

- **New feature: Smart Variables**
  - Smart Variables are dynamic variables that can be used in calculated fields, conditional/branching logic, and piping. Similar to using project variable names inside square brackets - e.g., [heart\_rate], Smart Variables are also represented inside brackets - e.g., [user-name], [survey-link], [previous-event-name][weight], or [heart\_rate][previous-instance]. But instead of pointing to data fields, Smart Variables are context-aware and thus adapt to the current situation. Some can be used with field variables or other Smart Variables, and some are meant to be used as stand-alone. There are many possibilities.
  - 35 Smart Variables are available. They can reference things with regard to users, records, forms, surveys, events/arms, or repeating instances. Documentation and examples for using Smart Variables are included on the Project Setup page, Online Designer, and other places throughout REDCap in a popup and alternatively as a standalone page.
  - Note: While Smart Variables can be used for filters in reports and for filters for Custom Record Status Dashboards, they are not yet able to be utilized in Data Quality rule logic.
  
- **New feature: PDF Auto-Archiver & e-Consent Framework**
  - **PDF Auto-Archiver**
    - Upon survey completion, a compact PDF copy of the survey response can be automatically stored in the project's File Repository, from which the archived PDFs can be downloaded at any time.
    - This setting is located on the Survey Settings page in the Online Designer, thus it can be enabled for any given survey in a project.
  - **e-Consent Framework**
    - This feature, which works together with the PDF Auto-Archiver, provides functionality for user's to implement electronic consent (e-Consent) using a survey as the consent form, such as for capturing the consent of a research study participant.
    - The e-Consent Framework option adds two things to the typical survey-taking process. 1) Before a participant completes the survey, an extra certification page is added to end of the survey that displays an in-line PDF copy of their survey responses in which they will be asked to confirm that all information in the document is correct. Once they confirm all is correct, the survey

will then be marked as complete. The survey will not be considered complete until they fulfill the certification step. 2) Upon completion of the survey, a static copy of their responses in the form of a consent-specific PDF will be stored in the project's File Repository. The consent-specific PDF will have the values of the e-Consent Framework Options inserted at the bottom of each page in the PDF. These values (i.e., name, date of birth, etc.) are added to the PDF as extra documentation of the identity of the person who is consenting.

- **New feature:** New syntax for referencing fields on repeating instances in piping, logic, and calculations
  - Fields that exist on a repeating instrument or on a repeating event can be referenced using a new syntax (note: repeating events and instruments are used the exact same way). This is done by appending the “repeat instance” number to the field inside square brackets – e.g., [weight][2], which points to repeating instance #2 for the field “weight”.
  - Please note the distinction that unique event names should be *\*prepended\** to variables whereas repeating instance numbers must be *\*appended\** to them. For example, if the field “weight” exists on a form in the event “Visit Data” in a longitudinal project, you might reference instance #2 for that field on that specific event with the following: [visit\_data\_arm\_1][weight][2].
  - Smart Variables can be used in place of the repeating instance number, in which there are 5 instance-related Smart Variables: [previous-instance], [next-instance], [current-instance], [first-instance], and [last-instance]. For example, if you wish to use @DEFAULT action tag to carry over data from the previous instance of a repeating instrument, it might be set up as follows: @DEFAULT="[weight][previous-instance]”.
- **New feature: Survey-specific email invitation fields**
  - This is a new option on the Survey Settings page that can be enabled for any given survey, in which a user may designate an email field for sending survey invitations for that survey only.

- The email field being utilized for the survey can exist on any instrument in the project, and you may use a different email field on each survey. You may also use the same email field for multiple surveys.
- This feature is similar to the project-level email invitation field except that it is employed only for the survey where it has been enabled. This allows users to have data entry workflows that require multiple surveys where the participant is different for each survey. Using this feature, multiple people can be emailed a survey invitation, after which all the survey data they enter goes into the same record in the project.
  
- **Improvement: PDF Customization Options** – Users may change or remove the “Confidential” text displayed in the header of all PDFs in a project. Also, instead of displaying the REDCap logo and REDCap website URL at the bottom right of all PDF pages, they can instead choose to display the text “Powered by REDCap” in small font. These two settings are project-level, so they will be applied to every page of a PDF for all instruments in a project (for both forms and surveys). These settings can be found in the Additional Customizations popup on the Project Setup page.
  
- **Improvement/change:** The Font Awesome 5 iconic font and CSS toolkit is now included as part of REDCap.
  
- **Improvement/change:** The project Logging page now provides useful contextual information for the ASI logged event "Automatically schedule survey invitation", in which it will display the record name, survey title, and event name (if longitudinal).
  
- **Improvement/change:** The project Logging page now logs when a survey invitation that was scheduled via ASI gets deleted due to the ASI option "Ensure logic is still true before sending invitation?", in which the logged event will display useful contextual information, such as the record name, survey title, and event name (if longitudinal).
  
- **Improvement/change:** The project Logging page now logs when a survey invitation is deleted or when its send-time is modified on the Survey Invitation

Log, in which the logged event will display useful contextual information, such as the record name, survey title, and event name (if longitudinal).

- **Improvement:** If a field has branching logic, the Online Designer now displays the logic (up to the first 65 characters) on the field so that the user can view it easily without having to open the Add/Edit Branching Logic popup.
- **Improvement:** The Survey Invitation Log now contains an extra column on the right-hand side to allow users to delete many scheduled invitations at once (rather than having to delete them one at a time).
- **Improvement:** Added new "Record ID" column in the Survey Invitation Log table to allow users to find specific invitations more efficiently. Note: If the record name should not be displayed in order to preserve the anonymity of a response (e.g., participant identifier is not used, designated email field is not used), it will instead display an icon indicating that the record name cannot be displayed.
- **Improvement:** Added new filter on the Survey Invitation Log table to allow users to filter the invitations by record ID.
- **Improvement/change:** Added new "Record ID" column in the Participant List table. In previous versions, the record ID was appended to the email address in the "Email" column. Having its own column will allow users to find specific participants more efficiently.
- **Improvement:** When opening the "Add/Edit Branching Logic" popup in the Online Designer, it could sometimes be very slow to open if the project contains many fields, especially many multiple choice fields. The popup could even be slow when the selected field does not even have branching logic yet. To improve this, it now defaults to selecting the "Advanced" option first when the popup opens and only attempts to load the "Drag-N-Drop" draggable field choices when that option has been selected by a user. While this won't completely alleviate the issue of the "Drag-N-Drop" option being slow when there are many fields, this will make it much more palatable in a majority of situations when branching logic is being added/edited in the Online Designer.

- **Improvement:** The datepicker widgets and timepicker widgets that are displayed on data entry forms and survey pages now have their language abstracted so that it will display the months, days of the week, and buttons in the language set for the project.
- **Improvement:** The REDCap::\$instrument) that can be utilized, in which `$instrument` is the unique/back-end name of the data collection instrument. This parameter only needs to be passed when utilizing the survey-specific email invitation field for a given survey, in which there might exist a different email address for that specific survey than for other surveys in the project.
- **Improvement:** Multiple choice fields can now have their raw value (as opposed to their choice label) piped by appending “:value” to the variable name – e.g., `[my_radio_field:value]`. Note: This can also be used for SQL Fields to display the raw value of the SQL Field drop-down.
- **Improvement:** Piping can now be used for checkbox fields
  - Piping from Checkbox fields is slightly different than with other field types because checkboxes allow for multiple saved values. There are options to display a list of checked choices, unchecked choices, or a specific choice.
    - `[my_checkbox:checked]` - Appending ':checked' will display a comma-delimited list of choice labels that have been checked - e.g., 'Sunday, Tuesday, Thursday'. Note: If neither ':checked' nor ':unchecked' is appended to the variable, then it will default to ':checked'.
    - `[my_checkbox:unchecked]` - Appending ':unchecked' will display a comma-delimited list of choice labels that have NOT been checked - e.g., 'Monday, Wednesday, Friday, Saturday'.
    - `[my_checkbox(code)]` - If a coded value of the checkbox is included inside parentheses after the variable name - e.g., `[my_checkbox:(2)]` - then it will output the word 'Checked' or 'Unchecked' regarding whether or not that specific choice has been checked off.
  - Please note that while the checkbox piping options listed above will return the text labels, you may also append ':value' to the variable to return the

raw value instead of the label. For example, [my\_checkbox:checked:value] and [my\_checkbox:unchecked:value] might return '1, 3, 5' and '2, 4, 6, 7', respectively, and [my\_checkbox(2):value] will return 1 or 0 if checked or not checked, respectively.

- **Change/improvement:** When using the Copy Project button on the Other Functionality page, it now copies the Record Locking Customization settings for the project.
- **Change/improvement:** When using the Copy Project button on the Other Functionality page, it now displays an option to the user to copy all custom record status dashboards in the project.
- **Improvement/change:** New method for composing survey invitation text using Smart Variables for survey link
  - When composing a survey invitation, the standard text and survey link are no longer automatically appended to the survey invitation text at the time the email is sent. Instead, users must now specify all the entirety of the text of the email (including the stock text and survey link that used to be appended automatically, if they wish) and therefore must supply [survey-url] and/or [survey-link] in the text if they wish to provide the participant with a link to the survey.
  - If the user forgets to enter the survey URL Smart Variable in the text, REDCap will automatically suggest to them that they should.
  - If using the Twilio telephony module for sending invitations, the standard instructional text will still be appended in the SMS message as in previous versions EXCEPT for the “Email invitation” and “SMS invitation (contains survey link)” invitation types, which require [survey-url] and/or [survey-link] in the SMS text in order for the participant to receive a survey link.
  - Note: All survey invitations that were scheduled prior to this upgrade will still have the standard text and survey link appended to their survey text. Additionally, during the upgrade to this version, all saved configurations for Automated Survey Invitations (ASIs) will have the standard text and survey link automatically appended to the saved ASI email text, thus allowing the ASI behavior to remain exactly the same after the upgrade and allowing it to be backward compatible.
- **Change/improvement:** On the "Stats & Charts" page, the variable name is now displayed next to the field label for each field displayed on the page.

- **Change/improvement:** Slight performance improvement on "Add/Edit Records" page for longitudinal projects using the Custom Record Label.
- **Improvement:** Custom Record Labels now use proper piping syntax and can also utilize Smart Variables.
  - Because Custom Record Labels existed long before the concept of piping was created in REDCap, they did not adhere to typical piping concepts – e.g., they could not use prepended event names; they would display the raw value of a multiple choice field whereas piping would instead display the label of a multiple choice field. There also used to be certain limitations Custom Record Labels, in which they could only use data from fields on the very first event (of the current arm). Now that Custom Record Labels can be used like regular piping, they can target fields on any event in a project, and they can also utilize Smart Variables.
  - Note: Any longitudinal projects existing before the upgrade that currently use Custom Record Labels will automatically have all fields in the Custom Record Label prepended with the [first-event-name] Smart Variable in order to maintain the existing behavior from previous versions that could only pull data from the first event of the current arm. So prepending [first-event-name] allows existing longitudinal projects to maintain the way they worked prior to the upgrade to this REDCap version.
- **Change/improvement:** When adding/editing Automated Survey Invitations, the "Send after lapse of time" value for "days" may now be 4 digits in length (specifically up to 7300 days = 20 years), whereas previous versions limited the days unit to 3 digits. This change allows for a much longer wait time before sending the scheduled invitations.
- **Change:** When using the designated email invitation field (enabled on the Project Setup page), if the field is located on an instrument that gets used on multiple longitudinal events or if it is located on a repeating instrument/event, all occurrences of the field will now be forced to have the same value. This means that if one value is entered for the field, that value will always be the value seen in other events or other repeating instances of the instrument. And if the value is changed on any event or repeated instance, then that value will

be updated on all events or repeating instruments/events where the field has a value. This will keep the field's value in sync in all locations since the underlying assumption of the designated email invitation field is that there is really only one single value, which is the email address of the survey participant.

- **Change:** When exporting data to SPSS, the resulting SPSS syntax file now defines Text fields as A30000 rather than A500 to allow for Text fields with text longer than 500 characters
- **Change:** If the secondary unique field is enabled and contains HTML tags in its field label, those tags will now be stripped out when displaying the label and value of the secondary unique field throughout a project, such as on a report, top of data entry page, and the left-hand project menu when a record is selected. This has been changed because HTML tags in the field label could distort the user interface in unpleasant ways.
- **Change:** When field values get modified via the action tags @TODAY, @NOW, @LATITUDE, @LONGITUDE, and @USERNAME, it now displays the red side bar on the right side of the text field (just like calculated fields do when changed) to denote there was a value that changed.
- **Change:** The action tags @TODAY and @NOW will no longer hide the Today/Now button, will no longer hide the date-picker icon, and will no longer make the field read-only by default. From this version onward, users will need to additionally use @READONLY in order to accomplish those things. For backward compatibility, the REDCap upgrade process will automatically replace all instances of the @TODAY and @NOW action tags with "@TODAY @READONLY" and "@NOW @READONLY", respectively, to maintain the existing behavior for fields already using @TODAY and @NOW.