



Around the world
throughout 2018

Single Day Events



Using C# to Develop a SAS Dataset Review Tool for Data Management Use

RUILING,PENG

CEO, 北京医普科诺科技有限公司



- 2015-至今，创立北京医普科诺科技有限公司，总经理
 - 专注提供合规、标准、高质量的数据管理和统计的专业服务；与同行共同打造以数据质量为目标的健康行业生态圈；已建立20多人的技术团队，完成标准化和自动化的技术流程。
 - 中国第一家CDISC 企业会员，CDISC C3C 核心成员，C3C 副主席，CDISC define.xml/ODM 认证讲师；作为CDISC Fellow参与制定TCM标准；“协助C3C向CDE提交“中国研究数据电子递交标准技术路线图”草案。
 - 与CDE 建立学术交流，参与制定中国药审中心CDE 组织的“114公告：临床试验的电子数据采集（EDC）技术指导原则”；并提供有关EDC和数据管理相关的内部知识分享和培训。
- 2012-2015，NNIT主题专家
 - 针对客户需求协助IT人员开发和定制解决方案，如EDC，临床项目管理系统，安全数据管理系统，临床数据仓库等。
- 2006-2012，曾在辉瑞（上海）、诺和诺德（中国）、RPS等公司负责临床数据管理及质量控制等工作。
- 2005-2006，澳大利亚昆士兰科技大学，进行流行病学方法学研究。
- 2001-2005，北大医学部公共卫生学院，环境流行病学，讲师；发表文章7篇；参与编写本科制教材。
- 2001年，获得北大医学部公共卫生学院，硕士学位。



- 2018, 北京医普科诺科技有限公司, 数据管理总监
 - 数据管理
 - IXRS系统设计
 - 医学编码
 - 团队管理
- 2015-2018 CRO公司（方恩, 诺思格）技术运营
 - EDC设计
 - IXRS系统设计
 - 医学编码
 - 团队管理
- 2006-2015 Global药厂（辉瑞, 阿斯利康, 诺和诺德）数据库设计
 - EDC设计
 - 外部数据管理
 - 数据标准制定

- ◆ **Background**
- ◆ **How to read SAS Metadata & Data using C#**
- ◆ **Main functionalities of Easy Listing tool**
- ◆ **Q & A**

Background

Challenges

- DM Data review challenges
 - Data from different EDC systems with different formats
 - Data are scattered in different EDCs, Server folders
 - Data structure not consistent across studies
 - Need database programmer's help on even simple requests
 - Data need to be reviewed by cycles

Solutions

- Find the solution to

- Standardize source data format
 - Using sas7bdat as the source format, the sas variables includes both variable name and label
- Centralize data from different source (EDC, external data)
- Data can be imported and refreshed by cycles
- DM can visually design simple listings and save listings.
- Support complex listing design
- Listing results can be exported separately or by batch

How to read SAS Metadata & Data using C#

Prerequisites

- Prerequisites
 - Develop Tool: Visual studio 2010 express
 - Database: SQLServer express to store listings, sas metadata, data
 - SAS OLEDB Provider: can be downloaded from SAS website
Or SAS universal viewer which contains sas oledb provider

[All Downloads](#) » [SAS Providers for OLE DB](#)

Downloads

SAS Providers for OLE DB

Release 9.47 - MAY 2018

The SAS Providers for OLE DB allow you to access SAS data through OLE DB and ADO. By selecting different access components, you will be able to access SAS data through information on the different access options, see the installation instructions.

To begin the download process, select the item in the table below which best meets your needs.

SAS Providers for OLE DB						
Platform	Description	Request Download	Size	Uncompressed	Release Date	ReadME
Microsoft® Windows® for x64	SAS Providers for OLE DB - Web	sasoledbweb__94180__wx6__xx__web__1.zip	516MB	556MB	2018-05	pdf txt
Windows	SAS Providers for OLE DB - Web	sasoledbweb__94180__win__xx__web__1.zip	516MB	556MB	2018-05	pdf txt

Key points - metadata(1)

- Key points to read SAS dataset metadata using C#
 - Setup an OleDbConnection
 - Use GetOleDbSchemaTable method to read the metadata to DataTable
 - Loop DataTable to get the SAS metadata

```
OleDbConnection cn = new OleDbConnection();
cn.ConnectionString = @"Provider=sas.LocalProvider; Data Source=' " + v_folder + "' ";

//try
//{
    cn.Open();
    DataTable schema = cn.GetOleDbSchemaTable(OleDbSchemaGuid.Columns, new object[] { null, null, t_in });
    if (schema.Rows.Count > 0)
    {
```

Key points - metadata(2)



- The metadata includes...
 - SAS dataset Name
 - Column Name, data type
 - Description
 - Format, length, precision

	study_name	type	table_name	column_name	ordinal_p...	datatype	character...	description	format_n...	format_le
?			dm							
26	TestStudy1	T	dm	MinCreated	26	5	0	Earliest data creation ti...	DATETIME	
27	TestStudy1	T	dm	MaxUpdated	27	5	0	Latest data update time	DATETIME	
28	TestStudy1	T	dm	SaveTS	28	5	0	Timestamp of last sav...	DATETIME	
29	TestStudy1	T	dm	BRTHDAT	29	5	0	BRTHDAT	DATETIME	
30	TestStudy1	T	dm	BRTHDAT_RAW	30	130	30	BRTHDAT (Character)	\$	
31	TestStudy1	T	dm	BRTHDAT_INT	31	5	0	BRTHDAT Interpolated	DATETIME	
32	TestStudy1	T	dm	BRTHDAT_YYYY	32	5	0	BRTHDAT Year		
33	TestStudy1	T	dm	BRTHDAT_MM	33	5	0	BRTHDAT Month		
34	TestStudy1	T	dm	BRTHDAT_DD	34	5	0	BRTHDAT Day		
35	TestStudy1	T	dm	SEX	35	130	3	SEX	\$	
36	TestStudy1	T	dm	SEX_STD	36	130	3	SEX Coded Value	\$	
37	TestStudy1	T	dm	AGE	37	5	0	AGE		
38	TestStudy1	T	dm	AGE_RAW	38	130	9	AGE (Character)	\$	

Key points - Data(1)

- Key points to read SAS dataset DATA using C#
 - Setup an OleDbConnection
 - Use OleDbCommand to get an OleDbDataReader object
 - Loop OleDbDataReader to get the SAS data.
- Note: SAS date start from 1960-01-01 while Sqlserver date start from 1900-01-01, a conversion is needed while read sas date.

```
cn.Open();  
// Create an OleDbCommand object and tell it  
// to open the specified table.  
OleDbCommand cmd = cn.CreateCommand();  
cmd.CommandType = CommandType.TableDirect;  
cmd.CommandText = t_in;  
// Execute the command and get an OleDbDataReader object.  
OleDbDataReader reader = cmd.ExecuteReader();  
while (reader.Read())  
{  
    DataRow dr_new = dt.NewRow();  
    for (int j = 0; j < reader.FieldCount; ++j)  
    {  
        ...  
    }  
}
```

Key points - Data(2)

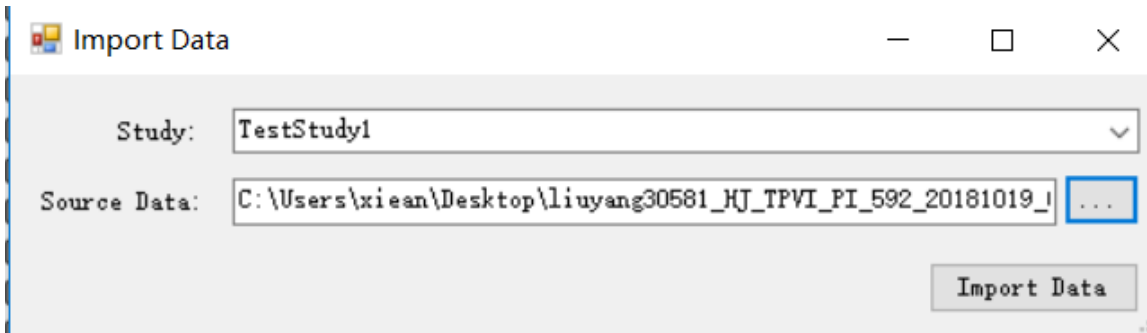
- The DATA looks like this...

	THDAT	BRTHDAT...	BRTHDAT...	BRTHDAT...	BRTHDAT...	BRTHDAT...	SEX	SEX_STD	AGE	AGE_RAW	RACE	RACE_STD	RACEOTH
▼													
▶ 1	93/7/12	1993 07 12	1993/7/12	1993	7	12	女	F	24	24	汉族	1	
2	07/7/11	2007 07 11	2007/7/11	2007	7	11	女	F	10	10	汉族	1	
3	95/12/10	1995 12 10	1995/12/10	1995	12	10	女	F	22	22	其他	99	苗族
4	01/5/29	2001 05 29	2001/5/29	2001	5	29	男	M	16	16	汉族	1	
5	17/9/26	2017 09 26	2017/9/26	2017	9	26	女	F	1	1	汉族	1	
6	92/10/11	1992 10 11	1992/10/11	1992	10	11	男	M	24	24	汉族	1	
7	99/1/1	1999 01 01	1999/1/1	1999	1	1	男	M	19	19	其他	99	壮族
8	91/7/5	1991 07 05	1991/7/5	1991	7	5	女	F	25	25	汉族	1	
9	93/7/12	1993 07 12	1993/7/12	1993	7	12	女	1	24	24	汉族	1	
10	92/12/1	1992 12 1	1992/12/1	1992	12	1	女	1	24	24	汉族	1	
11	92/1/1	1992 01 01	1992/1/1	1992	1	1	女	1			其他	99	
12	91/6/29	1991 06 29	1991/6/29	1991	6	29	男	2	27	27	汉族	1	
13	93/10/1	1993 10 01	1993/10/1	1993	10	1	女	1	25	25	其他	99	
14	93/3/1	1993 03 01	1993/3/1	1993	3	1	男	2	24	24	其他	99	苗族
15	91/6/29	1991 06 29	1991/6/29	1991	6	29	女	1	27	27	汉族	1	
16	19/12/20	2019 12 20	2019/12/20	2019	12	20	女	1	0	0	其他	99	

Main functionalities of Easy Listing tool

Data Import

- Data Import
 - Select Study, Folder contains datasets, click “Import Data”
 - Data will be refreshed each time



Raw data

- Raw data
- Imported data will be shown in “Raw data”, click to view the data

Easy Listing - Prod

File Edit Tools Help

TestStudy1

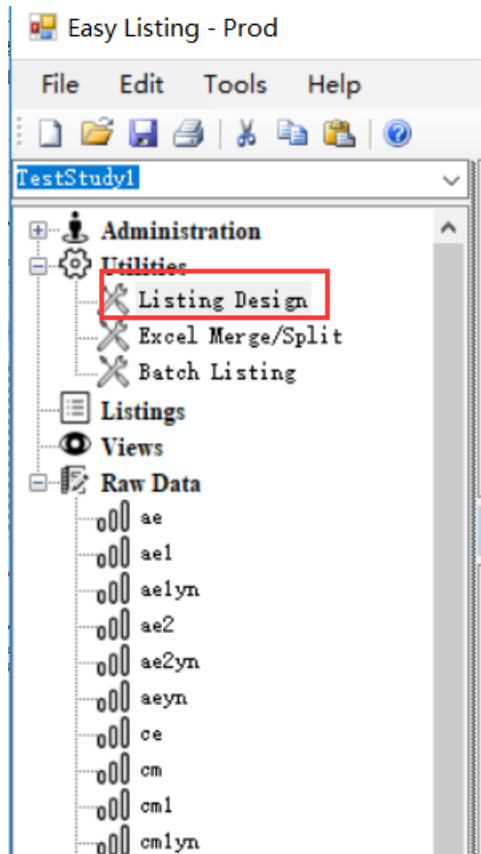
Administration
Utilities
Listings
Views
Raw Data
ae
ae1
ae1yn
ae2
ae2yn
aeyn
ce
cm
cm1
cm1yn
cmyn
dm
ds1
ds2
ds3
ex
ie1

Drag a column header here to group by that column

	projectid	project	studyid	environm...	subject Id	Study Sit...	Subject	siteid	Site	Site Number
1	871	HJ-TPVI-PI	67	UAT	12831	320	WS001	51	文山市疾...	WS
2	871	HJ-TPVI-PI	67	UAT	12843	320	WS002	51	文山市疾...	WS
3	871	HJ-TPVI-PI	67	UAT	12894	320	WS010	51	文山市疾...	WS
4	871	HJ-TPVI-PI	67	UAT	12899	320	WS045	51	文山市疾...	WS
5	871	HJ-TPVI-PI	67	UAT	12903	320	WS050	51	文山市疾...	WS
6	871	HJ-TPVI-PI	67	UAT	12911	320	WS098	51	文山市疾...	WS
7	871	HJ-TPVI-PI	67	UAT	12940	320	WS021	51	文山市疾...	WS
8	871	HJ-TPVI-PI	67	UAT	12952	320	WS017	51	文山市疾...	WS
9	871	HJ-TPVI-PI	67	UAT	12975	320	006	51	文山市疾...	WS
10	871	HJ-TPVI-PI	67	UAT	13050	320	WS004	51	文山市疾...	WS
11	871	HJ-TPVI-PI	67	UAT	13066	320	WS007	51	文山市疾...	WS
12	871	HJ-TPVI-PI	67	UAT	13082	320	WS008	51	文山市疾...	WS
13	871	HJ-TPVI-PI	67	UAT	13097	320	WS012	51	文山市疾...	WS
14	871	HJ-TPVI-PI	67	UAT	13109	320	013	51	文山市疾...	WS
15	871	HJ-TPVI-PI	67	UAT	13116	320	001	51	文山市疾...	WS
16	871	HJ-TPVI-PI	67	UAT	13129	320	WS015	51	文山市疾...	WS

Listing Design(1)

- Listing Design -- Visually design
 - From Utilities → Listing design



- Select table/tables
- Select columns, update label if needed
- Support multi-table joint
- Support multi-table Union
- Scripts will be auto-generated
- Listing can be saved to database

Listing Design(2)



Table	Type	Selected_...	Label	Selected_Tables	Alias	JoinType	Alias	Type
ae	Table	Site	Site name	dm	dm	Left Join	dm	Left Join
ae1	Table	Subject	Subject nam	ae	ae	Inner Join		
ae1yn	Table	BRTHDAT	BRTHDAT					
ae2	Table	SEX	SEX					
ae2yn	Table	RACE	RACE					
aeyn	Table	RACEOTH	RACEOTH					
ce	Table	AETERM	AETERM					
cm	Table	AESTDAT	AESTDAT					
		AEREL	AEREL					
		AESEV	AESEV					
		ABOUT	ABOUT					

Table	Alias	Question	Comparator	Question	Value
dm		subjectId	=	☒	
ae		subjectId		☐	

Condition	And/OR
(condition)	AND
dm.subjectId = ae.subjectId	

Label: RACE Coded Value Order By: (use number, like 1, 2, 3, 4)

Buttons:

Results:

	Site name	Subject n...	BRTHDAT	SEX	RACE	RACEOTH	AETERM	AESTDAT	AEF
1	文山市疾...	WS001	1993/7/12	女	汉族		白细胞计...	2017/7/17	肯定
2	文山市疾...	WS002	2007/7/11	女	汉族				
3	文山市疾...	WS010	1995/12/10	女	其他	苗族	上呼吸道...	2018/9/15	可能
4	文山市疾...	WS010	1995/12/10	女	其他	苗族	扁桃体炎	2018/9/16	可能
5	文山市疾...	WS010	1995/12/10	女	其他	苗族	左上臂组...	2018/9/17	可能
6	文山市疾...	WS045	2001/5/29	男	汉族				
7	文山市疾...	WS050	2017/9/26	女	汉族				
8	文山市疾...	WS098	1992/10/11	男	汉族				
9	文山市疾...	WS021	1999/1/1	男	其他	壮族			
10	文山市疾...	WS017	1991/7/5	女	汉族		摔伤	2017/3/4	可能

Listing Design(3)

- Listing Design -- Visually design
- After listing is saved, it will be shown in “Listings”

TestStudy1

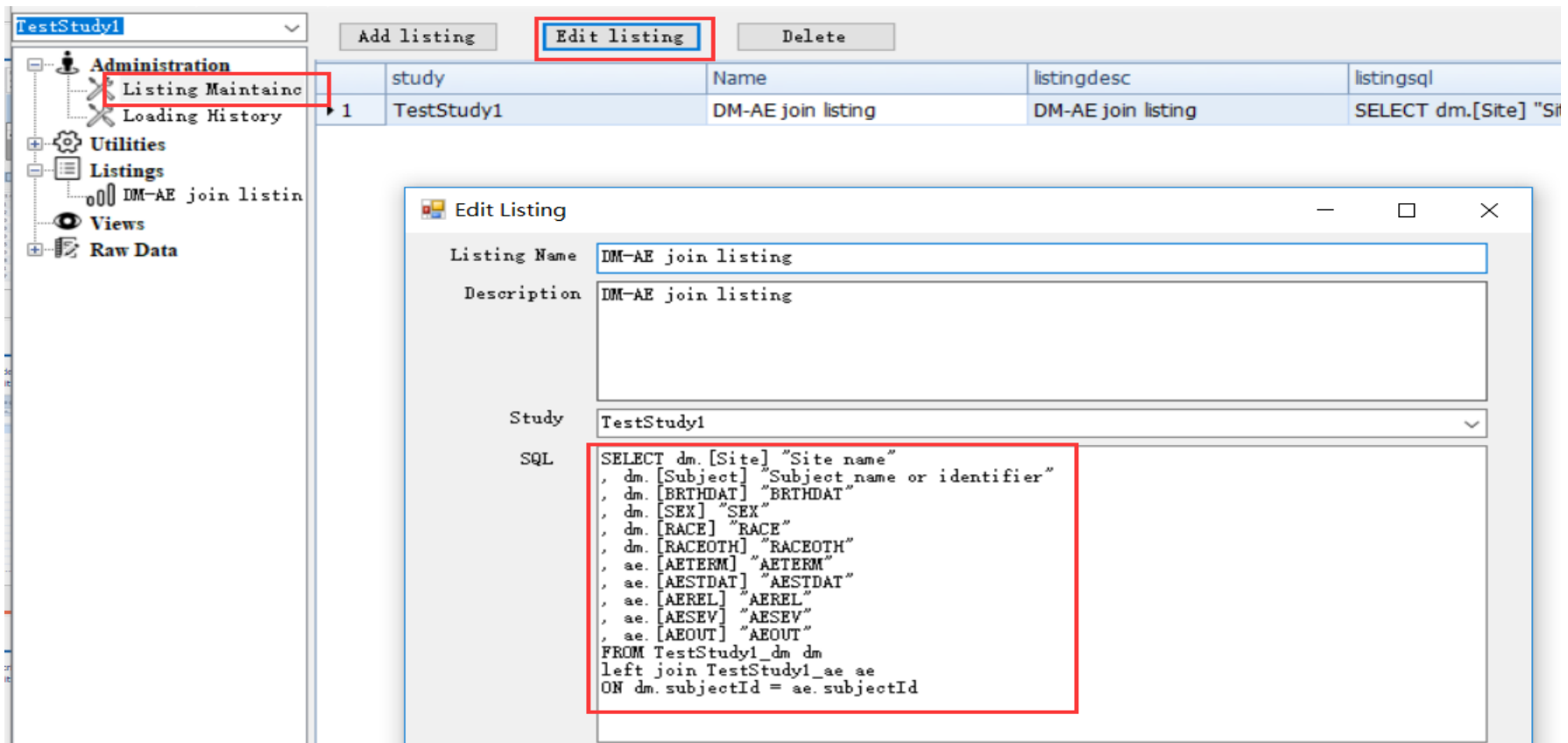
- Administration
- Utilities
- Listings
 - IM-AE join listin
- Views
- Raw Data

Drag a column header here to group by that column

	Site name	Subject n...	BIRTHDAT	SEX	RACE	RA...	AETERM	AESTDAT	AEREL	AESEV
1	文山市疾...	WS001	1993/7/12	女	汉族		白细胞计...	2017/7/17	肯定无关	2级
2	文山市疾...	WS002	2007/7/11	女	汉族					
3	文山市疾...	WS010	1995/12/10	女	其他	苗族	上呼吸道...	2018/9/15	可能无关	1级
4	文山市疾...	WS010	1995/12/10	女	其他	苗族	扁桃体炎	2018/9/16	可能有关	2级
5	文山市疾...	WS010	1995/12/10	女	其他	苗族	左上臂组...	2018/9/17	可能无关	3级
6	文山市疾...	WS045	2001/5/29	男	汉族					
7	文山市疾...	WS050	2017/9/26	女	汉族					
8	文山市疾...	WS098	1992/10/11	男	汉族					
9	文山市疾...	WS021	1999/1/1	男	其他	壮族				
10	文山市疾...	WS017	1991/7/5	女	汉族		摔伤	2017/3/4	可能无关	3级
11	文山市疾...	006	1993/7/12	女	汉族		白细胞计...	2017/7/15	可能无关	2级
12	文山市疾...	WS004	1992/12/1	女	汉族					
13	文山市疾...	WS007	1992/1/1	女	其他					
14	文山市疾...	WS008	1991/6/29	男	汉族					
15	文山市疾...	WS012	1993/10/1	女	其他					
16	文山市疾...	WS012	1993/10/1	女	其他					
17	文山市疾...	013	1993/3/1	男	其他	苗族	感冒	2018/1/12	可能有关	1级
18	文山市疾...	001	1991/6/29	女	汉族					
19	文山市疾...	WS015	2019/12/20	女	其他		头痛	2019/5/16	肯定有关	1级

Listing Design(4)

- Listing Design – by SQL scripts
 - From “Administration” → Listing Maintenance
 - Add or Edit SQL scripts and save



The screenshot shows the phuse software interface. On the left is a tree view with the following items: Administration, Listing Maintenance (highlighted with a red box), Loading History, Utilities, Listings, DM-AE join listing, Views, and Raw Data. The main window displays a table of listings with columns: study, Name, listingdesc, and listingsql. The table contains one row for 'TestStudy1' with the name 'DM-AE join listing' and the SQL script 'SELECT dm.[Site] "Site name"'. Above the table are buttons for 'Add listing', 'Edit listing' (highlighted with a red box), and 'Delete'. An 'Edit Listing' dialog box is open in the foreground, showing the following fields:

- Listing Name: DM-AE join listing
- Description: DM-AE join listing
- Study: TestStudy1
- SQL:

```
SELECT dm.[Site] "Site name"
, dm.[Subject] "Subject name or identifier"
, dm.[BRTHDAT] "BRTHDAT"
, dm.[SEX] "SEX"
, dm.[RACE] "RACE"
, dm.[RACEOTH] "RACEOTH"
, ae.[AETERM] "AETERM"
, ae.[AESTDAT] "AESTDAT"
, ae.[AEREL] "AEREL"
, ae.[AESEV] "AESEV"
, ae.[AEOUT] "AEOUT"
FROM TestStudy1_dm dm
left join TestStudy1_ae ae
ON dm.subjectId = ae.subjectId
```

 (The SQL script is highlighted with a red box in the original image)

Listing Export (1)

- Export single listing
 - From raw data or listing data, right click and click “Export”

column header here to group by that column

Site name	Subject n...	BIRTHDAT	SEX	RACE	RACEOTH	AETERM	AESTDAT
文山市疾...	WS001	1993/7/12	女	汉族		白细胞计...	2017/7/17
文山市疾...	WS002	2007/7/11	女	汉族			
文山市疾...	WS010	1995/12/10	女	其他	苗族	上呼吸道...	2018/9/15
文山市疾...	WS010	1995/12/10	女			扁桃体炎	2018/9/16
文山市疾...	WS010	1995/12/10	女	其他	苗族	左上臂组...	2018/9/17
文山市疾...	WS045	2001/5/29	男	汉族			
文山市疾...	WS050	2017/9/26	女	汉族			
文山市疾...	WS098	1992/10/11	男	汉族			
文山市疾...	WS021	1999/1/1	男	其他	壮族		

Listing Export (2)

- Export listings by batch
 - From “Utilities” → “Export by batch”
 - Select listings from “Listing” and “Raw”, click “Generate”
 - Conditions are supported like to filter subjects or sites

Batch Task

Batch Name: ☒ Add/Update Batch listing?

Data Type:

Name	type	ID
ae	Raw	0
ae1	Raw	0
ae1yn	Raw	0
ae2	Raw	0
ae2yn	Raw	0
aeyn	Raw	0
ce	Raw	0
cm	Raw	0
cm1	Raw	0
cm1yn	Raw	0
cmyn	Raw	0
dm	Raw	0
ds1	Raw	0
ds2	Raw	0
ds3	Raw	0
ex	Raw	0
ie1	Raw	0
ie1perf	Raw	0
ie2	Raw	0

Selected Listings

Name	type	ID
DM-AE join listing	Listing	1
ae	Raw	0
cm	Raw	0

Conditions:

- Result like this...



Microsoft Excel
97-2003 π\$0~±İ



Q & A

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