

USING SCL FOR QUALITY CONTROL DURING DATA ENTRY

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ABSTRACT

The Centers for Disease Control and Prevention (CDC), in collaboration with the Indian Health Service (IHS), assisted the State of South Dakota to set up a system for surveillance of Foetal Alcohol Syndrome (FAS). Battelle developed the FAS Applications Facility (FASAF) using SAS[®] software for data entry from abstraction forms. Using FASAF, the data abstraction coordinator developed and maintained SAS relational data sets directly on lap-top personal computers running SAS 6.04 on MS-DOS. With Screen Control Language (SCL), FASAF guards against illogical responses to sequential questions, and invalid entries to value-restricted data entry fields. SCL was also used to (i) compute on-screen summarizations, (ii) pass case identification numbers throughout the database, (iii) open 'help' windows when necessary, and (iv) provide warning messages and data entry instructions. Production of an accurate and precise database contributed to the purposes of surveillance, that is, intervention, prevention and case management.

INTRODUCTION

Foetal Alcohol Syndrome (FAS) is characterised by a specific set of birth defects or developmental disabilities, some of which are not discernible at birth. Occurrence of FAS results from *in utero* exposure of the baby to maternal consumption of alcohol. Some characteristics of FAS include shortness of stature, widely set eyes, a thin upper lip, a flat philtrum, lack of understanding of cause and effect, and mental retardation. This list is neither exhaustive nor conclusive, that is, there are other known characteristics and perhaps others unknown. Furthermore, every baby with FAS may not be characterised by all known traits, and neither would the evidence of these traits be conclusive of *in utero* exposure of the baby to maternal consumption of alcohol while pregnant. Other less discernible characteristics of alcohol-exposed babies are termed Foetal Alcohol Effects (FAE).

With about 8,000 babies being born each year with the characteristic birth defects or developmental disabilities associated with FAS or FAE, the Centers for Disease Control and Prevention (CDC), collaborating with the Indian Health Service (IHS), used an epidemiological approach to assist the State of South Dakota to address the FAS problem in the region. In the first instance, this was to develop and establish a surveillance system. SAS[®] software, version 6.04 on an MS-DOS platform and featuring SAS/AF[®] and SAS/FSP[®] software, was used to construct a PC-based, menu-driven database management facility called the Foetal Alcohol Syndrome Applications Facility (FASAF). FASAF is characterised by the capability for accurate data entry using SAS Screen Control Language (SCL) and can be easily implemented on lap-top computers in the field by nonSAS users.

Surveillance for FAS and FAE will allow the state to have a

database on hand by which to be able to identify mothers at high risk to be delivered of an FAS/FAE baby, to be able to assist such mothers in reducing their risk, and to be able to provide assistance to those babies or children who are already characterised by FAS or FAE. That is, the state will have the ability to conduct case-prediction, early intervention and case management.

METHOD

SCL and SAS/AF software

SAS/AF software allowed creation of HELP, MENU and PROGRAM entries which were saved in an applications catalog. These entries were each composed of a visible DISPLAY window and, except for HELP entries, user-transparent General Attributes or GATTR and Attributes or ATTR windows. In addition, the PROGRAM entry was characterised by a user-transparent SOURCE window within which SCL was written to back up the contents of the DISPLAY window. SCL was composed in three labelled sections: INIT:, MAIN:, TERM:, where each section was ended with a RETURN; statement.

SAS/AF software was used as the framework for FASAF because of these features. That is, a menuing system was built to preserve user-transparency while creating and accessing SAS data sets. Corresponding to each data management menu selection (Figure 1), a PROGRAM catalog

```

Chart Abstraction Main Menu
Select Option ---->

                                SOUTH DAKOTA FAS SURVEILLANCE
                                FASAF (VERSION 6)--CHART ABSTRACTION MAIN MENU

                                Data forms

                                1. Medical chart abstraction--single-record data entry
                                2. Medical chart abstraction--multiple-record browsing

                                3. Growth chart--single-record data entry
                                4. Growth chart--single-/multiple-record browsing

                                Other information

                                5. Orientation
                                6. Other activities (anthropometrics, counts, lists, etc.)

                                -- To quit, press 'F10'. --
  
```

Figure 1. MENU DISPLAY window for FASAF main menu

entry was designed (Figure 2) which, through the DISPLAY window, displayed a brief but extended description of the purpose or options for that particular menu selection (Figure 3). The purpose for this arrangement was to allow for user-

[illegible]

Figure 2. MENU ATTR window for FASAF main menu

```

4. Growth chart--browse
Command ==>
To exit quickly, press F10.
      SOUTH DAKOTA FAS SURVEILLANCE
      FASAF (VERSION 6)--GROWTH CHART BROWSE CONFIRMATION

This option opens the Growth Chart data set in browse mode.
You may browse the data set
    (i) one record at a time using the data entry screen, or
    (ii) in tabular form headed with the SAS variable names.

Note: No records may be added.  No records may be edited.

Press TAB or SHF TAB to select browse option.  Make one selection.

Do you wish to browse individual records per screen? _ (Y=Yes)

Do you wish to browse multiple records per screen? _ (Y=Yes)

If not, press F10 to return to the main menu.

```

Figure 3. PROGRAM DISPLAY window for confirming growth chart browsing

confirmation of the particular menu selection. That is, if an incorrect menu selection had been made, then the user would have the option to return to the main menu and make a new selection.

Making a browse selection from the main menu allowed the user to view the data while no editing of the data was allowed. Data views were arranged either in single-record, data-entry layout, or as a tabular display of the data in a multirecord, comparative layout (Figure 3). SAS/AF SOURCE

SCL for the former layout required a **CALL FSEDIT** statement in **BROWSE** mode, whereas the latter layout required the **CALL FSPRINT** statement (Figure 4).

```

main:
if gchs = 'Y' & gcbm = 'Y' then do;
  alarm; cursor gchs;
  _msg_ = 'Make one selection only.';
end;

if (gchs = 'Y' & gcbm ne 'Y') |
(gchs ne 'Y' & gcbm = 'Y') then do;

  call putlegend (1, ... , 'p');
  call putlegend (2, ... , 'c', 'r');
  call putlegend (3, ... , 'c', 'r');
  call putlegend (4, ... , 'c', 'r');
  call legend ('Growth Chart browsing--');

if gchs = 'Y' then do;
  call fseedit('lr.gc', 'lr.fascat.gcscr', 'browse');
end;

if gcbm = 'Y' then do;
  call fsprint ('lr.gc');
end;

  call endlegend();
end;

return;

```

Figure 4. PROGRAM SOURCE SCL for browsing growth chart data

A selection from the main menu for data entry required a **CALL FSEDT** statement in the **SOURCE SCL** (Figure 5). This allowed data to be keyed one record at a time.

```

main:

    if gode = 'Y' then do;

        call putlegend
[1,'      + + +   NOTE   + + +           + + +   NOTE
+ + +','p');
        call putlegend
(2,' Age will be computed in years and months.','c','r');
        call putlegend
(3,' Percentiles (except head circumference) will be
computed.','c','r');
        call putlegend (4,
' Enter length and head circumference with up to 2 decimal
places.','c','r');
        call legend ('Instructions for growth chart data entry:');

        call fscdit('lr.gc','lr.fascat.gcscr');

        call endlegend();
    end;

return:

```

Figure 5. PROGRAM SOURCE SCL for growth chart data entry

An appropriate entry in the **DISPLAY** window therefore invoked execution of the **SOURCE SCL** which in turn invoked **SAS/FSP** software.

SCL and SAS/FSP software

SAS/FSP software allowed the end-user to complete data entry into **SAS** data sets and to browse such **SAS** data sets. Both data entry and single-record browsing of data were done on identical customized screen layouts or **FSEDIT DATASETNAME** windows, where **DATASETNAME** is the name of the **SAS** data set being displayed. Transparent to the user were other **FSEDIT** windows. **SAS/FSP SCL**, for example, was composed in the **FSEDIT Program** window in five labelled sections: **FSEINIT**., **INIT**., **MAIN**., **TERM**., **FSETERM**., where each section was ended with a **RETURN** statement. Features of **SAS/FSP** software which enhanced quality control included the **MAXIMUM**, **MINIMUM**, **REQUIRED** and **PROTECT** frames of the **FSEDIT Attribute** window.

Thus, a series of 17 customized data entry screens were designed for medical chart data entry and saved in the **FASAF** catalog as a **SCREEN** entry including attributes defined in the **FSEDIT Attribute** window and **SCL** composed in the **FSEDIT Program** window. The data set for which the medical chart **SCREEN** entry was designed was comprised of 359 variables. A second data set was later added to **FASAF** to contain growth chart data. This data set included 17 variables displayed on one data entry screen and contained multiple records per individual. Thus, a second **SCREEN** entry was also designed and saved in the **FASAF** catalog.

FASAF was designed so that the growth chart data set was accessed either directly from the **FASAF** main menu (Figure 1), or from Screen 10 of the data entry facility for the abstracted medical chart data (Figure 6). Using the former

```

FSEDIT SD.ABSTFORM
Command ==>                               Obs 0
WARNING: No observations on data set. Please press END or ADD. Screen 10
                                         ICD-9 search code: Entry #:
SECTION 3: FAS DIAGNOSTICS--GROWTH DEFICIENCY

Is growth deficiency mentioned in the chart: _ (Y=Yes, N=No)

Was failure-to-thrive (FTT) diagnosed: _ (Y=Yes, N=No)

Was growth deficiency calculated: _ (Y=Yes, N=No)

Do you wish to enter growth chart data now? _ (Y=Yes, then press ENTER.)
                                         (If "No", then leave blank.)
Otherwise, ...

To access the growth chart data independent of the chart abstraction form,
return to the main menu (press F10) then select option 3.

Press F10 from any screen. All data entries or changes will be saved.
This current menu selection will be terminated. You will return to the main
menu.

[Screen 1-9: SHF F7; Screen 11-17: SHF F8]
  
```

Figure 6. Medical chart data entry, Screen 10

option, a **CALL FSEDIT** statement in the **SAS/AF PROGRAM SOURCE SCL** was used (Figure 5). Using the latter option, a **CALL FSEDIT** statement was used and was nested in the **SAS/FSP SCL** composed in the **FSEDIT Program** window of the medical chart **SCREEN** entry (Figure 7).

main:

```

/* --Enter growth chart data-- */
if gcde = 'Y' then do;
  call symputn ('xptdob', ptdob);
  call symput ('xentno', entno);
  call symput ('xsex', sex);
  call putlegend (1,
    < < < NOTE > > >,'yel');
  call putlegend (2,
    'Age will be computed in years and months.','red','r');
  call putlegend (3,
    'Percentiles (except head circumference) will be
    computed.','red','r');
  call putlegend (4,
    'Enter length and head circumference up to 2 decimal
    places.','red','r');
  call legend ('Growth chart data entry instructions:');
  call fedit ('lr.gc','lr.fascat.gcscr');
  call endlegend();
  cursor gcde; alarm;
  _msg_ = 'Change "Y" response to blank if growth chart
  data entry complete.';
end;
return;
  
```

Figure 7. **SCL** in **FSEDIT Program** window of medical chart **SCREEN** for accessing growth chart data

For data entry quality control, **SAS Screen Control Language** was implemented in a number of ways. These included (i) the display of on-screen messages for growth chart data entry, (ii) passing identification numbers to subsequent medical chart data entry screens and to the growth chart data set, (iii) computing values for select fields, (iv) performing validation checks for accuracy, (v) performing consistency checks for logical sequencing, and (vi) overriding certain types of errors.

Growth chart data entry in **FASAF** was done on a partial screen window. During data entry, a legend window was opened also occupying a partial screen and containing specific data entry instructions. This legend window was controlled by **CALL PUTLEGEND**, **CALL LEGEND** and **CALL ENDLEGEND SCL** statements (Figure 7).

Two numbers were used for record identification. One was a randomly assigned "entry number" and the other was an International Classification of Disease--9th Revision (ICD-9) code by which medical charts were initially selected for abstraction of data. These numbers were entered at the top of the first screen and **SCL** was used to pass and display those numbers onto all following screens in the same relative position (Figure 6). These two fields were identified as repeated fields in the **FSEDIT Identify** window and were protected from editing in the subsequent screens through use of the **PROTECT** frame of the **FSEDIT Attribute** window. In addition, **SCL** composed in the respective **FSEDIT Program** windows was used to pass the entry number to the growth chart data set using the **CALL SYMPUT** macro variable assignment (Figure 7) and the **SYMGET** retrieval function (Figure 8).

Another aspect of quality control was the use of computed

APPLICATIONS DEVELOPMENT

init:

```
if entno = '' then entno = symget('xentno');
bdat = symgetn('xptdob');
sex = symget('xsex');
cursor gon;
```

return;

main:

```
/* --Compute age-- */
if bdat ne . & date = . then do;
    alarm; cursor date; _msg_ = 'Is there a measurement
date?'; end;
if bdat = . & date ne . then do;
    agemo = .; ageyr = .;
    alarm; cursor date;
    _msg_ = 'There is no birth date. "Age" set to missing.';
end;
if bdat ne . & date ne . &
((ageyr = . & agemo = .) | (date ne pdate)) then do;
    agedys = (date - bdat) + 1;
    ageyr = int(agedys / 365.25);
    ager = mod(agedys, 365.25);
    agemo = int(ager / 30.44);
    pdate = date; end;
if agedys lt 0 then do;
    agemo = .; ageyr = .;
    alarm; cursor date;
    _msg_ = 'Measurement date precedes birth date. "Age"
set to missing.';
end;

/* --Convert standard units to metric if metric not given-- */
if wtgm = . & (wtlb ne . | (wtlb = . & wtoz ne .)) then do;
    if wtlb = . then wtlb = 0;
    if wtoz = . then wtoz = 0;
    wtgm = (wtlb + wtoz/16) * 453.592; end;
if lnhtcm = . & (lnhtft ne . | (lnhtft = . & lnhtin ne .)) then
do;
    if lnhtft = . then lnhtft = 0;
    if lnhtin = . then lnhtin = 0;
    lnhtcm = (lnhtft*12 + lnhtin) * 2.54; end;
if ofccm = . & ofcin ne . then ofccm = ofcin * 2.54;

return;
```

Figure 8. SCL in FSEDIT Program window of growth chart SCREEN for data entry

fields which exempted the user from performing computations or from keying summary information derived from data already keyed or collected on the abstraction form. Some fields, such as metric conversions and age at measurement in the growth data, were computed only if no entry was keyed in that field (Figure 8). Other fields were protected from keying via the PROTECT frame of the FSEDIT Attribute window. Completion of these fields was hinted to the user by the on-screen expression: ["ENTER"-->] (Figures 9 and 10). Frequent use of the ARRAY statement and associated DO loops were used for these computations. Also used were IF...THEN statements and the incrementing statement *varname* + 1;, where *varname* is an appropriately selected SAS variable name (Figure 11).

FSEDIT SD.ABSTFORM

Command ==> Obs 0
WARNING: No observations on data set. Please press END or ADD. Screen 3
ICD-9 search code: Entry #:

SECTION 1: PATIENT INFORMATION (2nd of 2 screens)

Gestational age weeks

Birth weight (gm) or (lb) (oz) ["ENTER"-->] IUGR:
Length (cm) or (in)
Head circumference (cm) or (in)

Address at time of birth: Date address recorded:
Street
City County
State Zip code

Other birth defects ICD code

[Screens 1-2: SHF F7; Screens 4-17: SHF F8]

Figure 9. Medical chart data entry, Screen 3

FSEDIT SD.ABSTFORM

Command ==> Obs 0
WARNING: No observations on data set. Please press END or ADD. Screen 13
ICD-9 search code: Entry #:

SECTION 5: PREVIOUS MENTIONS OF FAS/FAE/ARBD/ARDD

Date	Diagnostician	Diagnosis	1 = FAS	2 = FAE
			3 = FAS/FAE	
			4 = Suspect (S)/	
			Probable (P)/	
			Possible (P)/	
			Rule out (R) FAS	
			5 = S/P/P/R FAE	
			6 = No FAS/FAE	
			7 = Alcohol exposure	
			in utero	
			8 = ARBD	9 = ARDD

["ENTER"-->] FAS/ S/P/P/R S/P/P/R No Alc. exp.
FAS FAE FAE FAS FAE FAS/ in utero ARBD ARDD

Frequency of mention

[Screens 1-12: SHF F7; Screens 14-17: SHF F8]

Figure 10. Medical chart data entry, Screen 13

```
main:
.
link compute;
.
return;
.
```

Figure 11. SCL in FSEDIT Program window of medical chart SCREEN for computing fields--continued

```

compute:
/* --Validate previous mentions of FAS/FAE-- */
array pmdxnum {10} pmdx1-pmdx10;
do i = 1 to 10;
  if pmdxnum{i} ne . &
    pmdxnum{i} lt 1 | pmdxnum{i} gt 9 then do;
    alarm;
    _msg_ = 'Improper entry! Use codes on screen';
  end;
end;
/* --Produce on-screen distribution of previous
mentions of FAS/FAE-- */
array cntarr {9} cnt1-cnt9;
diffdx = 0;
do j = 1 to 9;
  cntarr{j} = .;
  do k = 1 to 10;
    if pmdxnum{k} = j then cntarr{j} + 1;
  end;
end;
/* --Produce 1 response on Screen 17 from Screen
13-- */
if cntarr{j} gt 0 then diffdx + 1;
end;
if diffdx gt 1 then multdx = 'Y';
else multdx = 'N';
/* --Produce 1 response on Screen 17 from Screen 5-- */
if etoh0 = 'Y' then alcdx = 'Y';
else alcdx = 'N';

/* --Compute IUGR given sex and gestational age and
birthweight-- */
/*
"Intrauterine growth as estimated from liveborn birth-weight
data at 24 to 42 weeks of gestation", Lula O. Lubchenco,
M.D., Charlotte Hansman, M.D., Marion Dressler, M.D., and
Edith Boyd, M.D. Pediatrics, November 1963. Pp. 793-800.
*/
if sex = 'M' & ga ne . & bwtgm ne . then do;
  if ga = 24 & bwtgm lt 610 |
    .
    ga = 42 & bwtgm lt 2780 then iugr = 'SGA';
  else if ga = 24 & bwtgm gt 1230 |
    .
    ga = 42 & bwtgm gt 3995 then iugr = 'LGA';
  else iugr = 'AGA';
end;
if sex = 'F' & ga ne . & bwtgm ne . then do;
  if ga = 24 & bwtgm lt 490 |
    .
    ga = 42 & bwtgm lt 2690 then iugr = 'SGA';
  else if ga = 24 & bwtgm gt 1250 |
    .
    ga = 42 & bwtgm gt 3840 then iugr = 'LGA';
  else iugr = 'AGA';
end;

return;

```

Figure 11 (contd.). SCL in FSEDIT Program window of medical chart SCREEN for computing fields

FASAF was originally designed for nonscientific staff to key data. As a result, three types of data checking were built into FASAF including (i) 93 validation checks for accurate keying of data, (ii) 12 consistency checks for logical sequencing of responses among associated fields, and (iii) 20 range checks which ensured that outliers were not accidentally created by incorrect keying. As mentioned above, SCL was developed to perform the first two of these data entry quality control checks. That is, in the SCL, ARRAY and IF...THEN statements were primarily used for validation checks (Figure 11) and consistency checks (Figure 12). In response to a check failure, SCL was used to sound an alarm, locate the

```

main:
.
.
/* --Verify facial features not present / present-not
mentioned-- */
if ff = 'N' & ffnm = 'X' then do;
  alarm; _msg_ = 'Inconsistent responses! Change one!';
  cursor ff; end;
/* --Verify facial features specified / present-not mentioned--
*/
array ffr {7} $ ffrmp ffrmp h ffrmm ffrmn ffrmb ffrml ffrmf;
do i = 1 to 7; if ffr{i} = 'X' & ffnm = 'X' then do;
  alarm; _msg_ = 'Inconsistent responses! Change...!';
  cursor ffr{i}; end;
/* --Verify facial features specified / not present, unknown--
*/
if ffr{i} = 'X' & ff ne 'Y' then do;
  alarm; _msg_ = 'Inconsistent responses! Change...!';
  cursor ff; end;
end;
.
.
return;

```

Figure 12. SCL in FSEDIT Program window of medical chart SCREEN for consistency checks

cursor at the source of the error, and display a message using the ALARM, CURSOR, and _MSG_ statements (Figures 11 and 12). Additional SCL syntax opened DISPLAY windows of HELP catalog entries at certain check failures using a CALL DISPLAY statement (Figure 13). These

```

main:
.
.
/* --Validate ICD-9 search code-- */
if icdsc ne '648.30' & icdsc ne '655.40' &
  icdsc ne '655.43' & icdsc ne '655.50' &
  icdsc lt '760.70' | icdsc gt '760.73' &
  icdsc ne '779.50' & icdsc ne '888888' then erroron icdsc;
if error(icdsc) = 1 then do;
  alarm; cursor icdsc;
  call display ('icdscrch.help');
  _msg_ = 'A) Review list-ENTER.
          B) Enter correct ICD-9 search code-ENTER.';
end;
.
.
return;

```

Figure 13. SCL in FSEDIT Program window of medical chart SCREEN for opening HELP DISPLAY window

"pop up" help windows were designed to open so as not to obscure the field in error. For other invalid entries, SCL was used to issue warnings via the `_MSG_` statement and to direct the user to an onscreen "help" window (Figure 10). Range checks required maxima and minima constraints and were set up in the `MAXIMUM` and `MINIMUM` frames of the `FSEDIT` Attribute window.

Error override as a measure of quality control was by design, contingent upon supervisory control. That is, in certain situations, the need for correct keying superceded the need for corrected data. However, error or warning messages were still given via the `_MSG_` statement whenever such records, which failed at least one SCL syntax check, were accessed during a FASAF session. Error override was controlled through the `FSEDIT` Params or parameter definitions window.

RESULTS

The overriding consideration in the design of FASAF and the composition of SCL was the nonscientific, nonSAS user who was to key the data. Consequently, SCL was lengthy because of the number of variables for which data were to be keyed or computed, and the number of situations for which logical responses were checked. However, the user-friendliness of FASAF was demonstrated through SCL in the SAS/AF framework by the use of confirmation windows.

Although a 17-screen display per record for data entry was extensive, this allowed keying of each abstraction form to proceed smoothly. The ease of inputting data was complete with the option to diverge at the identical point as the hardcopy abstraction form for keying of multirecord growth chart data.

One limitation of SAS software, version 6.04, was evident in the use of `HELP` windows which opened and displayed a list of valid data values when an incorrect value was keyed. In this situation, the correct value had to be noted from the window, then the window closed, before the correct value could be keyed.

Although data browsing was an arduous task because of the size of the database, the data analyst did not have to be concerned with inaccurate keying of data. SAS software, in the form of FASAF, has provided the end-user with the means to an accurately keyed database.

CONCLUSION

In order to address the FAS problem in the region, the State of South Dakota received support from the CDC to set up a surveillance system for FAS. With regards software support, provided under contract by Battelle, SAS software was recommended for construction of a data entry system. The features of SAS/FSP software fortified with simple yet effective SCL syntax in a SAS/AF framework were used to construct a customized data entry facility for nonSAS users. The final product, FASAF, was a PC-based, menu-driven, multiscreen application facility which afforded transparent user-access to these SAS data sets for entering, editing or browsing data. FASAF's quality control checks included the display of on-screen data entry instructions, passing identification numbers to other data entry screens and to a

subordinate data set, generation of computed values to prevent miskeying of duplicate values or summary information, validation of select entries, consistent response checking among sequential questions, and error allowance in certain cases. Also, being PC-based, FASAF can be easily implemented in the field.

REFERENCES

- CDC (1993), "Preventing Fetal Alcohol Syndrome and Other Alcohol-Related Developmental Disabilities," FAS Prevention Section, Centers for Disease Control and Prevention, Atlanta, Georgia.
- d'Almada, Philip J., Valborg Kvigne, and Michele D. Strachan (1994), "Surveillance of Foetal Alcohol Syndrome (FAS) Using SAS/FSP[®] and SAS/AF[®] Software with SCL", *Proceedings of the Nineteenth Annual SAS[®] Users Group International Conference*, in press.
- Hall, Judith G., Ursula G. Froster-Iskenius, and Judith E. Allanson (1989), *Handbook of normal physical measurements*, Oxford University Press, New York.
- Lubchenco, Lula O., M.D., Charlotte Hansman, M.D., Marion Dressler, M.D., and Edith Boyd, M.D. (1963), "Intrauterine growth as estimated from liveborn birth-weight data at 24 to 42 weeks gestation", *Pediatrics*, 793-800.
- SAS Institute Inc. (1991), *Developing SAS/FSP Software Applications Course Notes*, Cary, NC: SAS Institute Inc.
- SAS Institute Inc. (1992), *SAS/AF Software Applications Using Screen Control Language (Release 6.06) Course Notes*, Cary, NC: SAS Institute Inc.

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