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Managing Qualtrics Survey Distributions and Response Data with SAS®

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ABSTRACT

Managing multiple surveys and distributing them to several research participants at multiple time intervals can be tedious and time consuming. Qualtrics is an online survey tool that offers a variety of features that could be useful for researchers. By using SAS to interface with the Qualtrics REST API, and SAS XML Mapper to generate the XML maps from the XML responses, we were able to implement an effective system that enabled survey data to be accessed regularly, accurately scheduled the distribution of surveys to research participants, and prevented withdrawn participants from receiving scheduled emails.

In this paper, we demonstrate how to implement the submit API requests with the FILENAME statement (URL access method) and process API responses with SAS® XML Mapper. Additionally we describe an approach for tracking active and inactive respondents.

INTRODUCTION

The Center for Behavioral Cardiovascular Health (CBCH) at Columbia University Medical Center (CUMC) conducts a variety of clinical, basic, translational, and behavioral research studies. Federally-funded research studies are often running concurrently with the majority of these requiring participants to complete questionnaires within multiple follow-up intervals. For each research undertaking, it is essential that questionnaires are administered in a timely manner and are followed up within the correct follow-up window. Additionally, data must be accessible for regular reports and analyses.

One specific study at CBCH, the Stress and Activity Study, required healthy volunteers to complete a survey every month for 12 months. The follow-up dates were calculated using 30-day increments from the initial visit, and participants were given a 7-day window to complete the survey.

The challenge to our data management team was to develop an efficient and reliable system that ensures:

- surveys are sent at the correct follow-up dates,
- participants are sent reminders of incomplete surveys before their follow-up window is over,
- withdrawn participants must not receive survey invitations, and
- survey data are readily accessible for creation of progress results and interim analyses.

Qualtrics® Research Suite provided an effective and efficient way of collecting data from our research participants by eliminating paper questionnaires and having survey data immediately available. Importantly, the Business Associate Agreement between Qualtrics and CUMC ensures that all data are protected and stored in a secure, HIPAA-compliant data storage environment.

Qualtrics also offers a REpresentational State Transfer (REST) Application Program Interface (API) service, which when paired with SAS, enables the automation of multiple tasks that would otherwise be tedious and labor intensive. Therefore, we also discuss how we used SAS to interface with Qualtrics REST API to manage multiple surveys distributed across varying time frames.

QUALTRICS – HOW IT WORKS

The Qualtrics Research Suite is an online survey software that allows users to build and manage complex surveys and distribute using an intuitive graphical user interface (GUI). Surveys can be organized in a *library*, and research participants are considered *panel members*, and these can be organized in *panels*.

Panels can further be organized in the same *library* where respective surveys are stored. Completed responses are immediately available and can be downloaded in varying formats including comma-separated values (CSV), fixed-field-length text, or XML files. Qualtrics also generates an alphanumeric ID for each library, survey, panel, and panel member which are used to define and customize API requests.

QUALTRICS REST API

The Qualtrics REST API allows users to perform tasks like downloading or distributing surveys using a simple url syntax called a “HTTP request”. Moreover, users can perform other tasks that are not available through the GUI.

The HTTP request consists of the root url and five primary parameters (Table 1). Additional parameters may be required depending on the specific request being made.

Parameter name	Function
Request	Identifies type of request being made.
User	The username to login to Qualtrics.
Token	A unique alphanumeric identifier that is used to authenticate the API session.
Format	The format of the response. Valid values include XML, JSON or JSONP.
Version	The API version to be used.

Table 1. List of primary parameters for the Qualtrics REST API

The root url is

```
https://survey.qualtrics.com/WRAPI/ControlPanel/api.php
```

and the basic structure of a REST API request looks like this:

```
https://survey.qualtrics.com/WRAPI/ControlPanel/api.php?Request=[RequestName]&User=[UserName]&Token=[Token]&Format=XML&Version=2.4.
```

SAS AND REST API

Using the FILENAME statement, URL access method, and SAS XML LIBNAME engine, below is the basic structure of how an API query can be submitted in SAS:

```
FILENAME data_fileref URL '[HTTP Request]';

FILENAME map_fileref '[Directory\XMLMap.Map]';

LIBNAME data_fileref xmlv2 xmlmap = map_fileref access=READONLY;
```

The first FILENAME statement uses the URL access method to associate the HTTP request with the *data_fileref*, while the second FILENAME statement associates the XML map file with the *map_fileref*. The order of these two statements can be interchanged. The LIBNAME statement accesses the SAS XML LIBNAME engine, executes the HTTP request, and if successful, processes the XML response using the XML map and then converts it into SAS datasets.

In most cases, a single XML file will convert to two or more SAS datasets, therefore we use the DATASETS procedure to view the list of generated SAS datasets.

```
PROC DATASETS LIB = Survey; RUN;
```

DOWNLOADING SURVEY RESPONSES


Responses to survey data can be downloaded through the Qualtrics GUI. However, since new responses are expected periodically and reports need to be generated regularly, it is more efficient and less time-consuming to perform the required processes using SAS.

The API request to download all the response data from a specific survey is `getLegacyResponseData`. One additional parameter, `SurveyID` which identifies the specific survey to download, is required to complete this request. Several optional parameters are also available so users can customize the downloaded data according to their needs, but these are beyond the scope of this paper.

GENERATING THE XML MAP

Before we wrote the SAS code, we first generated the XML map using SAS XML Mapper. Afterwards, all other data processing steps can be accomplished using SAS code.

To create the XML Map:

1. Paste the HTTP request on the address bar of your web browser and press Enter.
2. If the request is successful, a prompt to save the XML file will appear. Save the file.
3. Open the XML Mapper (we used version 9.3) and open the XML file from step 2 by clicking **File** → **Open XML ...**
4. Click **Tools** → **AutoMap using XML** or the AutoMap icon  to generate the XML map.
5. (Optional, but highly recommended) Review the variable formats to make sure they are correct, particularly the length of character variables. To change the variable format, click on the variable name within the XMLMap pane, click the format tab, and make the necessary changes (Figure 1).
6. Click **Save XML Map As...** and save the generated XML Map in your work folder.

NOTE: It is important to remember the directory where the XML Map is saved, because you will need to refer to it in the SAS code.

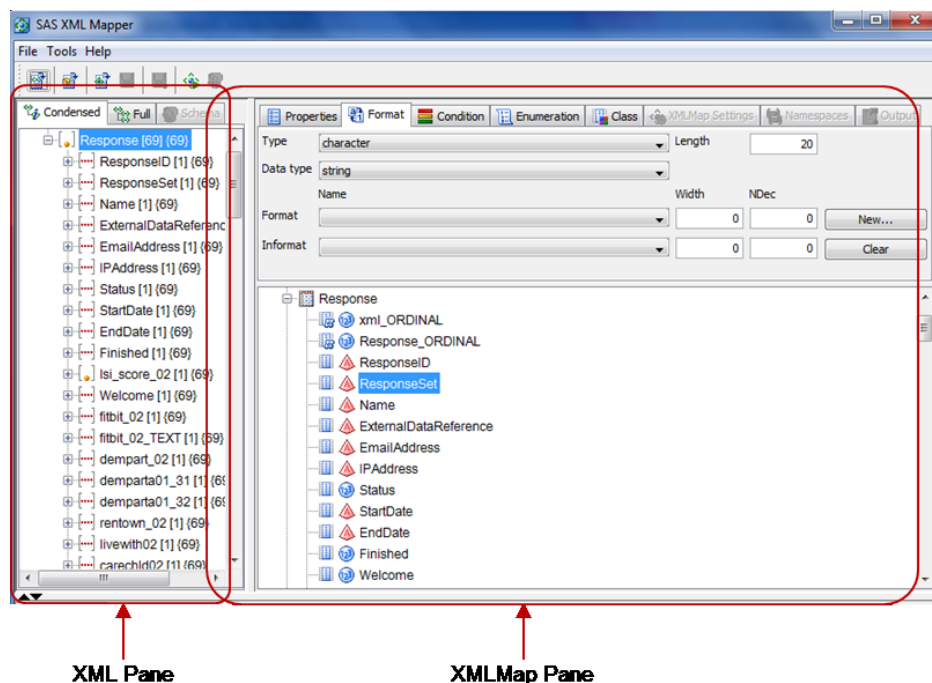


Figure 1. The SAS XML Mapper 9.3 window.

DOWNLOADING SURVEY DATA USING SAS

The following is an example code to download data from the survey with SurveyID SV_8hW6VeLhK6cDXXT.

```
FILENAME Survey URL
'https://survey.qualtrics.com/WRAPI/ControlPanel/api.php?Request=getLegacyResponseData&User=user20&Token=Sm0rxwhmEwolouMcapGzLO6ot5sEjRgMppqWyN2d&Format=XML&Version=2.4&SurveyID=SV_8hW6VeLhK6cDXXT' LRECL = 32767;

FILENAME SurvMap 'C:\My_Project\SurveyMap.map';

LIBNAME Survey xmlv2 xmlmap = SurvMap access=READONLY;

PROC DATASETS LIB = Survey; RUN;
```

DISTRIBUTING SURVEYS

ADDING RESEARCH PARTICIPANTS TO THE MAILING LIST

In Qualtrics, a Panel is a mailing list of research participants, and individual participants are referred to as panel members. Panels can be uploaded manually using the Qualtrics GUI, or through an HTTP request using addRecipient.

For example, the following FILENAME statement sends a request to add the study participant, Jane Doe, to the panel with ID 3t1N3ti5FD0q64B. This panel is stored in a library with ID UR_bfqictNzeViQb65. Users can also specify the participant's email address and an External Data Reference, usually the participant ID number.

```
FILENAME AddRec URL
'https://survey.qualtrics.com/WRAPI/ControlPanel/api.php?Request=addRecipient&User=user20&Token=Sm0rxwhmEwolouMcapGzLO6ot5sEjRgMppqWyN2d&Format=XML&Version=2.4&LibraryID=UR_bfqictNzeViQb65&PanelID=ML_3t1N3ti5FD0q64B&FirstName=Jane&LastName=Doe&Email=janedoe@email.com&ExternalDataRef=8000';
```

A successful request will return the following XML

```
<XML>
  <Meta>
    <Status>Success</Status>
    <Debug/>
  </Meta>
  <Result>
    <RecipientID>MLRP_bBhvBdGGyO75DWB</RecipientID>
  </Result>
</XML>
```

and the SAS XML LIBNAME engine converts this into three SAS datasets

#	Name	Member Type
1	Meta	DATA
2	Result	DATA
3	XML	DATA

run;

Alternatively, an unsuccessful request will return the following XML response.

```

▼ <XML>
  ▼ <Meta>
    <Status>Error</Status>
    <RequestType>addRecipient</RequestType>
    <ErrorCode>500</ErrorCode>
    <QualtricsErrorCode>ESRV16</QualtricsErrorCode>
    <ErrorMessage>Error Calling DME Element</ErrorMessage>
    <Debug/>
  </Meta>
</Result/>
</XML>

```

DISTRIBUTING SURVEYS VIA EMAIL

The survey link can be emailed to all panel members concurrently using the *sendSurveyToPanel* request. However, in most cases research participants will need to complete the surveys at different times, and it is more efficient to send them the survey links when they come in window for their respective follow-up date. This can be done by using the request *sendSurveyToIndividual*. Table 2 shows the list of parameters required for the HTTP request.

This feature is very useful, particularly when research participants are required to complete the same questionnaire at multiple time points. The SAS programmer can calculate the window dates for each follow-up date for every participant, and use a combination of DATA steps, loops, and MACRO variables to execute the API request.

Parameter name	Values/Format	Description
SurveyID	<String>	The survey to be distributed.
SendDate	YYYY-MM-DD hh:mm:ss	The time/date user wishes to send an email
FromEmail	<String>	The reply-to email address.
FromName	<String>	The name the email will come from.
Subject	<String>	The subject for the email.
MessageID	<String>	The message ID of the message you want to send. This may contain template language which needs to be created prior to distributing surveys.
MessageLibraryID	<String>	The library ID where the message is saved.
PanelID	<String>	The panel ID where the panel member belongs.
PanelLibraryID	<String>	The library ID where the panel is saved.
RecipientID	<String>	The ID of the individual panel member you wish send the email to.

Table 2. Required parameters for the sendSurveyToIndividual API request.

Here is an example request to send the survey on April 28, 2015 at 12pm MDT to a participant whose RecipientID is *MLRP_bCRPxd49mGptnsF*.

```

FILENAME Send URL
'https://survey.qualtrics.com/WRAPI/ControlPanel/api.php?Request=sendSurvey
ToIndividual&User=user20&Token=Sm0rxwhmEwolouMcapGzLO6ot5sEjRgMppqWyN2d&For
mat=XML&Version=2.4&SurveyID=SV_8hW6VeLhK6cDXXT&SendDate=2015-04-28
12:00:00&FromEmail=fep2110@cumc.columbia.edu&FromName=Faith
Parsons&Subject=Study
Survey&MessageID=MS_1IkZ13wrcIz3eol&MessageLibraryID=GR_8vsW1J9WlavB8WN&Pan
elID==ML_3t1N3ti5FD0q64B&PanelLibraryID=GR_8vsW1J9WlavB8WN&RecipientID=
MLRP_bCRPxd49mGptnsF';

```

OTHER USEFUL API REQUESTS

Occasionally research participants are unable to complete the study and are therefore withdrawn. Therefore, it is important that withdrawn participants no longer receive scheduled survey emails. This can be easily achieved by either:

1. Deleting the panel member using the `removeRecipient` request, or
2. Setting the panel member's status to "Unsubscribed" using the `updateRecipient` request, and specifying `&Unsubscribed=1`.

Unsubscribed or deleted panels will no longer receive any of the pre-scheduled emails.

Other useful API requests are listed in Table 3.

Request Name	Function
sendSurveyToPanel	Sends an email with survey link to all panel members in a <i>panel</i>
addRecipient	Adds a new panel member to an existing panel
sendReminder	Sends a reminder email to participants who have not completed a specific survey
getDistributions	Returns data for the specified distribution, which includes information on surveys completed.

Table 3. List of other useful API requests

CONCLUSION

Managing multiple surveys and distributing them to several research participants at multiple time intervals can be tedious and time consuming. By using SAS 9.3 to interface with the Qualtrics REST API, and SAS XML Mapper to generate XML maps from the XML responses, we were able to implement a system that can download the survey data regularly, accurately schedule the distribution of surveys to research participants, and prevent withdrawn participants from receiving scheduled emails.

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