

This section introduces some array applications in

Data manipulations from data search - Example 1
 Count consecutive days - Example 2
 LOCF - Example 3
 Find and replace - Example 4
 Shift - Example 5

Leading to a more complicated efficient process.

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Example 1 - Search Specified Value

The example is to find on which day the maximum efficacy is reached.

The algorithm is to compare the target value against an array and perform an action if the target value is found in the array.

SUBJECT	DAY1	DA Y2	DA Y3	DAY4	TMAX
101	0.0	0.0	0.0	0.0	
102		0.5	0.5	0.0	2
106	0.5	0.0	0.0	0.0	1
107	0.5	2.0	0.5	2.0	2
111	1.0	3.0	2.0	2.5	2
112	2.0	3.0	2.5	3.5	4

```
data pd2;
  set pd1;
  array days[4] day1-day4;
  maxscore=max (of days [*]);
  do i=1 to dim(days);
       if maxscore >0 and
              days[i]=maxscore then do;
           tmax=i;
           return;
       end;
  end;
  drop i maxscore;
run;
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                               Because health matters
```

Example 2 - Count Consecutive Days (1)

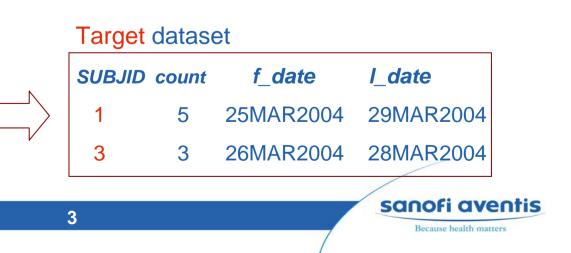
SUBJID DATE DATECNT

- 1 **25**MAR2004
- 1 26MAR2004 2
- 1 27MAR2004 3
- 1 28MAR2004 4
- 1 29MAR2004 5
- 2 26MAR2004 1
- 2 27MAR2004 2
- 2 29MAR2004 3
- 3 26MAR2004 1
- 3 27MAR2004 2
- 3 28MAR2004 3
- 3 02APR2004 4
- 4 02APR2004

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 We check to see whether a subject has experienced night awakening for more than 3 consecutive days.

From the DIARY data set and program below, we can easily list the subjects and their consecutive days along with start date and stop date by using array.





Step1. Transpose

Temp1

SUBJID	_ NA /	MEdat1	_dat2	_dat3	_dat4	_dat5
1	date	25MAR2004	26MAR2004	27MAR2004	28MAR2004	29MAR2004
2	date	26MAR2004	27MAR2004	29MAR2004		
3	date	26MAR2004	27MAR2004	28MAR2004	02APR2004	
4	date	02APR2004				

proc transpose data=diary prefix=_dat out=temp1;

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by subjid;

var date;

run;



Example 2 - Count Consecutive Days (3)

Step2. Count Consecutive Days using Array

			٦	Temp2
data temp2	SUBJID	flag	count	datecnt
(keep=subjid flag count I rename=(i=datecnt));	1	1	1	1
set temp1 ;	1	1	2	2
array dates {*} _dat: dummy ;	1	1	3	3
retain flag count 1;	1	1	4	4
<pre>do i=1 to dim(dates)-1;</pre>	1	1	5	5
if dates[i] ⁺ =. then do;	2	2	1	1
<pre>if dates[i] = dates[i+1]-1 then do;</pre>	2	2	2	2
<pre>output; count=count + 1; end;</pre>	2	3	1	3
else do;	3	4	1	1
output; flag =flag + 1; count=1;	3	4	2	2
end;	3	4	3	3
end;	3	5	1	4
end;	4	6	1	1
run;	L	/		

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Example 2 - Count Consecutive Days (4)

Step3. Manipulation

data temp3;

merge temp2 diary;

by subjid datecnt;

run;

Temp3

SUBJID	flag	count	datecn	t date
1	1	1	1	25MAR2004
1	1	2	2	26MAR2004
1	1	3	3	27MAR2004
1	1	4	4	28MAR2004
1	1	5	5	29MAR2004
2	2	1	1	26MAR2004
2	2	2	2	27MAR2004
2	3	1	3	29MAR2004
3	4	1	1	26MAR2004
3	4	2	2	27MAR2004
3	4	3	3	28MAR2004
3	5	1	4	02APR2004
4	6	1	1	02APR2004

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Example 2 - Count Consecutive Days (5)

Step3. Manipulation

Target dataset

SUBJID	cou	nt f_	date	I_date
1	5	25MA	R2004	29MAR2004
3	3	26MA	R2004	28MAR2004

```
data continue (where=(count >=3 ));
  /*3 consecutive days defined*/
  set temp3;
   by subjid flag;
   retain f_date;
   if first.flag then f_date=date ;
   if last.flag then do;
      l_date=date ;
      output;
   end;
   keep subjid f_date l_date count;
   format f_date l_date date9.;
```

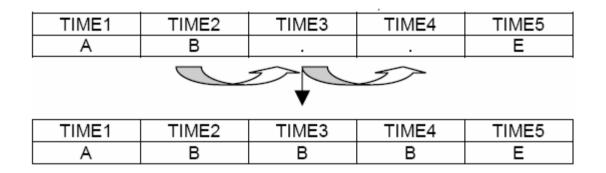
run;

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"LOCF" stands for "Last Observation Carried Forward", it means last non-missing value carried forward.



In LOCF analyses, when a patient drops out of a trial, the results of the last evaluation are carried forward as if the he had continued to the completion of the trial without further change.

Since patients who discontinue medication are regarded as treatment failures, LOCF analyses are widely considered to provide a more conservative test of drug effects.

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The following data set called SCORE will be used as the example.

```
data locf ; 4
set score ; 5
array time [*] time: ; 6
do i=1 to dim(time);
if time[i]=. then time[i]=time[i-1];
end;
drop i makeup; S
run;
```

SUBJID	TIME1	TIME2	TIME3	TIME4	TIME5
1	0.5	0.5	0.0	0.0	0.5
2	0.0	0.5	0.5	0.5	1.5
3	0.0	0.0	1.0	1.0	0.0
4	0.0	0.0	0.0	0.0	0.0
5	0.0	0.5	1.5	1.5	0.5
6	0.0	1.0	1.5	0.5	0.5
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SUBJID TIME1 TIME2 TIME3 TIME4 TIME5 MAKEUP

1.0 .

0.0 .

1.5 .

1.5

0.0

0.5

0.5

1.5

0.0

0.0

0.5

.

0.5

0.0

0.0

0.0

0.5

1.0

0.0

0.5 . .

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1

2

3

0.5

0.0

0.0

0.0

0.0

0.0

0.5

0.0

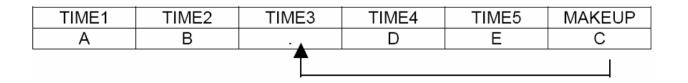
0.0

0.5

1.0

Example 4 - Find and Replace (1)

The array-implemented find& replace is exceptionally powerful and fast. The algorithm replaces elements referred to by iterator i in the array with new value when the condition holds, such as to find and replace the missing data. In some cases, the experiment measurements are not conducted continuously. They are discrete instead. To test the irritation of skins to patch or ointment as the example, the skin at different positions are supposed to be tested in the order of left arm, right arm, back, ... If one or more points somehow are skipped, the makeup tests would be done to get those data missed.





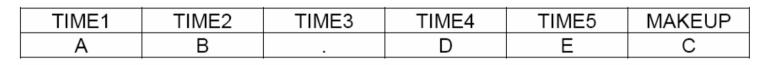
Example 4 - Find and Replace (2)

	SUBJI	D TIME	1 TIME2	TIME3	TIME4	TIME5	MAKEUP
	1	0.5	0.5	0.0	0.0	0.5	0.5
	2	0.0	0.5			1.5	0.0
	3	0.0	0.0	1.0		0.0	0.0
	4	0.0	0.0	0.0		0.0	0.0
<pre>data replace; set score;</pre>	5	0.0	0.5	1.5		0.5	0.5
array apps [5] time1- time5;	6	0.0	1.0	1.5	0.5		1.0
<pre>do i=1 to dim(apps); if apps[i] =. then apps[i]</pre>	=make	up ;					
end; drop i ;	SUBJID	TIME1	TIME2	TIME3	TIME4	TIME:	5 MAKEUP
run;	1	0.5	0.5	0.0	0.0	0.5	0.5
	2	0.0	0.5	0.0	0.0	1.5	0.0
	3	0.0	0.0	1.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0
	5	0.0	0.5	1.5	0.5	0.5	0.5
	6	0.0	1.0	1.5	0.5	1.0	1.0

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One subject should undergo a certain times of tests in some situations, and the time order should be kept, then a data shift process can be applied with the help of array.



		\checkmark		
TIME1	TIME2	TIME3	TIME4	TIME5
A	В	D	E	С

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data shift;		SL
set score;		1
<pre>array apps[*] time: makeup;</pre>		2
do i = 1 to $dim(apps)-1;$		3
<pre>if apps[i] = . then do;</pre>		4
do j = i to dim(apps)-:	L;	5
<pre>apps[j] = apps[j+1]</pre>];	6
end;		0
<pre>mu='-' compress(i);</pre>		
<pre>mu='-' compress(i); if apps[i] = . then i=:</pre>	i-1;	
1 M M M M M M M M M M M M M M M M M M M	i-1; <i>SUBJ</i>	ID 1
if apps[i] = . then i=:		ן סו 0
<pre>if apps[i] = . then i=: end;</pre>	SUBJ	
<pre>if apps[i] = . then i=: end; end;</pre>	SUBJ	0
<pre>if apps[i] = . then i=: end; end; drop i j ;</pre>	SUBJ 1 2	0

the rows.

SUBJID	TIME1	TIME2	TIME3	TIME4	TIME5	MAKEUP
1	0.5	0.5	0.0	0.0	0.5	0.5
2	0.0	0.5			1.5	0.0
3	0.0	0.0	1.0		0.0	0.0
4	0.0	0.0	0.0		0.0	0.0
5	0.0	0.5	1.5		0.5	0.5
6	0.0	1.0	1.5	0.5		1.0



	SUBJID	TIME1	TIME2	TIME3	TIME4	TIME5	MAKEU	P mu
	1	0.5	0.5	0.0	0.0	0.5	0.5	
	2	0.0	0.5	1.5	0.0	0.0	0.0	-3
	3	0.0	0.0	1.0	0.0	0.0	0.0	-4
if there	4	0.0	0.0	0.0	0.0	0.0	0.0	-4
data in	5	0.0	0.5	1.5	0.5	0.5	0.5	-4
	6	0.0	1.0	1.5	0.5	1.0	1.0	-5

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Example 6 - Data Merge (1)

It is often required to merge dose data with other safety data, such as adverse events, vital signs, ECG, and lab results, and locate the dose-related safety profiles. For example, a patient is given several doses at certain time points. After each dose, some adverse events may occur to the patient. We need to know which adverse event is associated with which dose. Suppose there is a dose dataset and an adverse event dataset.

AE

SUE	BJID A	E	AEDTT	M
1	NERVOUS	NESS	30JAN19	999:06:00:00
1	TACHYCA	RDIA	30JAN19	999:12:15:00
1	NAUSEA		06FEB19	999:16:20:00
1	DIZZINESS	6	20FEB19	999:09:20:00
2	HEADACH	E	06FEB1	999:14:10:00
2	NAUSEA		06FEB19	999:17:40:00

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Dose

SL	JBJID	DOSEN1	DOSEN2	DOSEN3	DOSEN4
1	30JAN1	999:08:00:00	06FEB1999:08:00:00	20FEB1999:08:00:00	27FEB1999:08:00:00
2	30JAN1	999:08:01:00	06FEB1999:08:01:00	20FEB1999:08:01:00	06MAR1999:08:01:00
3	30JAN1	999:08:02:00	06FEB1999:08:02:00	13FEB1999:08:02:00	27FEB1999:08:02:00

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	SUBJID AEDTTM			AE	dosedttm	dose	enum	hrpostds	
	1	30JAN99:12:1	5:00	TACHYCARDIA	30JAN1999:08:00	0:00	1	4.3	
	1	06FEB99:16:2	20:00	NAUSEA	06FEB1999:08:00	00:00	2	8.3	
	1	20FEB99:09:2	20:00	DIZZINESS	20FEB1999:08:00	00:00	3	1.3	
A.L. A.L	2	06FEB99:14:1	0:00	HEADACHE	06FEB1999:08:0	1:00	2	6.2	
data dose_ae; merge dose ae;	2	06FEB99:17:4	0:00	NAUSEA	06FEB1999:08:07	1:00	2	9.7	
dosedtt end; end; if dosenum^=.; hrpostds = roun	osei ^=. m = d(()	n); and aedttm dosen[i]; (aedttm-dose	<pre>> dosen[i] then do; dosenum = i; edttm)/3600), 0.1);</pre>						
format dosedttm drop i dosen1 - run;	ttm datetime20.; 1 - dosen4;			The final result is shown above, variable DOSENUM is the order number of doses, and HRPOSTDS is time in hours after dosing.					
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