that  
18 Professor Cornell used receipt data or collection data. And so  
19 we had that data, which has been -- you've heard the testimony,  
20 and it's in the details in this display here that you have and  
21 you got last Friday.

22 So we had that data, and that was all the data that can  
23 be found at this point from the system. There are a lot of  
24 gaps, still, but there's a lot more data than Professor Cornell  
25 had.



1           Now, we didn't use anything different at that point  
2           from what you've already seen from Michelle Herman.

3           Q.   Okay.  Let me be a little more precise.  There were data  
4           points that Professor Cornell used.  Correct?

5           A.   Yes.

6           Q.   Did you make any changes to the data points that were in  
7           Professor Cornell's information?

8           A.   My recollection is that he had -- may have imputed some data  
9           points that were not in the record, but I do not know that right  
10          now.  I am not able to tell you that.

11          But what I am saying to you is what we did is we took  
12          all the data points that we had from Ed Angel and used those.

13          Q.   Okay.  But you can't remember what you did with the data  
14          points that Professor Cornell had in his, or not?

15          A.   Basically his data points were a subset of the data points  
16          we had.

17          Q.   Okay.  So to the extent they were in your data set, you used  
18          them.  To the extent they were not in your data set, did you use  
19          them or not?

20          A.   I have this recollection that there were some data points  
21          that he had imputed, and they weren't in Ed Angel's data set,  
22          but I cannot verify that right now.  I'm sorry, I can give you  
23          that answer this afternoon.  I'm sure we'll be doing this a  
24          little more this afternoon.

25          Q.   Well, would it be fair to say, in order to answer the

1 question I've asked you, you would need the analysis itself in  
2 order to answer that question?

3 A. I need to go back to some workpapers we had, yes.

4 Q. Okay. Now, when you then did the calculation, did you  
5 include anything in that calculation for any benefit that the  
6 government may have gotten from having excess money caught up in  
7 the system, I think is the way you described it earlier.

8 A. That's not something I did, no. Or we did.

9 Q. Now, but the point I think I understood you to say is that  
10 what you did did come up and show that there would be something  
11 in addition to the 2007 reported balance of about \$30 million?

12 A. That's correct.

13 Q. And that you were saying that really is not that much  
14 different from the analysis you've done, once you consider that  
15 your analysis tried to take into account the uncertainty  
16 regarding the data. Correct?

17 A. They were not inconsistent with each other, given the  
18 differences in assumptions that were made by us and by  
19 Professor Cornell.

20 Q. Okay. Now, I did understand you to say that from an  
21 overview perspective, you thought that Professor Cornell's  
22 approach was a good approach?

23 A. If he had had the data that we had, yes.

24 Q. The key to either approach, one of the keys to either  
25 approach is being grounded on the best data that's available.

1 Correct?

2 A. That's correct. But there is still this issue of the  
3 uncertainty, which Professor Cornell did not focus on.

4 Q. Okay. And once focused on that, that is uncertainty with  
5 respect to even the data points that we have, there's  
6 uncertainty about those. Is that correct?

7 A. That's what I said, yes.

8 Q. Now, you testified during your direct examination something  
9 that you -- and Mr. Warshawsky was real quick to clarify that  
10 you were testifying as a statistician. But something to the  
11 effect that you had made a decision to use a higher number  
12 because that was favorable to the plaintiffs. Do you recall  
13 that?

14 A. No, I didn't say that.

15 Q. Okay.

16 A. If I did, it was -- I misspoke. Higher number of what, of  
17 imputations?

18 Q. We'll come back to that when we have the transcript and can  
19 ask you about that.

20 A. Certainly.

21 Q. Would you bring up -- because there are a few questions I  
22 want to get in before lunch so that I can understand it better  
23 and the examination this afternoon can be shorter.

24 MR. DORRIS: Can you bring up Defendant's Exhibit 461?  
25 And would you highlight up across the top columns?

1 BY MR. DORRIS:

2 Q. This is the exhibit, Dr. Scheuren, that then reported the  
3 data you had and identified the missing data. Correct?

4 A. That's correct.

5 MR. DORRIS: And let's pan back out for just a moment.

6 BY MR. DORRIS:

7 Q. On the first page here, from 1887 certainly through 1921,  
8 there's a lot more missing data than there is data filled in on  
9 this page. Correct?

10 A. That is correct.

11 Q. Now let's go back across the top columns. There were  
12 several times during your testimony, at least as I was  
13 listening, that you talked about five variables that you  
14 considered. Do you recall that?

15 A. Correct. Yes.

16 Q. I see four columns here. Were each of those columns one of  
17 the variables that was considered?

18 A. You actually see five columns, because the fiscal year is a  
19 column.

20 Q. Oh, okay. So fiscal year is one of the variables?

21 A. Yes.

22 Q. And so that the other variables were collections,  
23 disbursements, balance, and Osage?

24 A. Yes. Per share value.

25 Q. Per share. Correct.

1           And explain to me again why it was important that you  
2 were using per share as opposed to total Osage headrights for a  
3 particular year.

4           A. Because my understanding is that when you go back to this  
5 early period, particularly, you don't have an actual number.  
6 You have to make a guess. So I chose a variable that we  
7 actually could believe in all the way back.

8           Q. Okay. So how important were having the correct Osage per  
9 share numbers to your analysis, at least in these early years  
10 that we're looking at on page one?

11          A. I would say that they were important, yeah.

12          Q. Are they critical?

13          A. I guess they are, yeah.

14          Q. Okay. Now, let's delve on that for a minute. If you have  
15 incorrect information on your chart for the Osage per share,  
16 then there are some serious problems with the entire model, at  
17 least for these early years. Correct?

18          A. Let me make two points. First of all, we can run the model  
19 without the Osage data, all right, and look at -- the word  
20 "important" and "serious" and so on needs to be quantitative,  
21 not qualitative. And that's the world we live in; we're quants,  
22 we're not quals. And we can go and run the model without it.  
23 All right?

24                 And the second point, small errors may not matter. I  
25 don't know -- you apparently have some notion that there are

1 some mistakes. I don't know what they are, but small errors  
2 should not matter.

3 Q. Okay. What percentage would be considered a small error?

4 A. Let me say it back to you again. Give me another data set  
5 with some other values that you think are better and we'll run  
6 the model again.

7 Q. Dr. Scheuren, I'm trying to ask you about the analysis that  
8 you performed and not about some new analysis that you could  
9 perform. Do you understand that?

10 A. Yes, sir.

11 Q. And you've testified now for some time this morning about  
12 various opinions you've drawn from this analysis. Correct?

13 A. Yes, sir.

14 Q. And I'm just trying to inquire now, looking behind that, as  
15 to what's important underlying your opinions and your analysis.  
16 Do you understand that?

17 A. Yes, sir.

18 Q. And would you agree with me -- let me ask again. Was having  
19 the correct Osage per share amounts, is that something that's  
20 important in this analysis?

21 A. I agreed with you already and said it was.

22 Q. I thought you kind of unagreed with me later, but I'm glad  
23 we got back to that same point. Thank you.

24 Now, where did you get the Osage per share information?

25 A. I didn't get it myself. It was obtained from the website.

1 Q. Obtained from which website?

2 A. The Osage website, and adjusted by data from Michelle  
3 Herman.

4 Q. So did you use Michelle Herman's data in any way?

5 A. Yes.

6 Q. Okay. I mean, the Osage per share is something that's  
7 published on the website. Correct?

8 A. Correct.

9 Q. What calculation did you need from Michelle Herman to know  
10 what's published on the website?

11 A. We needed to adjust for the difference in years. Some of  
12 these are calendar year on the website and some are fiscal year.

13 Q. So how did you go about adjusting for fiscal year?

14 A. We had quarterly data on the website, so we adjusted it  
15 straightforwardly.

16 Q. So what you did is then you went in and adjusted what was on  
17 the website so that it would then be compared to the fiscal  
18 year?

19 A. Correct.

20 Q. Is that correct?

21 A. Correct.

22 Q. And how did you use anything that Ms. Herman gave you with  
23 respect to doing that calculation?

24 A. We had her insights about the data that we used.

25 Q. Okay. Now, with respect to the --

1           MR. DORRIS:  If you will come back out so we can see  
2           the whole page.

3           BY MR. DORRIS:

4           Q.  I take it that in looking at this page, there were four  
5           cells of data that you viewed as being, quote, "outliers"?

6           A.  That's correct.

7           Q.  And is outliers your word, I take it?

8           A.  It's a standard statistical word.

9           Q.  And you took those that are in the gray -- or you called it  
10          a different color before, but I'm challenged like you on the  
11          colors.  But the gray, and you took and you threw those out in  
12          terms of being used in your analysis?

13          A.  That's correct, in the imputation.  We were going to replace  
14          them with imputed values.

15          Q.  Now, with respect to the four variables that are represented  
16          by the columns that are other than the fiscal year, did you look  
17          at interrelationships between those variables as you put  
18          together your assumptions?

19          A.  Of course.

20          Q.  So you would try to establish, then -- this set of  
21          assumptions that you made before you did the imputations, you  
22          then established certain relationships between collections and  
23          disbursements, for example?

24          A.  Correct.

25          Q.  And how did you go about establishing that relationship in



1 your assumption?

2 A. Well, we talked about the word "scatterplot" earlier. When  
3 we had both data, both variables, we looked at them in the  
4 scatterplot. That would be a simple beginning for that kind of  
5 analysis.

6 Q. Okay. And then did you consider that type of disbursement  
7 information with respect to the fifth variable, which is the  
8 fiscal year?

9 A. Yes.

10 Q. So you tried to consider what disbursement relationship  
11 between collections and disbursements were over periods of time.  
12 Correct?

13 A. That's correct.

14 Q. And certainly in terms of known information, collections and  
15 disbursements in 1909 through 1911 is the only collection and  
16 disbursement information you have until 1920 -- that you  
17 accepted until 1923. Correct?

18 A. I'll take -- I'll have to look at this again, but yes.

19 MR. DORRIS: Well, can we blow it up a little bit  
20 there?

21 BY MR. DORRIS:

22 Q. This is important, so I don't want to ask you to guess.

23 A. The answer is yes, before 1923.

24 Q. So how, in your assumptions that you created for this model,  
25 then, did you give weight to the fact that the relationship

1 between collections and disbursements in those three years would  
2 be important in attempting to impute and determine these other  
3 values to put into the columns missing before it and after it?

4 A. We're looking at relationships that change over time -  
5 that's your implication, and that's true - and so the  
6 relationships that we can see in 1909 to 1911 would be very  
7 important for nearby years. Okay? Indeed, just as the  
8 relationships going backwards from 1923 would be more related to  
9 1923 than 1909.

10 Q. When you say nearby years, how nearby?

11 A. Well, the system -- we're filling in values here. Okay?  
12 Remember, we're making the distinction between what we did to  
13 analyze the reported data, which we were discussing a few  
14 minutes ago, to how we're going to fill in these missing values.  
15 And we end up with a model of the relationships which has time  
16 as a factor, okay, and has a relationship between disbursements  
17 and collections and balances as factors, and we do have the  
18 balance data here, which turns out to be very important. And  
19 the Osage data.

20 Q. Okay. Let me get my notebook, because I have a calculation.

21 MR. DORRIS: If I might have just a moment, Your Honor.

22 THE COURT: Yes, sir.

23 BY MR. DORRIS:

24 Q. Now, Mr. Scheuren -- Dr. Scheuren, excuse me. If I call you  
25 Mr. Scheuren, it's not out of any disrespect, it's just I've

1 found that I do that some. And I want to go ahead and tell you,  
2 I know you're Doctor, and I apologize if I call you Mister, just  
3 as I'm up here and inadvertently do that. Okay?

4 A. I'm Fritz usually, but you can call me anything you want.

5 THE COURT: No, no, no, not in this courtroom.

6 THE WITNESS: Excuse me, Your Honor.

7 MR. DORRIS: Your Honor, I wasn't going to go there.

8 BY MR. DORRIS:

9 Q. Okay. Dr. Scheuren, when I look, then, at Defendant's  
10 Exhibit 462, first page --

11 MR. DORRIS: And let's blow up kind of that part that  
12 is around 1909, 1911, and give us some room on either side.

13 BY MR. DORRIS:

14 Q. When I look from 1887 through 1908, these numbers that are  
15 in this chart under collections and disbursements would end up  
16 ranging from a low of about 93 percent disbursement rate to a  
17 high of a little bit over 95 percent disbursement rate. Do you  
18 see that?

19 A. Not from this view, no.

20 Q. Okay. Well, I will tell you that's what I came up with my  
21 handy calculator. And when I look in the 1909 to 1911 time  
22 frame, it ranges from about 72.5 to about 85 percent  
23 disbursement rate, with an average of about 76 percent  
24 disbursement rate.

25 A. Uh-huh.

1 Q. Now, if we move down, when I look after that period on below  
2 it, from 1912 on down, those begin to range starting at about  
3 88 percent in 1912 to about 94 percent in 1915.

4 Sitting here today, can you explain to us why this key  
5 information about the relationship between the collections and  
6 disbursement variables, considering the fiscal year variable  
7 also, ends up having, with respect to the only known data for  
8 collection and disbursements in this time frame, you coming up  
9 with a disbursement rate so much higher both before and after  
10 that period?

11 A. I don't have an answer to you right now, but I have to go  
12 look at that. Yeah.

13 Q. That is certainly something when you looked at this, that  
14 you studied and saw a concern about even yourself when you  
15 looked at this data. Correct?

16 A. There are two comments. May I?

17 Q. Well, did you go back -- let me start back a question before  
18 that. Did you go to this Defendant's Exhibit 462 when you ran  
19 it and start looking for outlier type issues?

20 A. I did do that.

21 Q. And let me ask you, if you remember, if the phenomenon that  
22 I just asked you about was one that you noticed when you went  
23 back and studied it.

24 A. I did not notice that in the outlier analysis I was using.  
25 I actually found some other outliers here, but not that one.

1 Q. Would --

2 A. That does not -- may I?

3 Q. No, I would like you to wait and answer my question. Okay?

4 All right.

5 Now, you indicated to us before that the balance  
6 information that you had -- and when we pull back out from this  
7 chart, we can see that there is no balance information up  
8 through 1908. Correct?

9 A. Yes.

10 Q. But even the balance -- when I say no balance information,  
11 no balance information in the reported values. Correct?

12 A. Uh-huh.

13 Q. You need to say yes or no.

14 A. Yes.

15 Q. And then the "Reported Value" column begins in 1909 and  
16 continues to the bottom of that first page. Do you see that?

17 A. Yes.

18 Q. But you testified earlier that it doesn't foot. What do you  
19 mean by that?

20 A. That the incoming balance plus collections minus  
21 disbursement doesn't equal the outgoing balance.

22 Q. So to have any appreciation of how you have used that  
23 variable in relationship to this chart, you would have to know  
24 how you tied that variable in your assumptions to the other five  
25 variables. Correct?

1 A. Correct.

2 Q. And can you explain that to us, sir?

3 A. We're in a world of multivariate normal. The relationships  
4 are captured in a variance-covariance matrix, and they're really  
5 usually characterized by correlations, linear relationships  
6 between variables.

7 Q. And over what period of time, then, would this balance  
8 variable be applied to the other variables to have such a linear  
9 relationship?

10 A. The model that we used assumed a linear relationship in  
11 order to do the imputations. The actual final values grow out  
12 of the imputations.

13 Q. Okay. Now, the model also assumes a relationship between  
14 collections and disbursements. Correct?

15 A. It's fit. The relationship is fit, and then that  
16 relationship grows out of the -- comes out of the imputation  
17 process itself.

18 Q. And it assumes a relationship between Osage share numbers  
19 and other columns. Correct?

20 A. The word "assume" is giving me a little trouble here. We  
21 are fitting relationships between these variables, okay, and the  
22 data is speaking to us about what they are. And it may be  
23 strong relationships, it may not be strong.

24 Q. What the Osage headrights were for oil there near the Osage  
25 reservation, on the allotted lands adjacent there, what does

1 that have to do with timber production and timber sales from the  
2 Northwest, anything?

3 A. The answer is, there's a system here, and this is part of  
4 the system. The specific answer is the timber sales are not  
5 particularly related to other things, except there's a general  
6 economic relationship for that period of time. And that's about  
7 what we're getting here from this.

8 Q. So are you indicating that other than just a general -- to  
9 the extent they generally reflect the economy, there is no  
10 relationship between what the Osage per share would be and other  
11 forms of resources that produced income from Individual Indian  
12 Trust property?

13 A. That would be my belief, yes.

14 Q. Okay. And is that taken into account adequately in your  
15 model somehow, that one of the five variables that you used has  
16 nothing to do with many of the other resources that generated  
17 income?

18 A. You know, I like you. You take a partial answer and then  
19 you stick the word "nothing" in front of it, which is not what I  
20 said, by the way, sir.

21 Q. You like that?

22 A. I like your twisting. And let me come back and answer your  
23 question. Okay? Without the lawyer word. All right?

24 We are not claiming that this is a good model, we are  
25 claiming that we did this model in a way that would allow us to

1 measure the uncertainty in the data. And to the extent that the  
2 model is not good, it gives you more uncertainty; and to the  
3 extent it's a better model, less uncertainty.

4           If you have other variables, we could try them. But  
5 this is what we came up with.

6 Q. Okay. And that's just what I'm wanting to ask you about, is  
7 the things you came up with, Dr. Scheuren. And I understand  
8 that there are times that I will be asking you questions about  
9 weaknesses in the model, and we understand that you're saying --  
10 I just understood you to say you acknowledge it's not a good  
11 model. Is that correct?

12 A. You've just done it again, haven't you? You like to recast  
13 what I say. I would like to resay what I said, okay, and then  
14 maybe you can accept what I said as what I said. Okay?

15 Q. Let me ask this question: What did you mean when you said  
16 that this is not a good model?

17 A. I didn't say that. I did not intend to say that if I did  
18 say it. What I intended to say is that the focus of this model  
19 was not to necessarily produce good estimates, the focus of this  
20 model was to see the uncertainty in the data. And we tried to  
21 do the best we can to get a good model, of course, but we don't  
22 claim that this is the best of all possible models.

23 Q. Okay.

24           MR. DORRIS: Your Honor, we're approaching the lunch  
25 break. This is probably as good a breaking spot as I...



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THE COURT: All right. We'll be in recess for an hour.  
(Recess taken at 12:32 p.m.)

**CERTIFICATE OF OFFICIAL COURT REPORTER**

I, Rebecca Stonestreet, certify that the foregoing is a  
correct transcript from the record of proceedings in the  
above-entitled matter.

\_\_\_\_\_  
**SIGNATURE OF COURT REPORTER**

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