UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

REDCap
Research Electronic Data Capture

AUTO-CALCULATIONS

From Equations to results!

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INTRODUCTION

Introduction

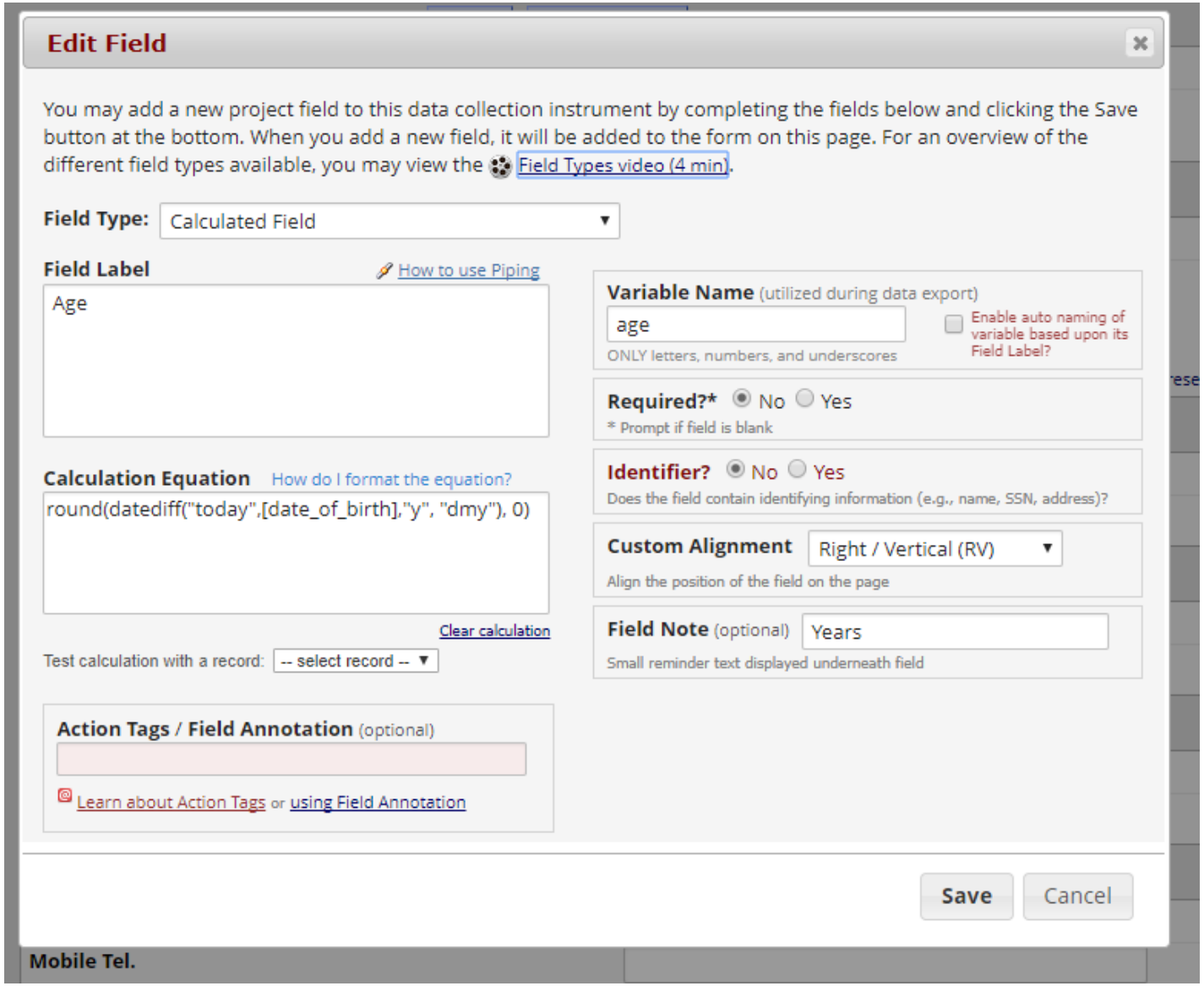
- Data entry forms
- Real-time calculations
- Do not excessively use on REDCap data collection instruments
  - *can slow down the webpages.*

Definitions

- Similar to constructing equations in spreadsheet processors
  - *Microsoft Excel*.
- Variable names are the construction unit in the equation
- [ ] brackets identify variables
- Follow the mathematical order of operations when
  - *or else your calculated results might end up being incorrect*.

Create an auto-calculated field

- Online Designer page
- Select *Calculated Field*
- Type the calculation into the *Calculation Equation* box.
- Validate and test the equation



Expected results!

- **Can I create a calculation that returns text or a date as a result?**

  - *Sadly, NO!* **Only numbers.**

CODING AN EQUATION

The basics!

Basics of coding!

- Variables between brackets
  - *[variable]*
- Play with your basic math signs
  - Add +
  - Substract -
  - Multiply *
  - Divide /

- Must be in the same event!

SCORING CALCULATIONS

Scoring from multiple answers

- You want to calculate certain score for risk factors.
  - *Out of 3!*
- Variables are labelled as:
  - *Smoking*
  - *Alcohol_Abuse*
  - *Obesity*
- It is based on summation of different answers that are translated to numerical value.
  - *Yes = 1*
  - *No = 0*
- Equation:
  - ***sum ([smoking],[alcohol_abuse],[obesity])***
  - *No spaces!*

Add New Field

You may add a new project field to this data collection instrument by completing the fields below and clicking the Save button at the bottom. When you add a new field, it will be added to the form on this page. For an overview of the different field types available, you may view the Field Types video (4 min).

Field Type: Calculated Field

Field Label How to use Piping

Risk factor score!

Calculation Equation How do I format the equation?

sum ([smoking],[alcohol_abuse],[obesity])

✔ Valid Clear calculation

Test calculation with a record: -- select record --

Variable Name (utilized during data export)

risk_factor_score

ONLY letters, numbers, and underscores

Enable auto naming of variable based upon its Field Label?

Required?* No Yes

* Prompt if field is blank

Identifier? No Yes

Does the field contain identifying information (e.g., name, SSN, address)?

Custom Alignment Right / Vertical (RV)

Align the position of the field on the page

Field Note (optional)

Small reminder text displayed underneath field

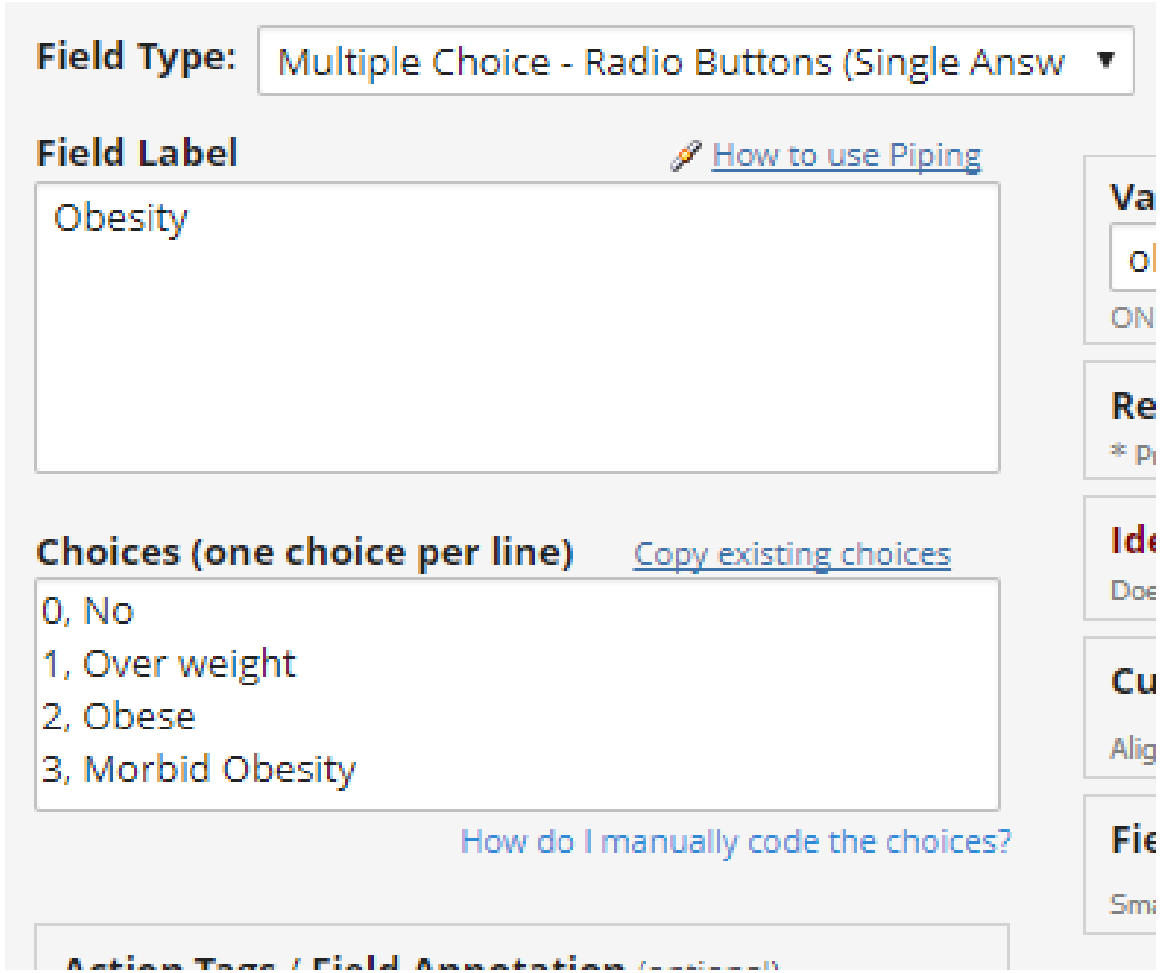
Action Tags / Field Annotation (optional)

Learn about Action Tags or using Field Annotation

Save Cancel

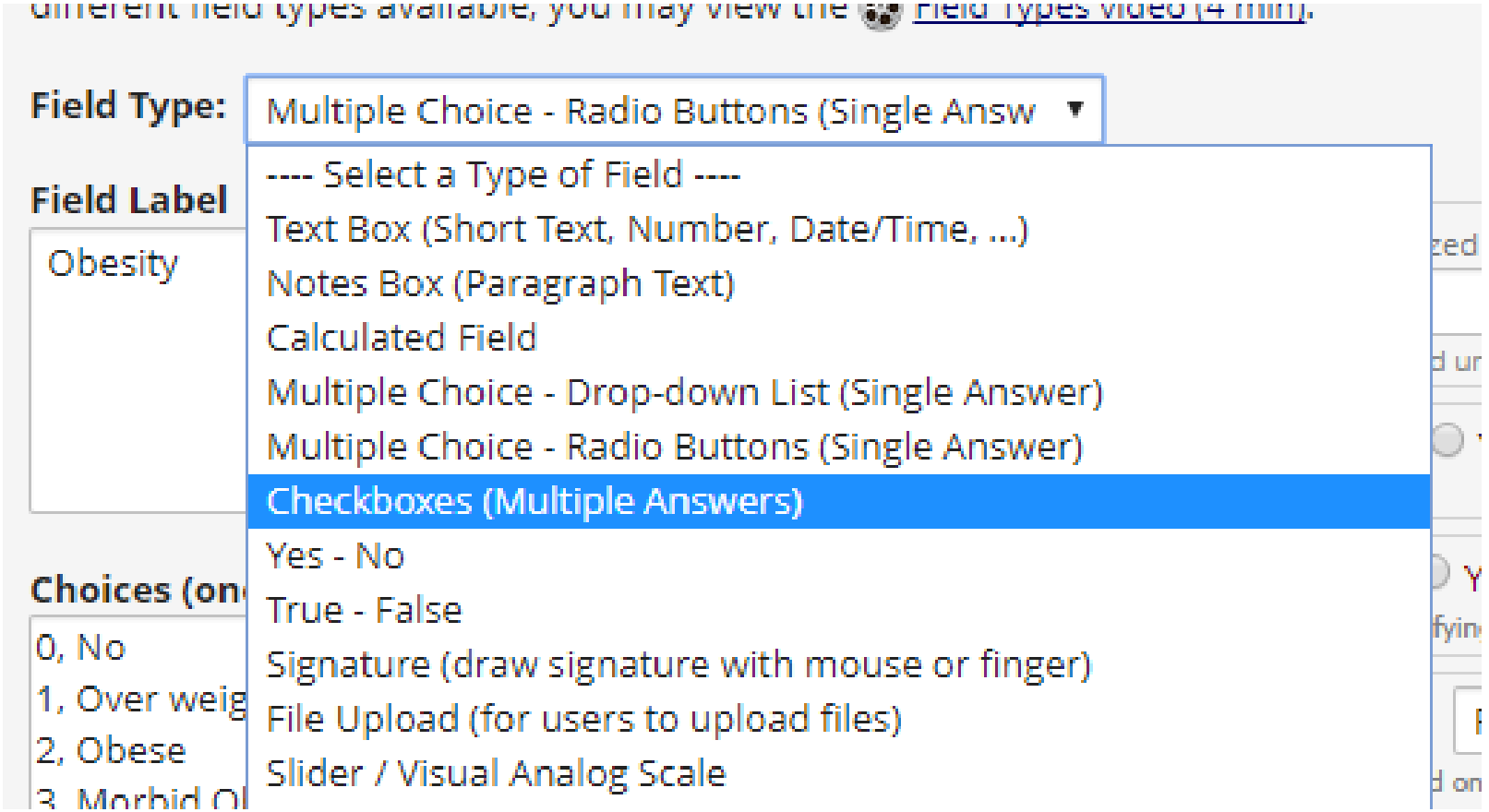
Advanced scoring!

- Same applies if there is a grading – depends on choices label design code.
- Example:
  - Label Obesity as:
    - *No = 0*
    - *Over weight = 1*
    - *Obese = 2*
    - *Morbid obesity = 3*
- Then the equation will calculated value as designed in the multiple choice field code.



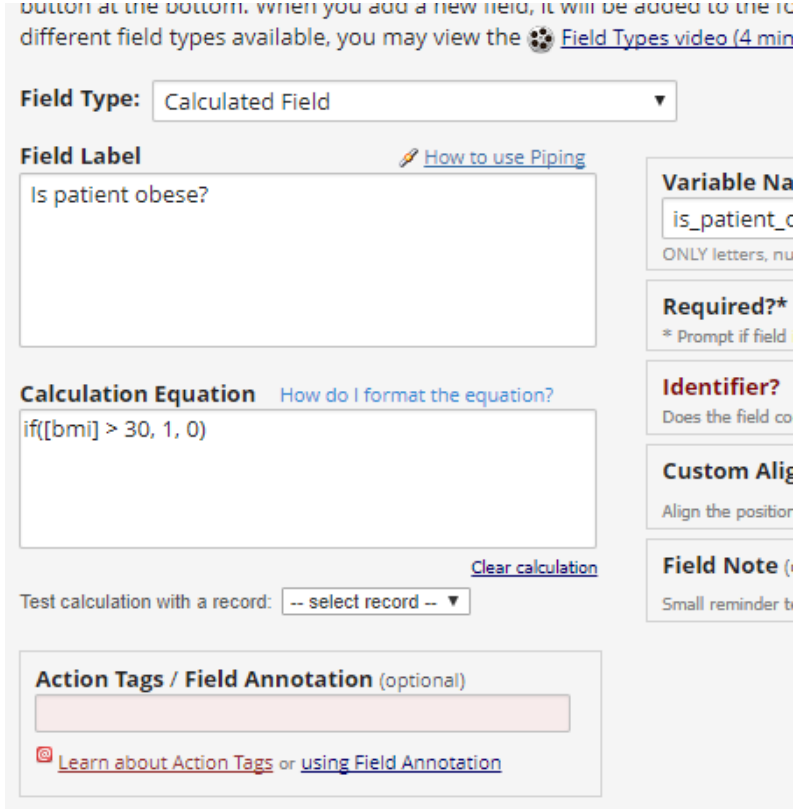
Tips #1 … ‘Multiple Choice’ Field type!

- For scoring, never use a multiple selection multiple choices field!
- Leave each score as simple and separate!



Conditional Values for equations

- If you need to numerically auto-classify a value.
- Example:
  - *If BMI more than 30, gives 1 as an answer.*
  - ***if([bmi] > 30, 1, 0)***
- **if(**CONDITION**,** if condition is TRUE**,** if condition is FALSE**)**



Tip #2 … Sum or Addition!

- **sum([q1],[q2],[q3],[q4])**
  - *Sum of questions 1-4, even if one of the values is **blank**.*
  - *Blank values or missing data will be ignored*

- **[q1]+[q2]+[q3]+[q4]**
  - *Sum of questions 1-4 but **only if** every question has a value.*
  - *Blank values won't be ignored!*
  - ***Allows secondary prevention of missing data in important equations!***

Common equations - BMI

- Original form:

$$\mathrm{BMI} = \frac{\mathrm{mass(kg)}}{(\mathrm{height(m)})^2}$$

- Translation to REDCap:
  - ***([weight]/([height]*[height])***

- **Design tip:**
  - ***Ensure units accuracy!***

DATE AND TIME

Dates and time!

- Basic Code:
  - ***datediff([date1],[date2],"y")***
- Common, and more complex equations
- Example
  - *Age*
  - *Hospital stay*
  - *Time between visits*

Design definitions!

datediff("today",[date_of_birth],"y", "dmy“, true)

- Years **Y**
- Months **M**
- Days **D**
- Present time **Today**
- **Accuracy of date format**
  - *DMY, MDY*

Tip #3 … Variable arrangement!

- Always make sure in subtraction or extraction equations that larger values comes first, to avoid false negative values!

datediff("today",[date_of_birth],"y", "dmy“, true)

Tip #4 … Returned Sign Value!

- Denotes calculating absolute value – either in positive or negative plan!
  - *"false"*
    - returns the absolute value of the difference (never negative, always a positive value)
  - *"true"*
    - Returns the actual value (either positive or negative)
- Example:
  - *if [date1] is larger than [date2], then the result will be negative if Return Signed Value is set to true. If Return Signed Value is not set or is set to false, then the result will ALWAYS be a positive number.*
- **Importance:**
  - ***Always set to true, to detect if any wrong date was entered!***
    - **Example 1-12-2008 instead of 1-12-2018**

Examples for time calculations

- **Age at enrolment:**
  - *datediff([date_enrolled],[dob],"y", true)*

- **Time between project start and recruitment**
  - *datediff("01-02-2018",[dob],"m","dmy", true)*

- **Current age**
  - *datediff("today",[dob],"y", true)*

ADVANCED FUNCTIONS

And basic statistics on patients' timeline!

Round - Approximation

round(‘your equation’**)**

- Returned values are **approximated** to nearst decimal
- E.g. if result = 34.6756, it will be rounded to **34.7**

Square root!

sqrt([*variable*] or ‘your Equation’)

- E.g. if variable value = 9, it will be **square rooted** to 3

Or

- **If you need a square root of a whole equation, enter it between brackets (and).**

Exponents

([variable]^'exponent'

Returned values are **exponential to certain value**

- E.g. 3rd exponent of height
  - ***([height]^(3))***

Minimum and Maximum values

min([v1],[v2],[v3],...)
max([v1],[v2],[v3],...)

Returned value is the **min/max value** of these variables.

e.g. outcomes from different visits – least weight patient recorded during his follow ups!

Mean value

mean([v1],[v2],[v3],...)

Returned value is the **mean** of these variables.

e.g. mean weight patient recorded during his follow ups!

Median value

median([v1],[v2],[v3],...)

Returned value is the **median** of these variables.

e.g. mean weight patient recorded during his follow ups!

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EXCERCISE

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Baie dankie ☺ Hartelijk bedankt

QUESTIONS?!