Encryption and Data Security for Academic Research

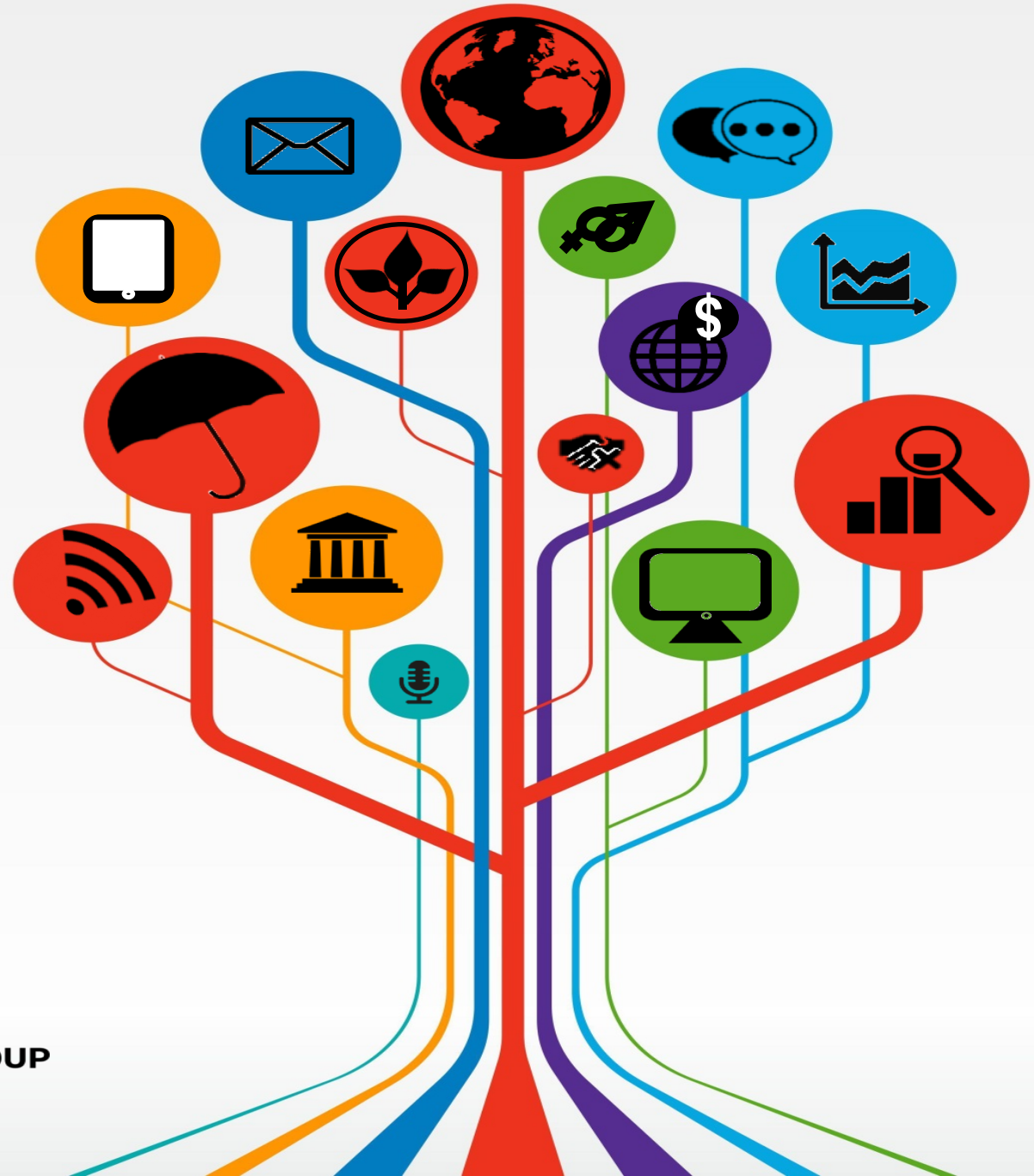
Research Assistant Onboarding

Prepared by **DIME Analytics**

dimeanalytics@worldbank.org

Presented by **Benjamin Daniels**

bdaniels@worldbank.org



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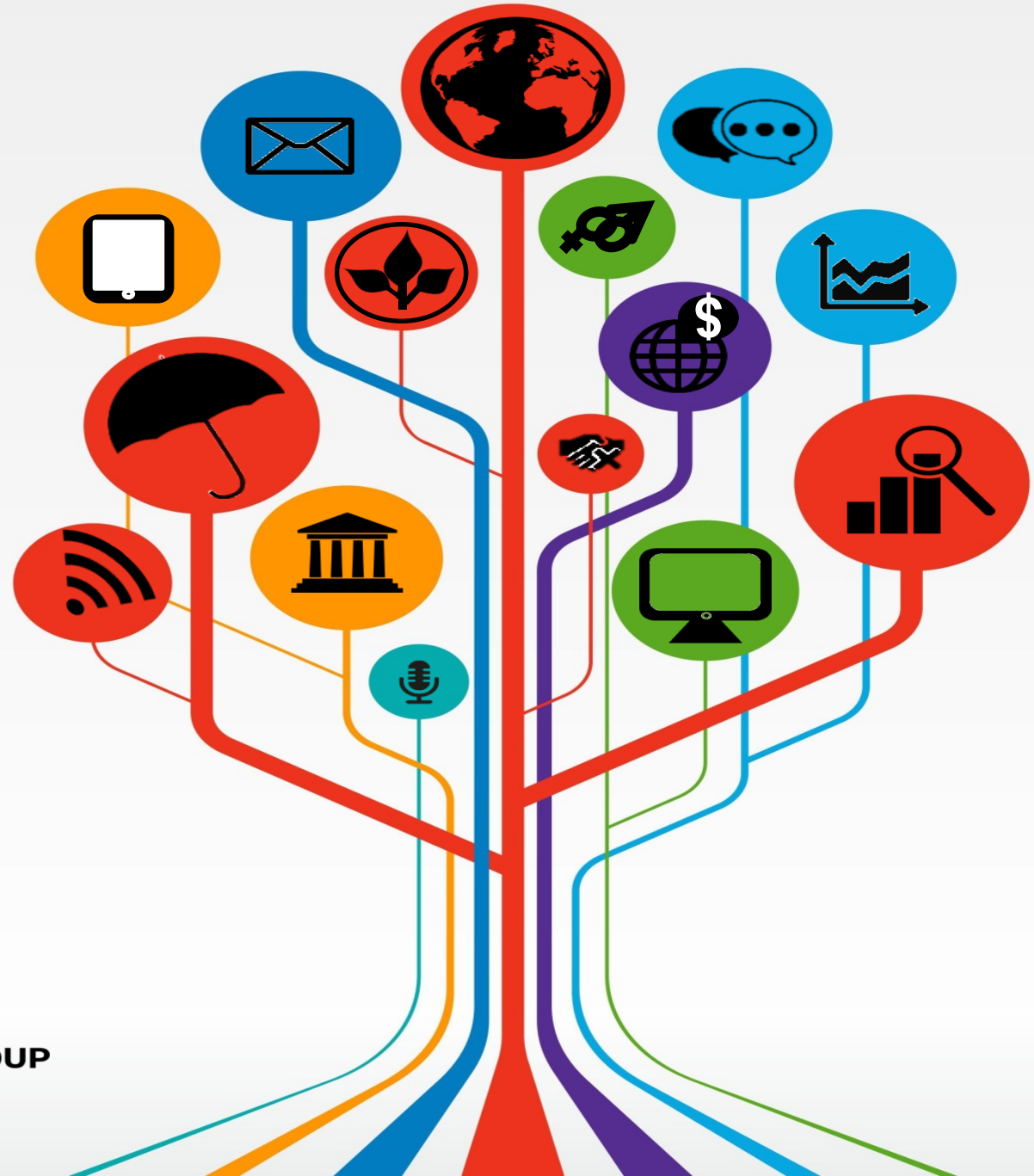
Data Security: Basic Ideas



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You have a responsibility to keep data secure

- Ethical – it's the right thing to do
- Contractual – IRBs, universities, and other partners require it
- Legal – GDPR legal framework reformed data handling regulations based on a human right to privacy in the EU

- Homework: complete the National Institutes of Health course "Protecting Human Research Participants". You will receive a certificate for this continuing education that is often required for academic submissions and trial registrations. https://phrp.nihtraining.com/#!/

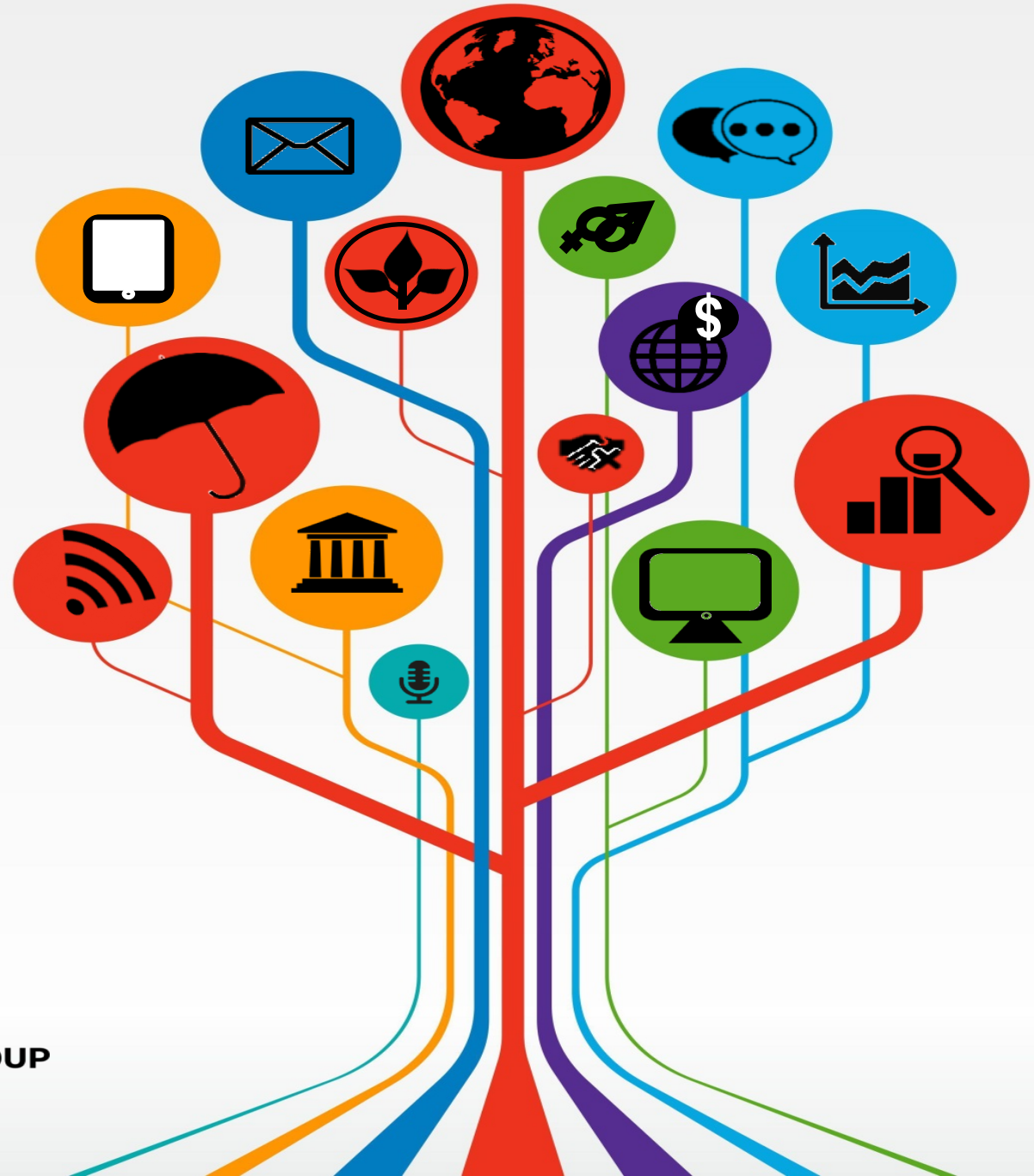
Data security should be a core part of your life

- This is not an ”extra” thing
- So we design workflows that make it natural and beneficial to your organizational structure
- In this case, we will leverage our data security obligations to *also ensure:*
  - Easier workflows and naming conventions for surveys and datasets
  - Backed-up and 2FA-protected passwords for *all* personal accounts

Wait, what personal accounts?

- All accounts which have access to financial or personal information should be secured and backed up
- Modern encryption is “strong”, meaning if you lose your passwords, you lose your data – we are going to prevent that!
- Three core tools:
  1. Two-factor authentication (2FA)
  2. Password storage and backups
  3. Encryption

Tools – Outline



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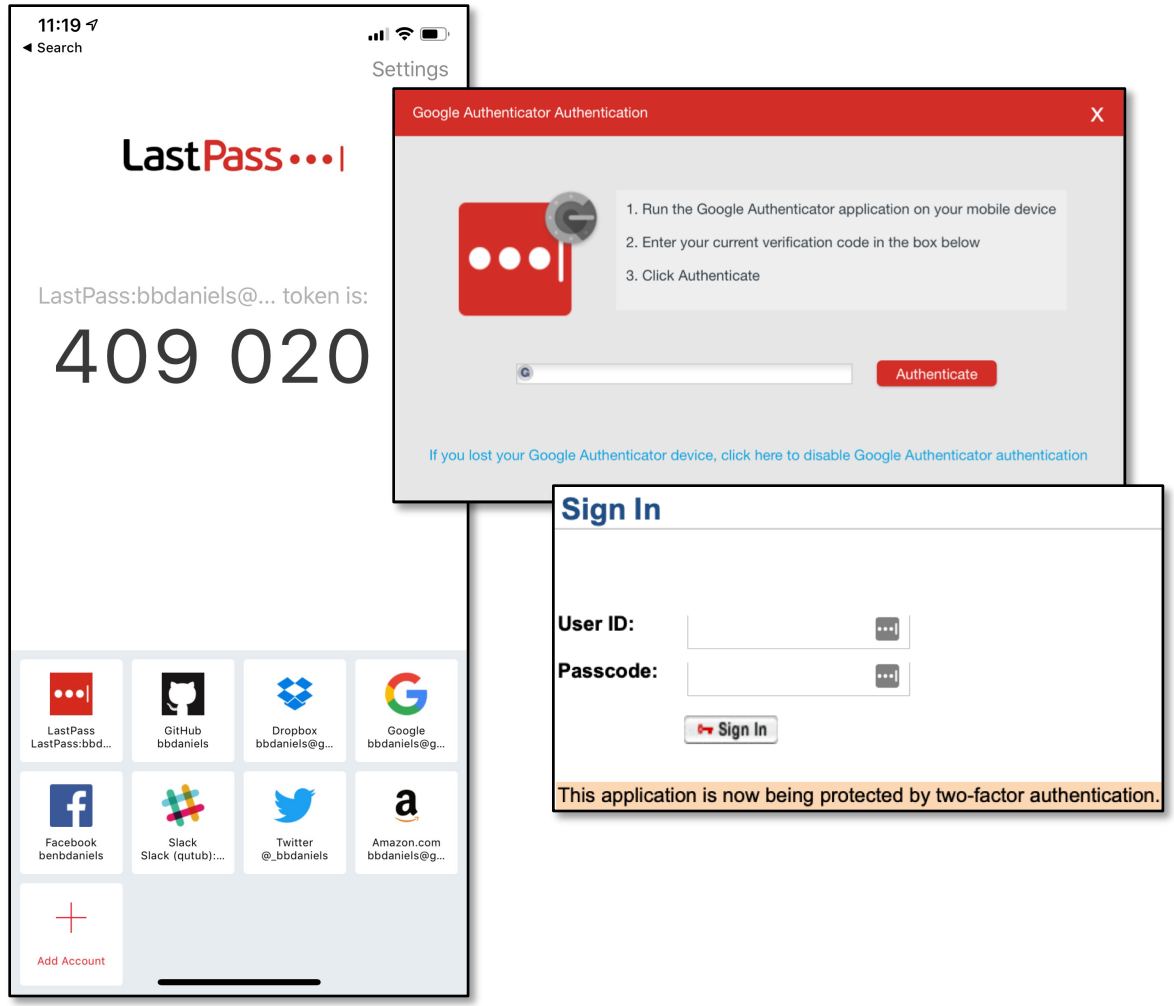
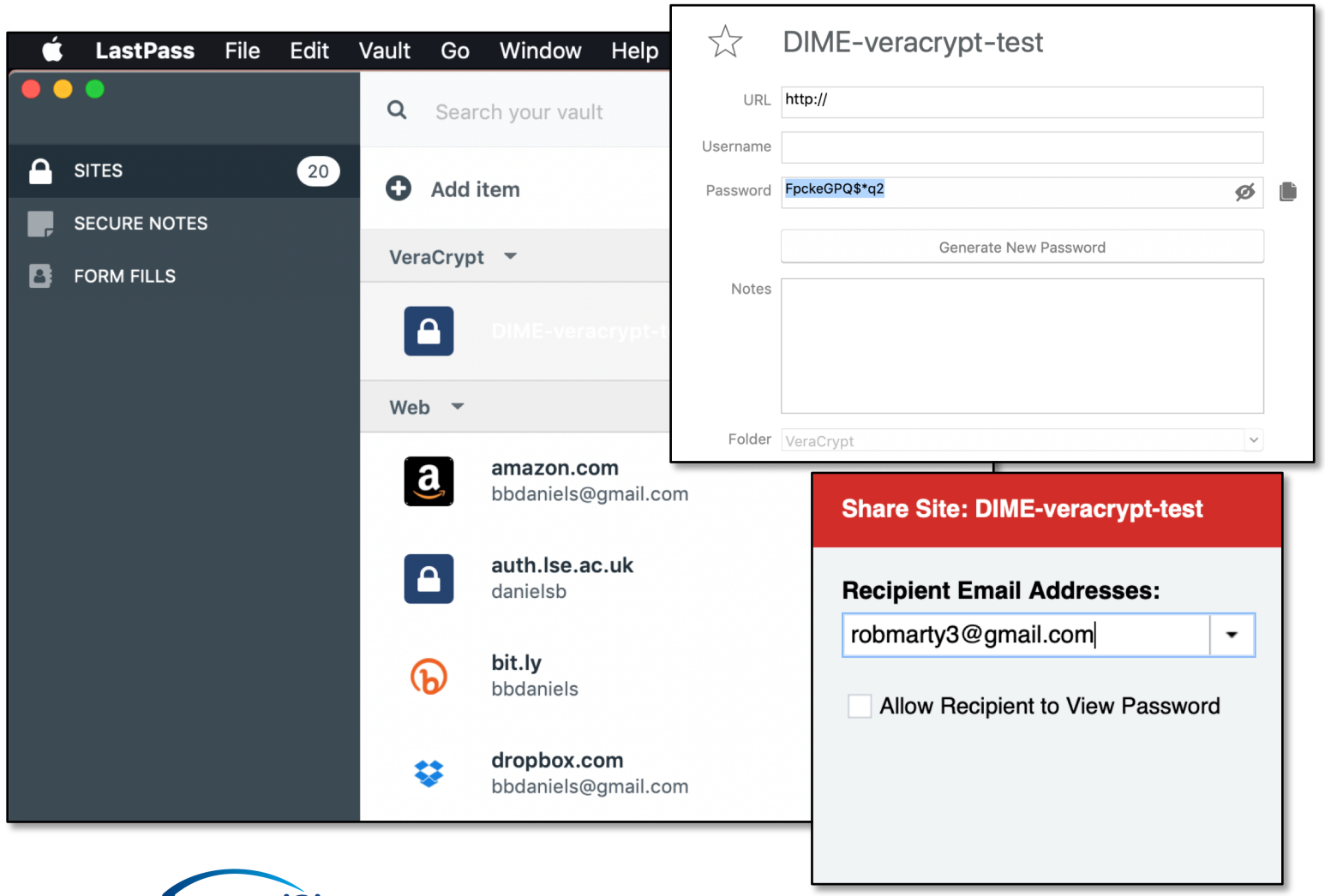
Two-factor authentication (2FA) is standard

- Any account you have which has personal or private information should be secured by 2FA
- First you enter your password, then you are prompted for a one-time “token”, which only exists on your phone (in Google Authenticator or Authy)
- This prevents anyone from accessing things like your Facebook account, your credit cards, or your survey data



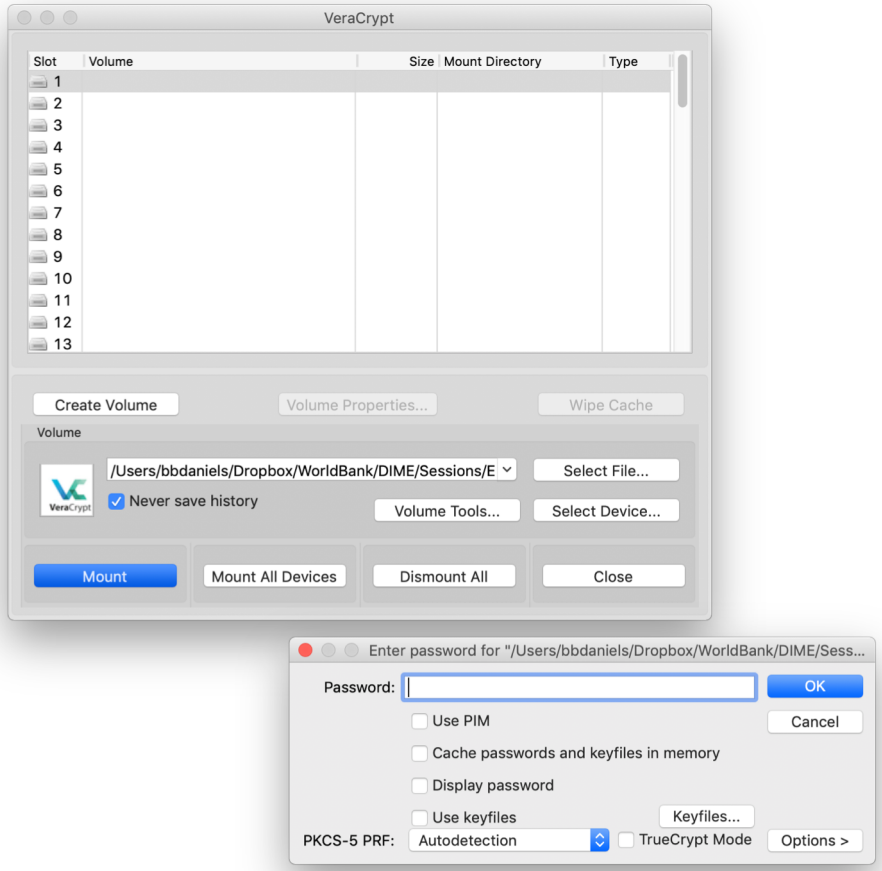
Password management is critical with many

- LastPass is a free password manager (web and local) that allows you to generate, store, access, and share passwords
- We will use this to create and save passwords to encrypted information
- **Homework: set up Authy and LastPass**

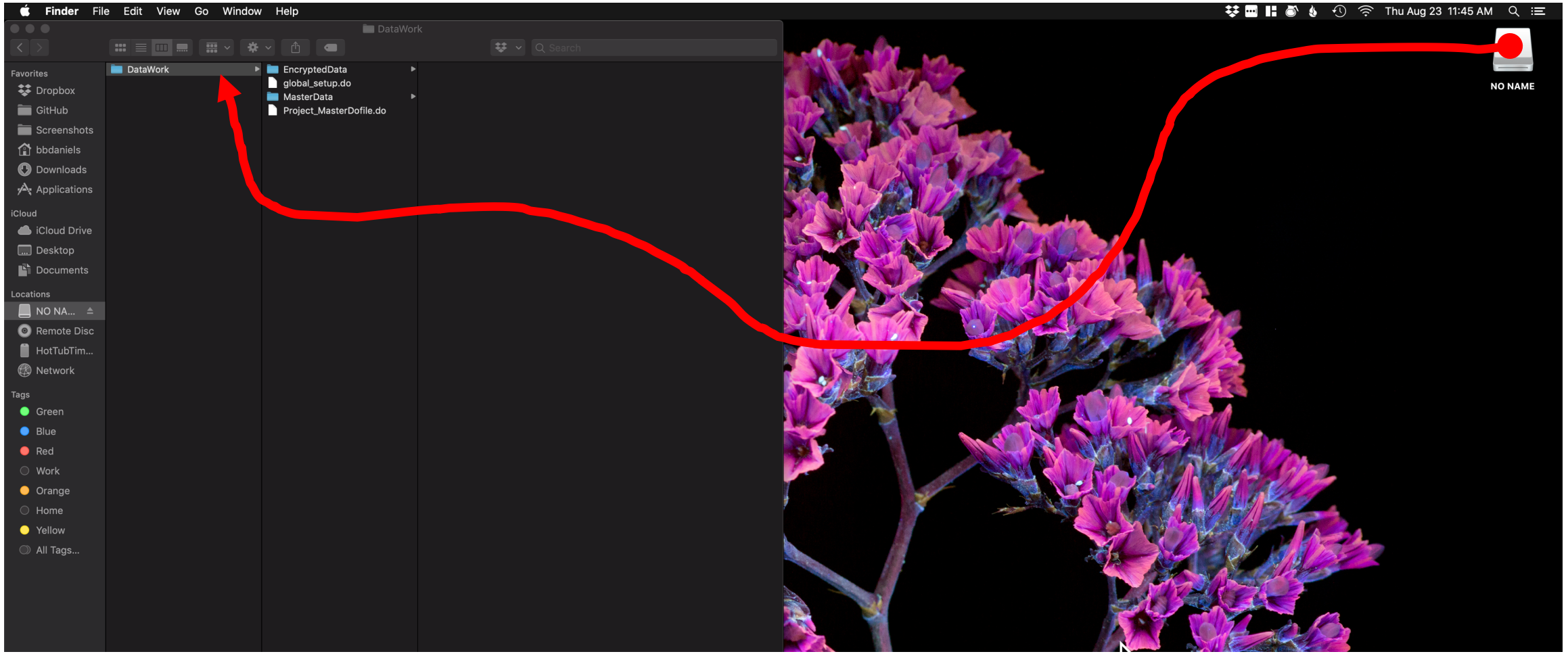


VeraCrypt creates secure objects to contain data

- This works by setting aside a fixed amount of storage space on the hard drive
- This object has only a name, no file extension (similar to a folder)
- It is encrypted using a strong password and randomness generated by moving the mouse
- “Mounting” this object with VC is like plugging in a flash drive

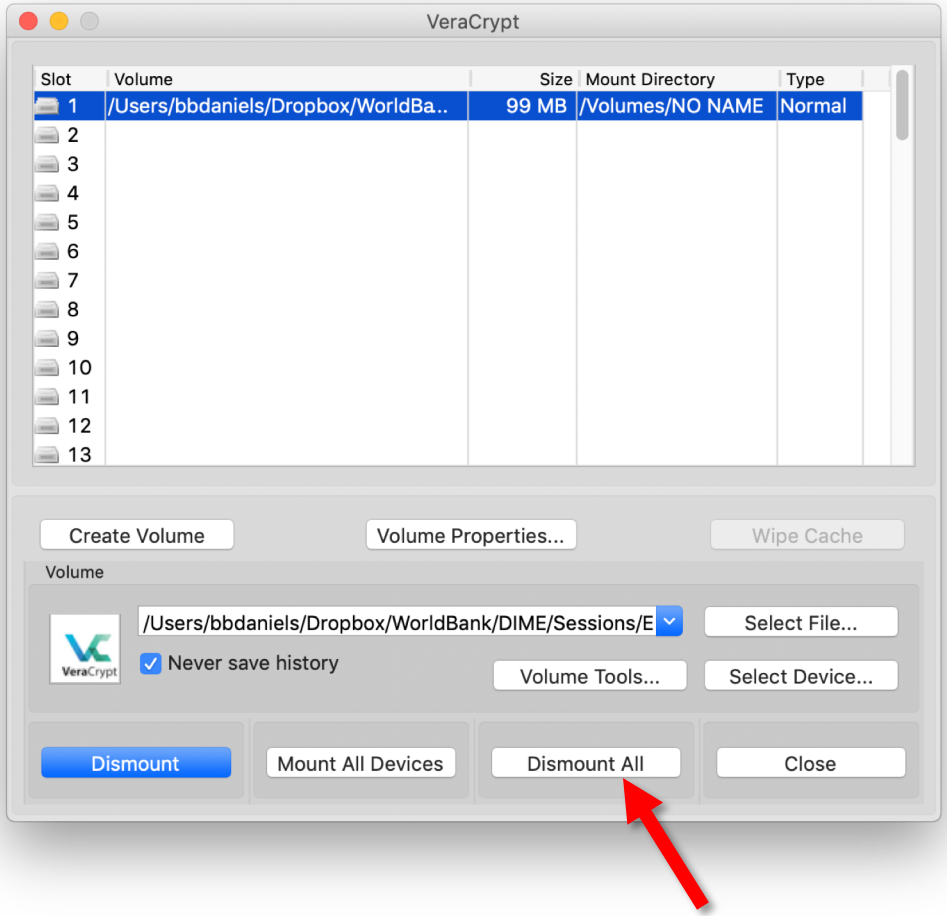


VC Objects are only editable when “mounted”

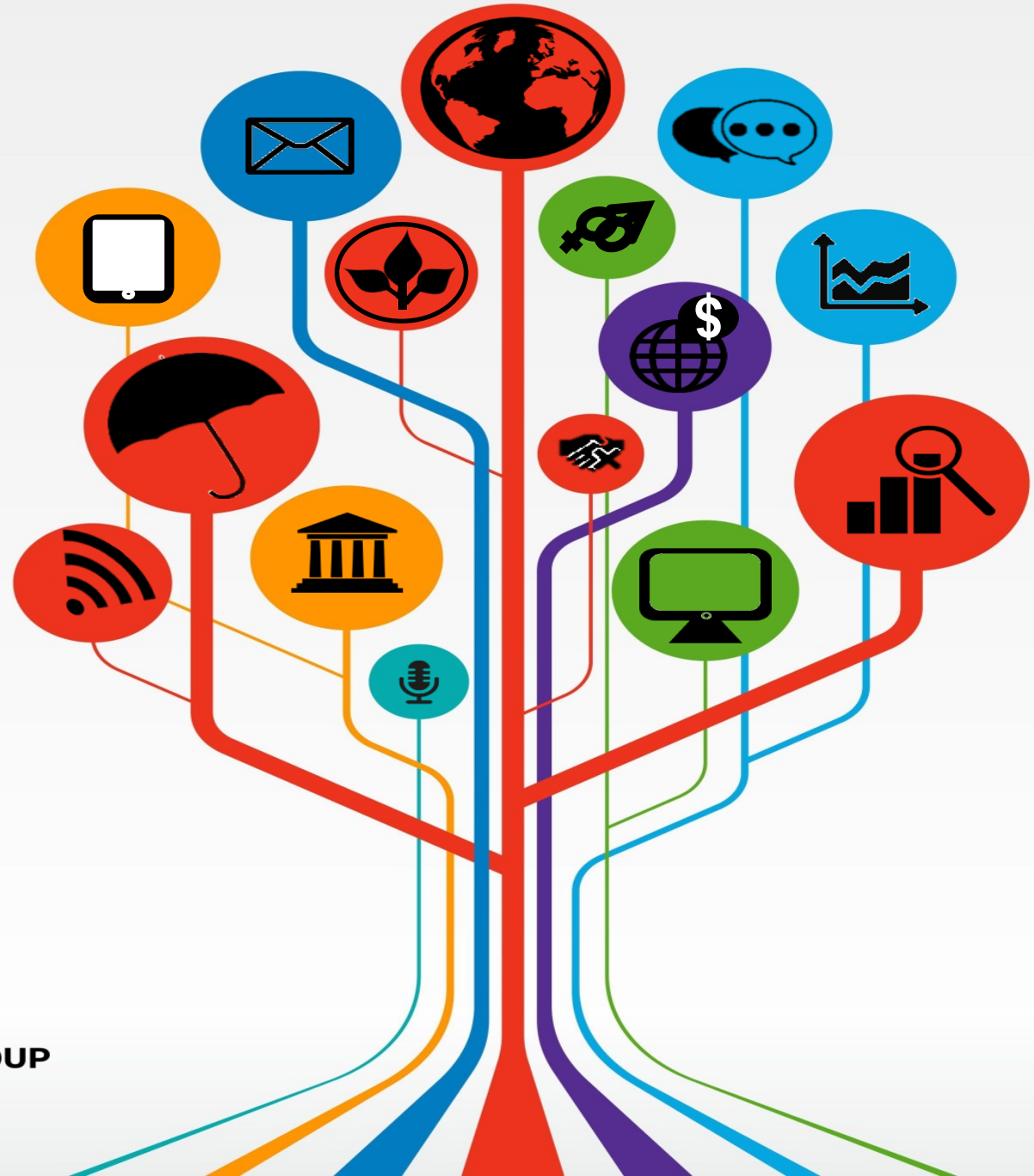


All changes are encrypted when dismounted

- Once the drive is dismounted, it disappears from the file system and then the encrypted object is updated by VeraCrypt
- Your changes are not saved to your hard drive until you complete this step!



Workflow – Encrypted Data with SurveyCTO



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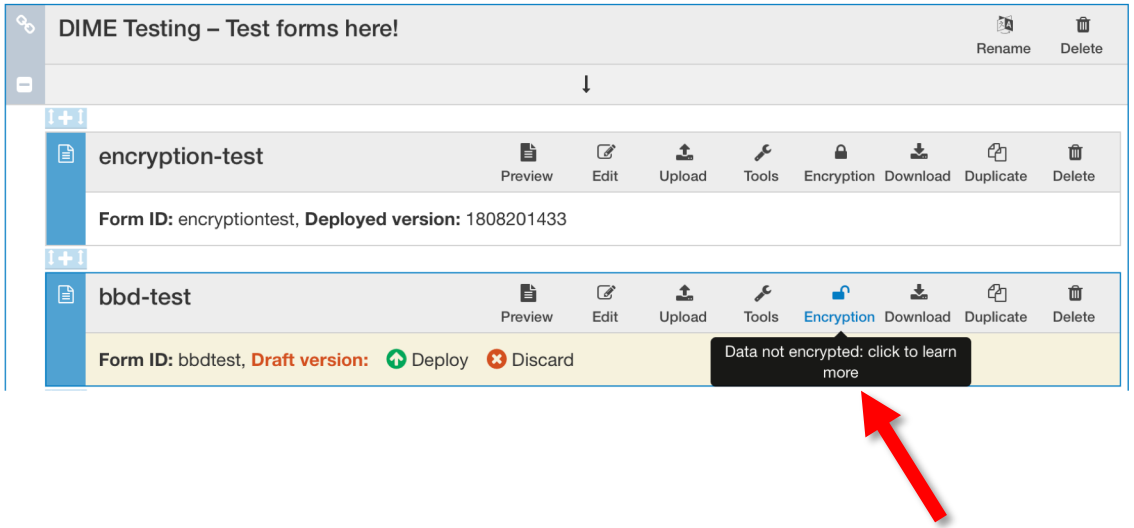
WB SurveyCTO server data *must* be encrypted

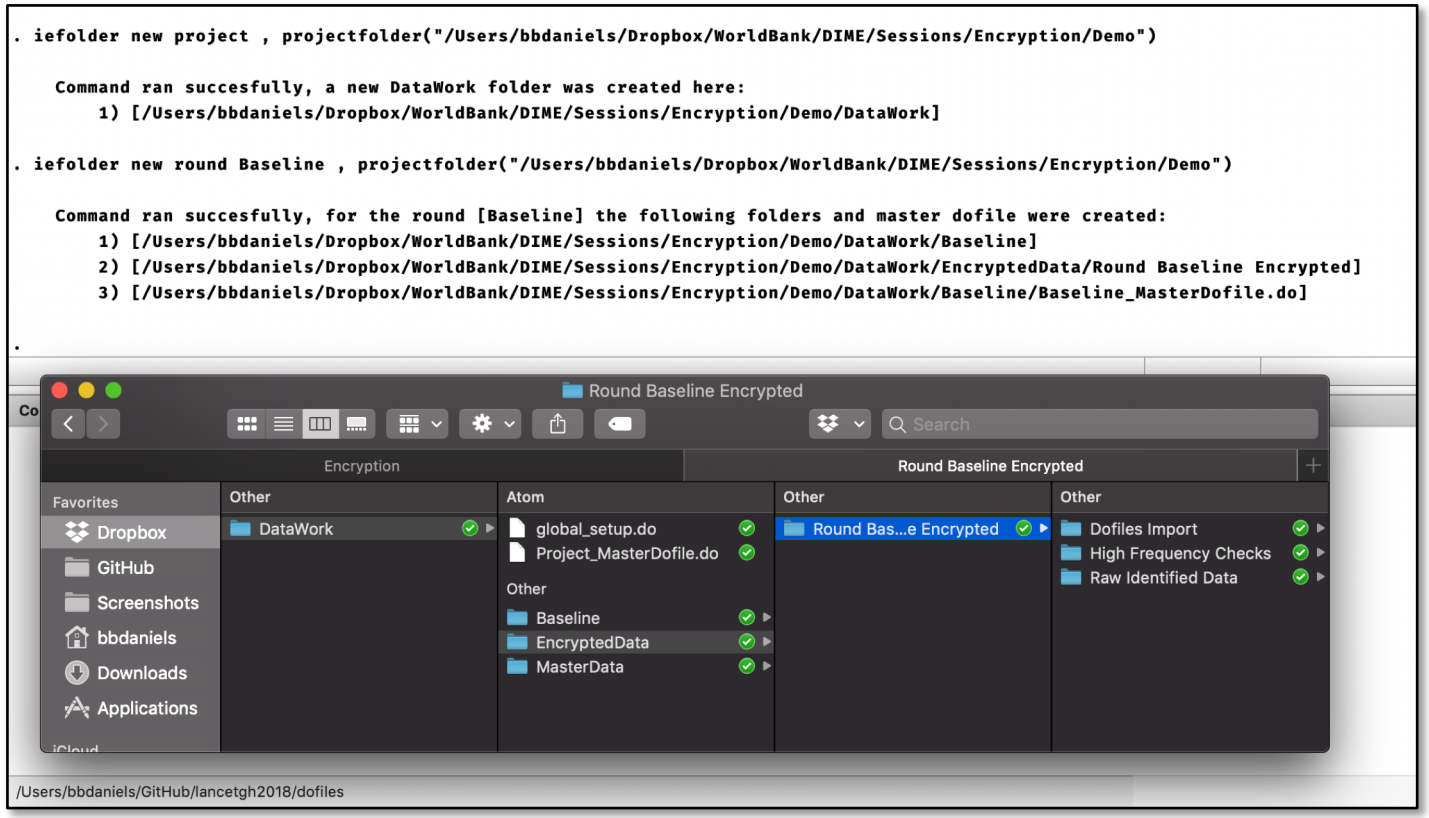
- If form data is not encrypted on the server, all server administrators can access and export your data
- SurveyCTO provides easy tools to make sure your new surveys are encrypted
- Since there are several pieces, the key in this workflow is *organization.*



[*iefolder*] rounds have an EncryptedData folder

- First, we need to create a VeraCrypt object here for our survey keys. 1MB will be large enough since these are small files.

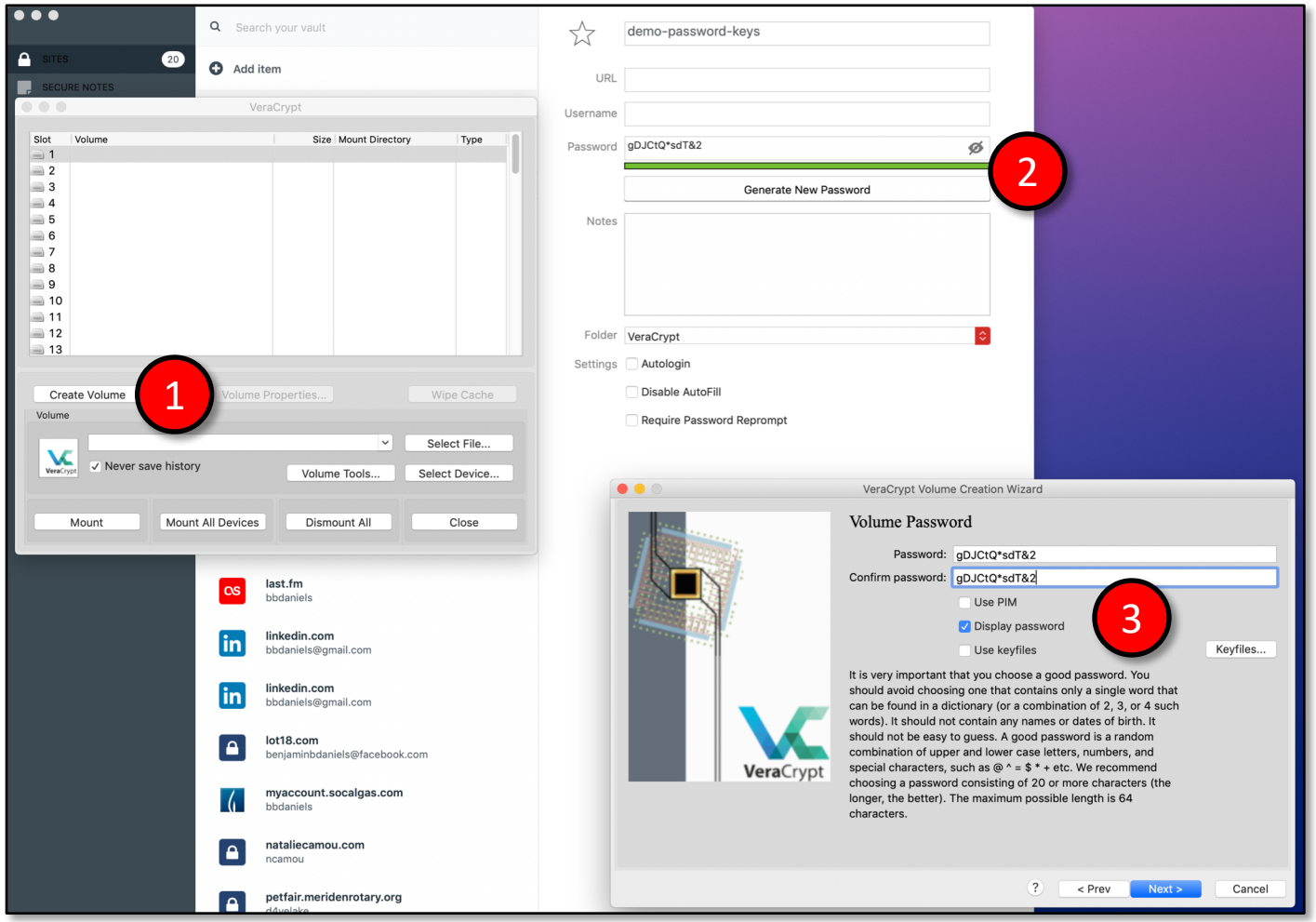
```
. iefolder new project , projectfolder("/Users/bbdaniels/Dropbox/WorldBank/DIME/Sessions/Encryption/Demo")

   Command ran succesfully, a new DataWork folder was created here:
       1) [/Users/bbdaniels/Dropbox/WorldBank/DIME/Sessions/Encryption/Demo/DataWork]

. iefolder new round Baseline , projectfolder("/Users/bbdaniels/Dropbox/WorldBank/DIME/Sessions/Encryption/Demo")

   Command ran succesfully, for the round [Baseline] the following folders and master dofile were created:
       1) [/Users/bbdaniels/Dropbox/WorldBank/DIME/Sessions/Encryption/Demo/DataWork/Baseline]
       2) [/Users/bbdaniels/Dropbox/WorldBank/DIME/Sessions/Encryption/Demo/DataWork/EncryptedData/Round Baseline Encrypted]
       3) [/Users/bbdaniels/Dropbox/WorldBank/DIME/Sessions/Encryption/Demo/DataWork/Baseline/Baseline_MasterDofile.do]

.
```



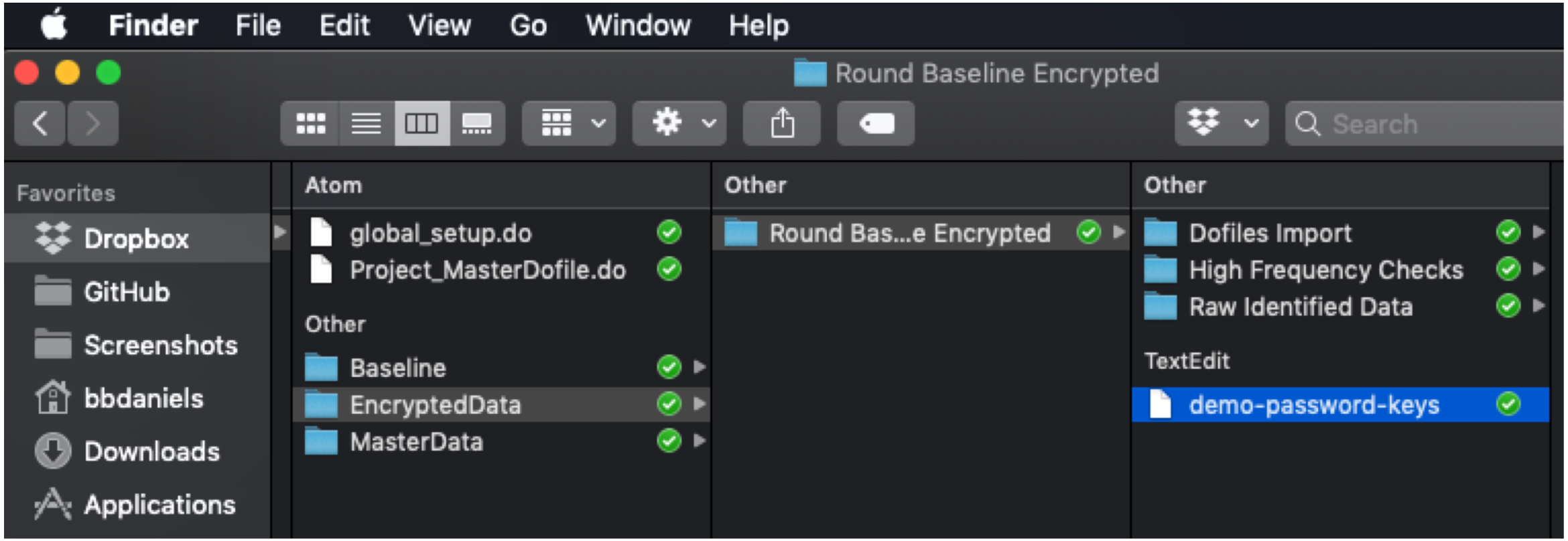
First, use VeraCrypt to create the volume

- VeraCrypt: “Create Volume” at the location of the Round Encrypted folder.
- LastPass: “add item” with the detailed name of the survey, round, and –survey-keys
- LastPass: “generate password”, then be sure to “Save”
- VeraCrypt: Copy and paste the plaintext password (“display password”, then follow instructions)

- JPAL guide to VeraCrypt: https://www.povertyactionlab.org/sites/default/files/A%20guide-to-VeraCrypt-Installation-and-Demo_Sep-2016.pdf

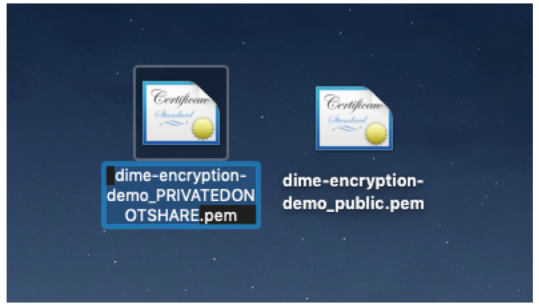


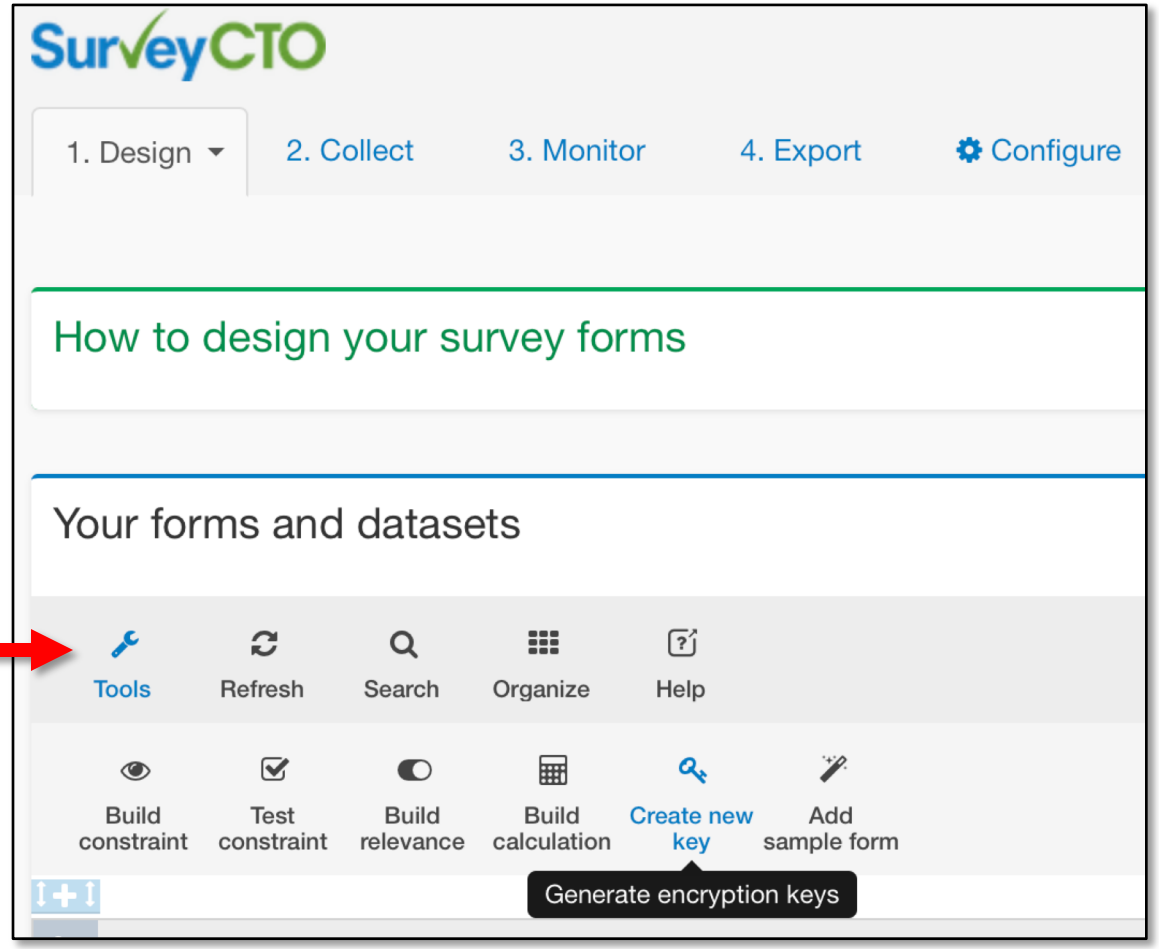
Rename the volume to match the password



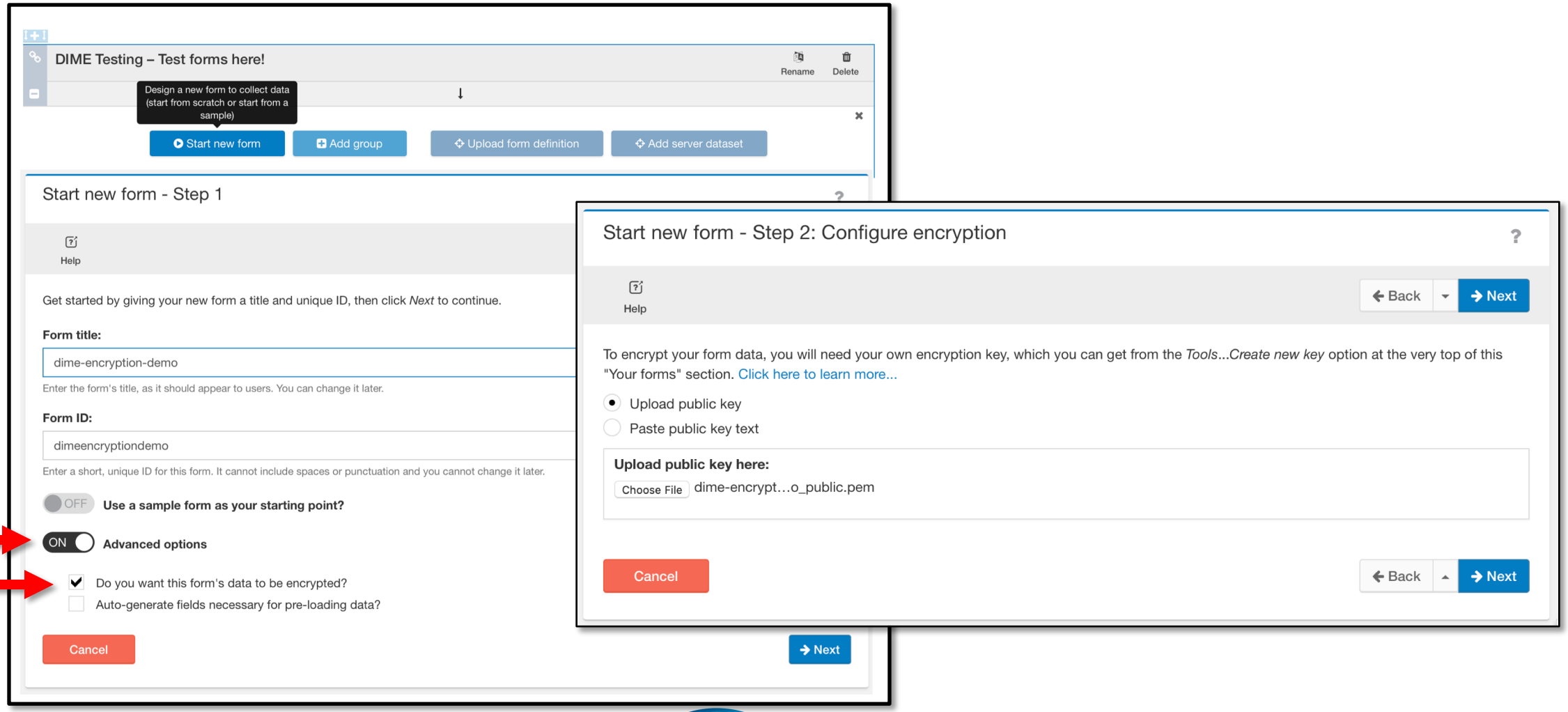
Create encryption keys on SurveyCTO

- Use the key generator to create a “public-private key pair” for your data, with the name of your intended survey. These will download two files as below:



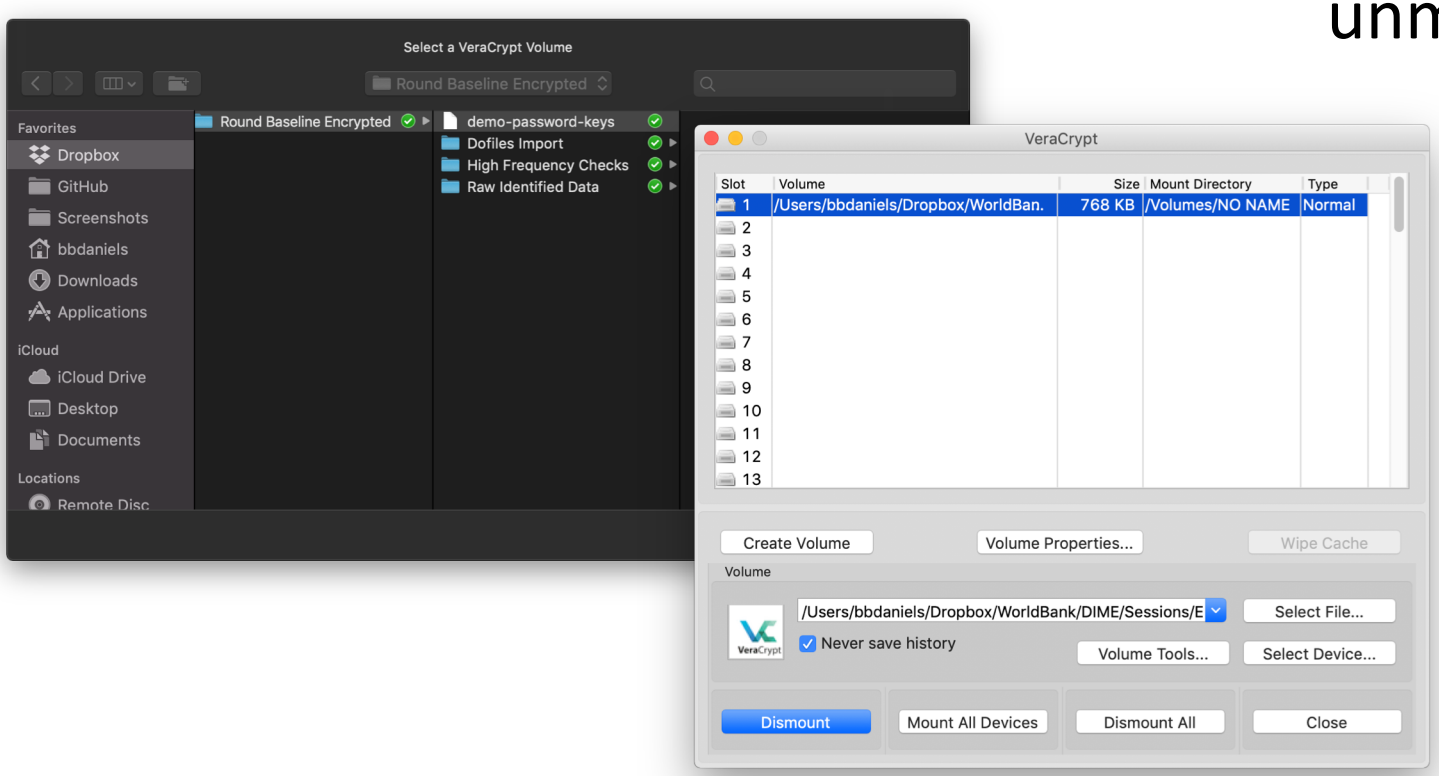


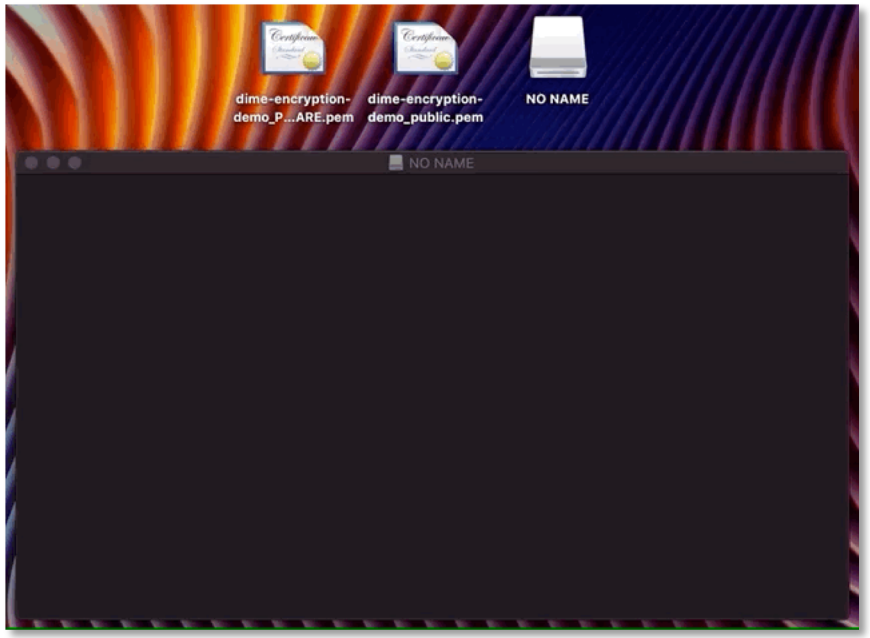
Create an encrypted survey with the *public* key



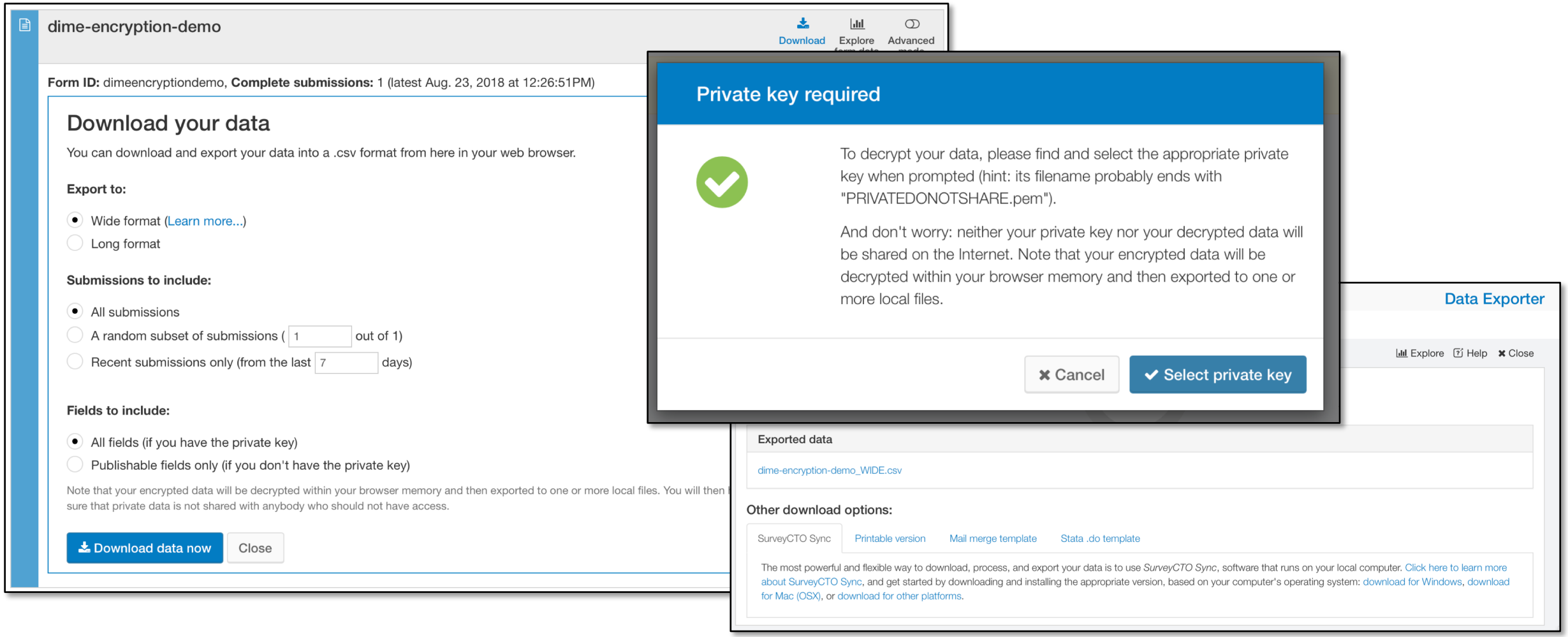
Then put the keys in the vault!

- Mount the VC object using VeraCrypt and LastPass
- Then put the keys in the mounted drive, delete them and unmount it with VeraCrypt.

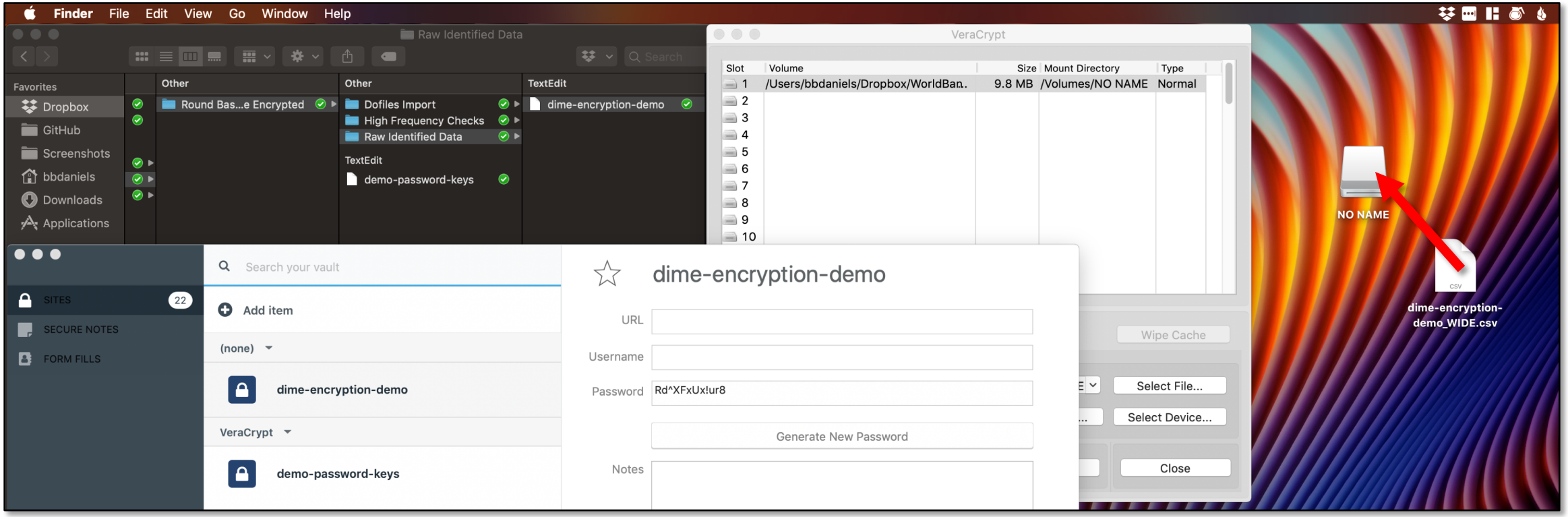




Form data download now requires the private key



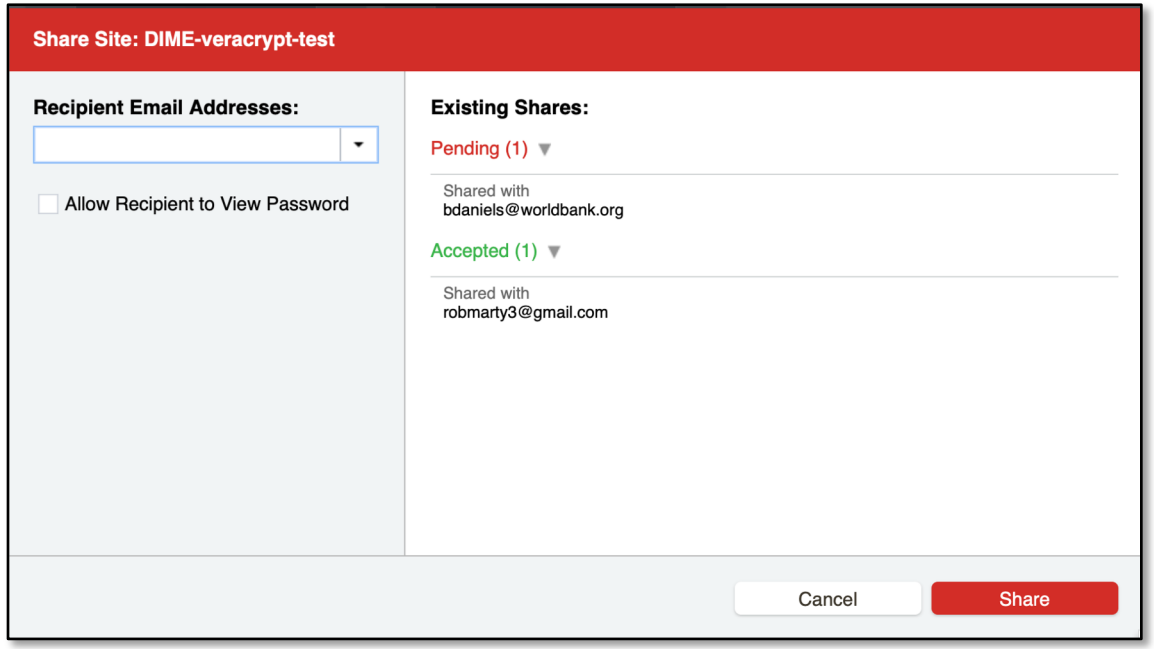
Create a separate container for the data



(This is necessary since you will not know the size of the data when you create the vault for the keys.)

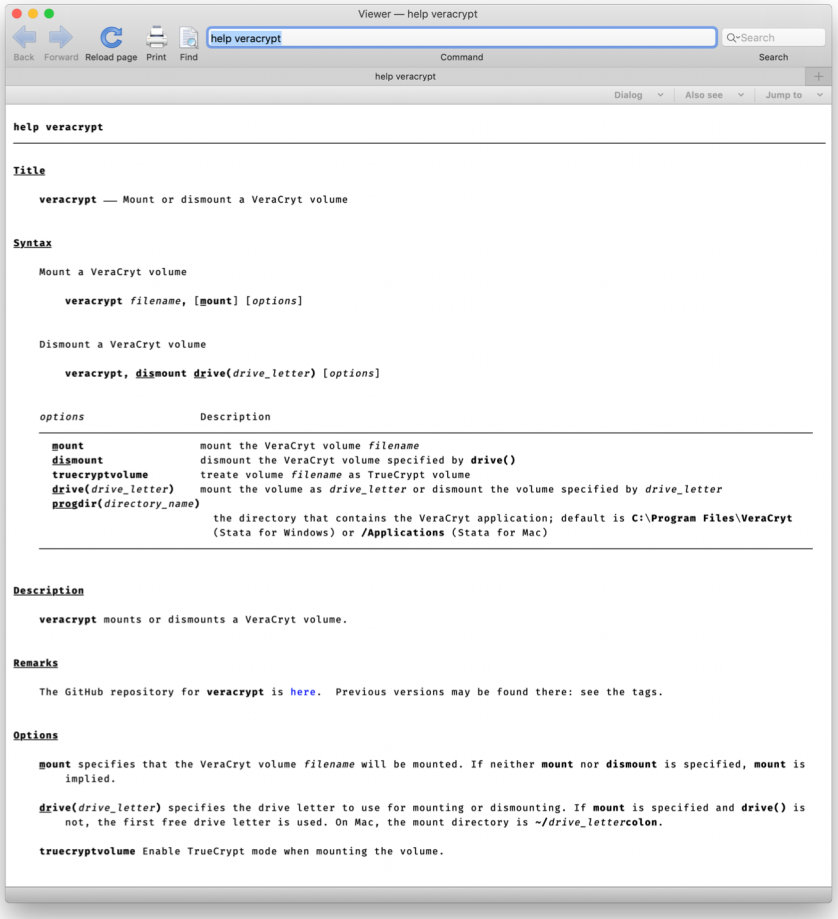
You can share securely using LastPass and Dropbox

- With this method, you never transmit information outside of a secure setting, but all data is synced with the features of Dropbox as you are used to it.



Your first cleaning dofile will create non-PII data

- The [*veracrypt*] command allows Stata to call for VeraCrypt to mount the drive.
- You have to manually enter the password any time you run the dofile.
- The first cleaning file should move a non-PII version of your data to the regular Data folder.
- *Tip: create a "second language" in the survey called "stata" with the variable labels you want. For variable names, best practice is to use the question codes so that the first dataset matches the survey exactly.*



Rapid cleaning: Codebook commands

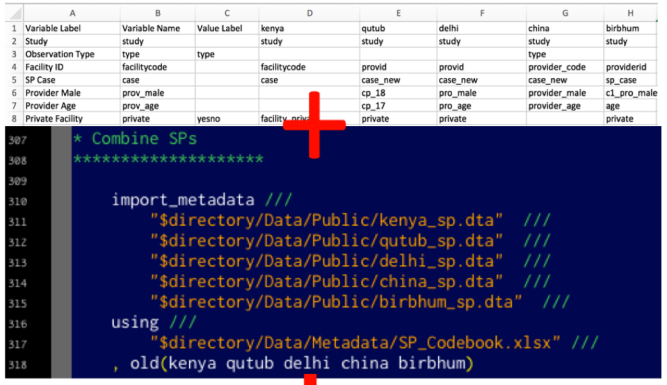
Three commands in development:

- importCodebook
  - Merges data across multiple survey rounds, useful when labelling and variable names need to be harmonized
- applyCodebook
  - Allows you to clean data (rename, recode, value label, variable label) very quickly
- exportCodebook
  - Creates a "release" version of your data which only contains the variables used in your analysis dofiles
- Need testing on all three!
  - Hoping to release later this year in iefieldkit as [*iecodebook*] commands.
- http://worldbank.github.io/stata

Demos of Codebook commands

importCodebook

importCodebook allows the user to create an Excel-based metadata file, then import one or more .xlsx or .dta files, including harmonizing variable naming and categorical coding and labeling. It can be used to expedite the cleaning of a single file or to combine (append) different surveys or survey rounds, taking the "hard work" out of the dofile.



	A	B	C	D	E	F	G	H
1	Variable Label	Variable Name	Value Label	kenya	qutub	delhi	china	birbhum
2	Study	study		study	study	study	study	study
3	Observation Type	type	type				type	
4	Facility ID	facilitycode		facilitycode	provid	provid	provider_code	providerid
5	SP Case	case		case	case_new	case_new	case_new	sp_case
6	Provider Male	prov_male			cp_18	pro_male	provider_male	c1_pro_male
7	Provider Age	prov_age			cp_17	pro_age	provider_age	age
8	Private Facility	private	yesno	facility_pdyn	private	private		private

```
* Combine SPs
**********************

    import_metadata ///
        "$directory/Data/Public/kenya_sp.dta"  ///
        "$directory/Data/Public/qutub_sp.dta"  ///
        "$directory/Data/Public/delhi_sp.dta"  ///
        "$directory/Data/Public/china_sp.dta"  ///
        "$directory/Data/Public/birbhum_sp.dta"  ///
    using ///
        "$directory/Data/Metadata/SP_Codebook.xlsx" ///
    , old(kenya qutub delhi china birbhum)
```

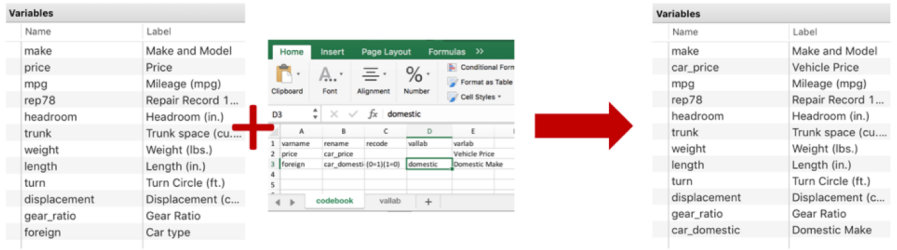
```
. ta study case
```

Study	Angina	Asthma	Diarrhea	SP Case TB1 Naive	TB2 CXR	TB3 AFB	TB4 MDR	Total
Birbhum C	392	395	398	0	0	0	0	1,185
Birbhum T	392	392	395	0	0	0	0	1,179
China	0	0	0	578	0	0	0	578
Delhi	0	0	0	168	75	50	50	343
Kenya	42	42	40	42	0	0	0	166
Madhya Pradesh	723	850	830	0	0	0	0	2,403
Mumbai	0	0	0	804	247	204	328	1,583
Patna	0	0	0	573	138	150	158	1,019
Total	1,549	1,679	1,663	2,165	460	404	536	8,456

```
wb_git_install importCodebook
[see documentation for extensive examples]
```

applyCodebook

applyCodebook allows the user to create an Excel codebook file, which will apply renames, recodes, variable labels, and value labels to the open dataset. It can be used to expedite the cleaning of a single file , taking the "hard work" out of the dofile.



Variables

Name	Label
make	Make and Model
price	Price
mpg	Mileage (mpg)
rep78	Repair Record 1...
headroom	Headroom (in.)
trunk	Trunk space (cu....
weight	Weight (lbs.)
length	Length (in.)
turn	Turn Circle (ft.)
displacement	Displacement (c...
gear_ratio	Gear Ratio
foreign	Car type

Variables

Name	Label
make	Make and Model
car_price	Vehicle Price
mpg	Mileage (mpg)
rep78	Repair Record 1...
headroom	Headroom (in.)
trunk	Trunk space (cu....
weight	Weight (lbs.)
length	Length (in.)
turn	Turn Circle (ft.)
displacement	Displacement (c...
gear_ratio	Gear Ratio
car_domestic	Domestic Make

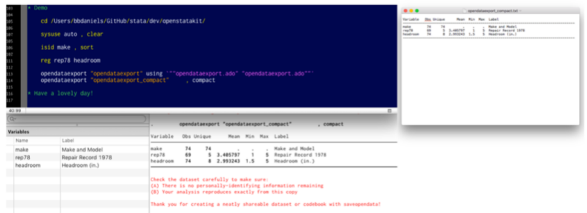
```
. applyCodebook using "applyCodebook_DEMO.xlsx" , rename varlab recode vallab
Codebook applied!
```

```
wb_git_install applyCodebook
sysuse auto, clear

applyCodebook ///
  using "applyCodebook_DEMO.xlsx" ///
  , rename varlab recode vallab
```

exportCodebook

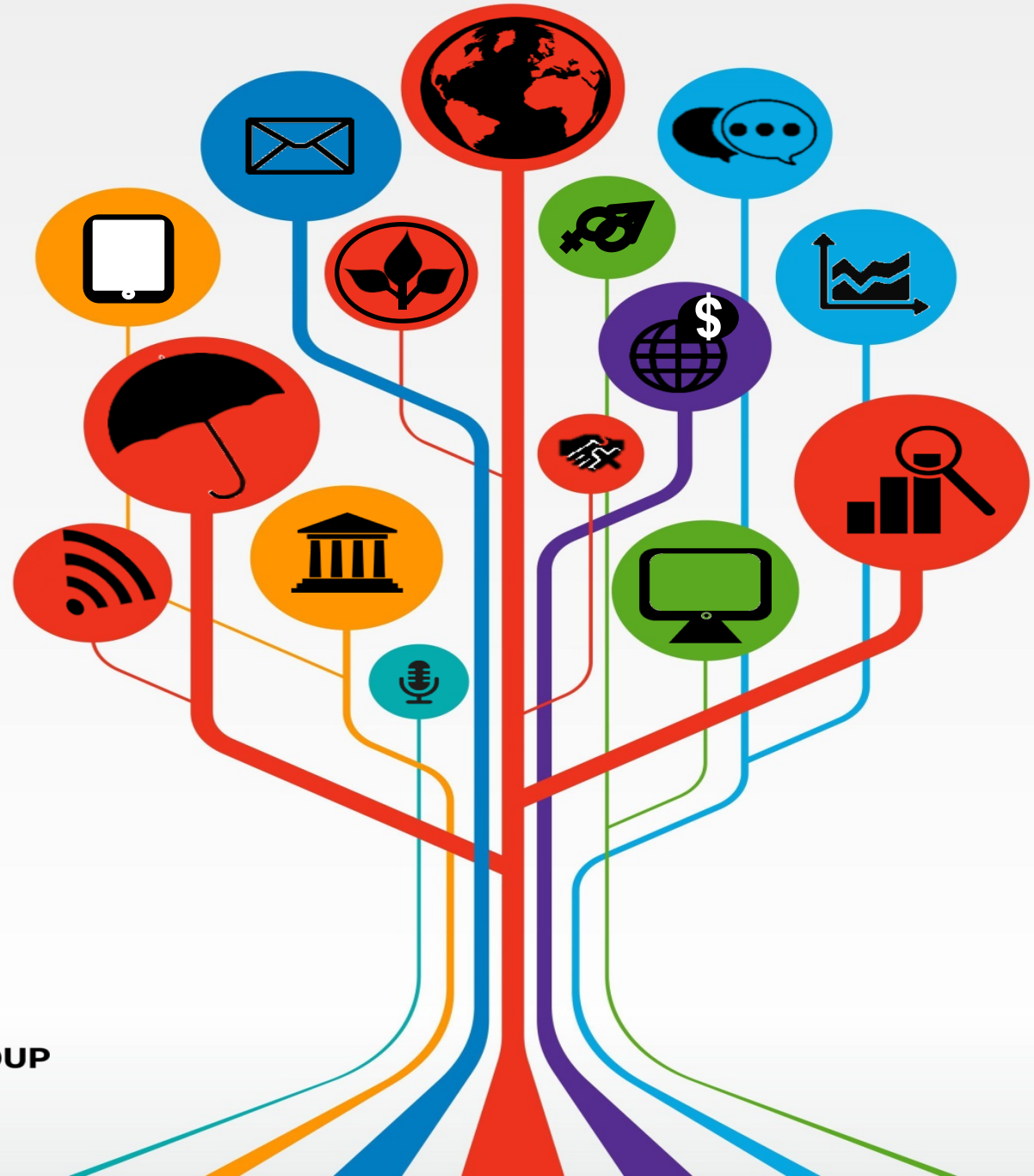
exportCodebook reads the currently open dataset and either (A) creates a codebook for it in the specified location; or (B) reads a series of .dofiles that reference the data and keeps only the variables that those dofiles reference.

opendataexport: Data + list of dofiles → trimmed dataset + codebook



```
wb_git_install exportCodebook
sysuse auto , clear
exportCodebook "exportCodebook_compact"          , compact
```

Thank you!



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