

Package ‘ukbbhelpr’

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Type Package

Title Helper functions for UK Biobank data

Version 0.2.0

Description A collection of helper functions for working with UK Biobank data.

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Encoding UTF-8

LazyData false

Depends R (>= 2.10)

Imports ConceptLibraryClient,
data.table,
lubridate,
readxl,
stringr,
checkmate

Remotes github::SwanseaUniversityMedical/ConceptLibraryClient

RoxygenNote 7.1.2

Suggests testthat

R topics documented:

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ehr_extract	<i>Extract EHR records and values</i>
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Description

Extracts records/values from linked EHR data. If values is TRUE, values are extracted the value1 field with the exception of data provider 2 where values are extracted from value2 if value1 is empty. Units are taken from value3 for data provider 2 (otherwise units are unavailable). NA, zero and duplicate values are dropped.

Usage

```
ehr_extract(ehr_data, read_codes, format = NULL)
```

Arguments

ehr_data	Data table with UK Biobank clinical event data i.e. gp_clinical.txt.
read_codes	Extract records matching these codes. Data table/frame with read_2 (Read v2) and read_3 (CTV3) columns.
format	Set to "values" to extract values from EHR records. Replaces the value1, value2, value3 columns with a single value column and a unit column. Default is currently "values" but will change in a future release.

Value

Filtered EHR data with value and unit columns if format is "values".

ehr_hdr_extract	<i>Extract EHR records and values using a HDR UK phenotype library concept</i>
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Description

Extracts records/values from linked EHR data. If values is TRUE, values are extracted the value1 field with the exception of data provider 2 where values are extracted from value2 if value1 is empty. Units are taken from value3 for data provider 2 (otherwise units are unavailable). NA, zero and duplicate values are dropped. Wrapper for ehr_extract().

Usage

```
ehr_hdr_extract(ehr_data, id, version_id = NULL, api = NULL, format = "raw")
```

Arguments

ehr_data	Data table with UK Biobank clinical event data i.e. gp_clinical.txt.
id	Concept ID.
version_id	Optional concept version ID. Otherwise latest version of concept is returned.
api	Optional HttpClient to connect to phenotype library (default uses https://phenotypes.healthdatagateway.org).
format	Set to "values" to extract values from EHR records. Replaces the value1, value2, value3 columns with a single value column and a unit column. Default is currently "values" but will change in a future release.

Value

Filtered EHR data with value and unit columns if format is "values".

ehr_map_codes	<i>Map EHR codes to another terminology</i>
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Description

Map EHR codes from one terminology to another using UK Biobank mapping dictionaries. Currently supports mapping Read v2 to CTV 3 only.

Usage

```
ehr_map_codes(codes, from = "read2", to = "ctv3", overwrite = FALSE)
```

Arguments

codes	Vector of codes to map.
from	Terminology to map from. Currently supports Read v2 codes only.
to	Terminology to map to. Currently supports CTV3 only.
overwrite	Overwrite existing mapping dictionary (default FALSE).

Value

Data table with mapped codes and description.

get_coding	<i>Get UK Biobank coding</i>
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Description

Returns the UK Biobank coding file for the supplied id. The file is downloaded if it is unavailable locally.

Usage

```
get_coding(id, overwrite = FALSE)
```

Arguments

id	ID for coding file. Obtain this from the data dictionary for your application, or directly from the Data Showcase (https://biobank.ndph.ox.ac.uk/showcase/), by looking up the relevant data field.
overwrite	Overwrite existing file (default FALSE).

Value

Data table with contents of coding file.

get_hdr_concept	<i>Get concept from HDR UK phenotype library</i>
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Description

Queries HDR UK phenotype library for a given concept. Read v2 codes are mapped to CTV3 if the read argument is TRUE.

Usage

```
get_hdr_concept(id, version_id = NULL, api = NULL, read = FALSE)
```

Arguments

id	Concept ID.
version_id	Optional concept version ID. Otherwise latest version of concept is returned.
api	Optional HttpClient to connect to phenotype library (default uses https://phenotypes.healthdatagateway.org/).
read	Set to TRUE if concept contains Read v2 codes. Read v2 codes of length less than 5 are padded with a "." e.g. "C10" becomes "C10.". Codes are mapped to CTV3 using UK Biobank mapping dictionaries.

Value

Data table with phenotype codes. read_2/term_2 and read_3/term_3 columns are added with codes and terms under Read v2 and CTV3 if read is TRUE.

get_hdr_phenotype	<i>Get phenotype from HDR UK phenotype library</i>
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Description

Queries HDR UK phenotype library for a given phenotype.

Usage

```
get_hdr_phenotype(id, version_id = NULL, api = NULL)
```

Arguments

id	Phenotype ID.
version_id	Optional phenotype version ID. Otherwise latest version of phenotype is returned.
api	Optional HttpClient to connect to phenotype library (default uses https://phenotypes.healthdatagateway.org/)

Value

Data table with phenotype codes.

visit	<i>Example UK Biobank visit data set.</i>
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Description

Synthetic UK Biobank visit data for function testing and demonstration.

Usage

```
visit
```

Format

Data table with columns as set out below.

Details

Data is provided for 100 synthetic participants with two instances (visits) for 40% of participants. Fields provided are 50 (height), 53 (visit date) and 21002 (weight).

visit_cancer	<i>Extract self-reported cancer history</i>
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Description

Extracts self-reported cancer history in a "long" format that is easier to work with than "wide" as provided by UK Biobank (NOTE: watch for type coercion of different data types). Wrapper function for `visit_mult_array()`.

Usage

```
visit_cancer(visit_data)
```

Arguments

`visit_data` Data frame/table with UK Biobank data. Must include fields 20001 and 20006.

Value

Data table with the following columns:

eid UK Biobank identifier.

date Reported date of diagnosis.

condition Cancer type coded as in <https://biobank.ctsu.ox.ac.uk/crystal/coding.cgi?id=3>.

desc Description of cancer type (added if coding data can be downloaded).

reported Visit date at which the cancer was self-reported.

visit_conditions	<i>Extract self-reported non-cancer medical history</i>
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Description

Extracts self-reported non-cancer medical history in a "long" format that is easier to work with than "wide" as provided by UK Biobank (NOTE: watch for type coercion of different data types). Wrapper function for `visit_mult_array()`.

Usage

```
visit_conditions(visit_data)
```

Arguments

`visit_data` Data frame/table with UK Biobank data. Must include fields 20002 and 20008.

Value

Data table with the following columns:

eid UK Biobank identifier.

date Reported date of diagnosis.

condition Health condition coded as in <https://biobank.ctsu.ox.ac.uk/crystal/coding.cgi?id=6>.

desc Description of health condition (added if coding data can be downloaded).

reported Visit date at which the condition was self-reported.

visit_extract	<i>Extract field data from UK Biobank visit data</i>
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Description

Extracts all instances/arrays of data for a UK Biobank field(s) in clean "long" format (NOTE: watch for type coercion of different data types). See <https://biobank.ndph.ox.ac.uk/showcase/> to identify field codes. Wrapper for `visit_fields()` which extracts raw field data.

Usage

```
visit_extract(visit_data, fields, format = NULL)
```

Arguments

<code>visit_data</code>	Data frame/table with UK Biobank data.
<code>fields</code>	Vector of fields to extract e.g. 50 or <code>c(50, 21002)</code> . Field name will be identified from UK Biobank schema. Alternatively, field names can be set using a named vector e.g. <code>c("height" = 50, "weight" = 21002)</code> .
<code>format</code>	Format of output table (raw or source). Default is currently raw but will change to source in a future release.

Value

Data table with values of all instances/arrays for each field in "long" format. The following columns are provided:

eid UK Biobank identifier.

date Visit date.

field/variable Field name (see below).

array Provided if any fields have multiple arrays (more than one value recorded on the same date e.g repeated blood pressure).

value Value recorded.

If `format = "source"`, an additional column `source = "ukbb"` is added to indicate data was recorded by UK Biobank and the field column is renamed `variable`. This will be the default in a future release. Use `format = "raw"` to keep current format.

Examples

```
## Not run:
# Load data
data_path <- "" # add path to your data
visit_data <- fread(data_path)

# Extract a field
visit_extract(visit_data, 50)

# Extract multiple fields
visit_extract(visit_data, c(50, 21002))

# Manually specify a field name
visit_extract(visit_data, c("height" = 50, 21002))

## End(Not run)
```

visit_family_history *Determine family history of a specified condition*

Description

Determines presence of a specified condition in the self-reported family history data. If multiple history fields are provided (e.g. history of mother and father), presence of the condition in either field determines a positive family history.

Usage

```
visit_family_history(
  visit_data,
  fields,
  condition,
  collapse = TRUE,
  name = NULL
)
```

Arguments

visit_data	Data frame/table with UK Biobank data.
fields	Vector of family history fields to extract e.g. one or more from 20107 (father), 20110 (mother) or 20111 (sibling).
condition	Code for condition. Only a single condition at a time is currently supported. See https://biobank.ndph.ox.ac.uk/showcase/coding.cgi?id=1010 to identify condition codes.
collapse	Summarise results across all visit dates (default TRUE). If FALSE, the presence of the condition is provided at each visit date in the output table.
name	Optional column name for condition (default history).

Value

Data table with TRUE (condition was reported), FALSE (condition was not reported) or NA (unknown/no response).

Examples

```
## Not run:
# Load data
data_path <- "" # add path to your data
visit <- fread(data_path)

# Extract history for father
visit_family_history(visit, 20107, 9)

# Extract history for father, mother and siblings
visit_family_history(visit, c(20107, 20110, 20111), 9)

# Name column in output
visit_family_history(visit, c(20107, 20110, 20111), 9, name = "diabetes")

# Get history reported at each visit date
visit_family_history(visit, c(20107, 20110, 20111), 9, collapse = FALSE)

## End(Not run)
```

visit_fields	<i>Extract raw field data from UK Biobank visit data</i>
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Description

Extracts all instances/arrays of data for a UK Biobank field(s). See <https://biobank.ndph.ox.ac.uk/showcase/> to identify field codes.

Usage

```
visit_fields(visit_data, fields, format = "wide")
```

Arguments

visit_data	Data frame/table with UK Biobank data.
fields	Vector of fields to extract e.g. 50 or c(50, 21002).
format	Format of output table i.e. "wide" or "long" (default "wide"). NOTE: watch for type coercion if use long format.

Value

Data table with all instances/arrays for each field.

Examples

```
## Not run:
# Load data
data_path <- "" # add path to your data
visit_data <- fread(data_path)

# Extract a field
visit_fields(visit_data, 50)

# Extract multiple fields
visit_fields(visit_data, c(50, 21002))

# Extract multiple fields in long format
visit_fields(visit_data, c(50, 21002), format = "long")

## End(Not run)
```

visit_mult_array	<i>Extract data from two UK Biobank fields jointly</i>
------------------	--

Description

Some fields relate to each other e.g. self-reported medical history where field 20002 contains the disclosed conditions and 20008 the date of diagnosis. The date in array i of 20008 corresponds to the condition in array i of 20002. `visit_mult_array()` jointly extracts such fields in a "long" format that is easier to work with than "wide" as provided by UK Biobank (NOTE: watch for type coercion of different data types).

Usage

```
visit_mult_array(visit_data, fields)
```

Arguments

<code>visit_data</code>	Data frame/table with UK Biobank data.
<code>fields</code>	Vector of fields to extract e.g. <code>c(50, 21002)</code> . Must be length two. Field name will be identified from UK Biobank schema. Alternatively, field names can be set using a named vector e.g. <code>c("height" = 50, "weight" = 21002)</code> .

Value

Data table with `eid`, `reported`, and columns corresponding to the `fields` argument. `reported` is the date corresponding to the field instance e.g. the UK Biobank visit at which the data was collected. Each row shows the data for an array.

visit_subset	<i>Subset fields from UK Biobank visit data</i>
--------------	---

Description

Loads UK Biobank data and subsets required fields. Use to avoid loading full data each time. See <https://biobank.ndph.ox.ac.uk/showcase/> to identify field codes.

Usage

```
visit_subset(data_path, fields, ..., save = NULL)
```

Arguments

data_path	Path to raw UK Biobank data unpacked using ukbunpack utility.
fields	Vector of fields to extract e.g. 50 or c(50,21002).
...	Passed to fread e.g. to set file separator.
save	Optional path to save output.

Value

Data table with all instances/arrays for each field. Note the date field (53) is always returned.

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