

Package ‘naaccr’

December 17, 2019

Type Package

Title Read Cancer Records in the NAACCR Format

Version 1.0.0

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Description Functions for reading cancer record files which follow a format defined by the North American Association of Central Cancer Registries (NAACCR).

URL <https://github.com/WerthPADOH/naaccr>

BugReports <https://github.com/WerthPADOH/naaccr/issues>

Imports data.table, stringi, utils

Suggests devtools, httr, jsonlite, magrittr, testthat, ISOCodes, xml2, rmarkdown, roxygen2, rvest

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Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

NeedsCompilation no

Repository CRAN

Date/Publication 2019-12-17 12:20:05 UTC

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as.naacr_record	<i>Coerce to a naacr_record dataset</i>	<i>Convert objects into naacr_record objects, if a method exists.</i>
-----------------	---	---

Description

Coerce to a naacr_record dataset Convert objects into naacr_record objects, if a method exists.

Usage

```
as.naacr_record(x, keep_unknown = FALSE, version = NULL,
  format = NULL, ...)
```

```
## S3 method for class 'list'
as.naacr_record(x, keep_unknown = FALSE,
  version = NULL, format = NULL, ...)
```

```
## S3 method for class 'data.frame'
as.naacr_record(x, keep_unknown = FALSE,
  version = NULL, format = NULL, ...)
```

Arguments

x	An R object.
keep_unknown	Logical indicating whether values of "unknown" should be a level in the factor or NA.
version	An integer specifying the NAACCR format version for parsing the records. Use this or format, not both. If both version and format are NULL (default), the most recent NAACCR format will be used.
format	A record_format object for parsing the records.
...	Additional arguments passed to or from methods.

Value

An object of class [naacr_record](#)

See Also

[naacr_record](#)

clean_address_city	<i>Clean city names</i>
--------------------	-------------------------

Description

Clean city names

Usage

```
clean_address_city(city, keep_unknown = FALSE)
```

Arguments

city	A character vector of city names.
keep_unknown	Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and "UNKNOWN" are replaced with NA.

clean_address_number_and_street

Clean house number and street values

Description

Clean house number and street values

Usage

```
clean_address_number_and_street(location, keep_unknown = FALSE)
```

Arguments

location A character vector of house numbers and street names.
 keep_unknown Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and "UNKNOWN" are replaced with NA.

clean_age

Clean patient ages

Description

Clean patient ages

Usage

```
clean_age(age, keep_unknown = FALSE)
```

Arguments

age Age_at_Diagnosis values.
 keep_unknown Replace values for "unknown" with NA?

Value

An integer vector of ages. If keep_unknown is FALSE, values representing unknown ages are replaced with NA.

clean_census_block *Clean Census block group codes*

Description

Clean Census block group codes

Usage

```
clean_census_block(block, keep_unknown = FALSE)
```

Arguments

block A character vector of Census block group codes.
keep_unknown Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and values representing unknown block groups are replaced with NA.

clean_census_tract *Clean Census tract group codes*

Description

Clean Census tract group codes

Usage

```
clean_census_tract(tract, keep_unknown = FALSE)
```

Arguments

tract A character vector of Census tract group codes.
keep_unknown Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and values representing unknown Census Tracts are replaced with NA.

clean_count	<i>Clean counts</i>
-------------	---------------------

Description

Replaces any values of all 9's with NA (if keep_unknown is TRUE) and converts the rest to integers.

Usage

```
clean_count(count, width, keep_unknown = FALSE)
```

Arguments

count	A character vector of counts (integer characters only).
width	Integer giving the character width of the field.
keep_unknown	Replace values for "unknown" with NA?

Value

Integer vector of count. If keep_unknown is FALSE, values representing unknown counts are replaced with NA.

clean_county_fips	<i>Clean county FIPS codes</i>
-------------------	--------------------------------

Description

Clean county FIPS codes

Usage

```
clean_county_fips(county, keep_unknown = FALSE)
```

Arguments

county	A character vector of county FIPS codes.
keep_unknown	Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and values representing unknown counties are replaced with NA.

clean_facility_id	<i>Clean facility identification numbers</i>
-------------------	--

Description

Clean facility identification numbers

Usage

```
clean_facility_id(fin, keep_unknown = FALSE)
```

Arguments

fin	A character vector of facility identification numbers (FIN).
keep_unknown	Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and values representing unknown facilities are replaced with NA.

clean_icd_9_cm	<i>Clean ICD-9-CM codes</i>
----------------	-----------------------------

Description

Clean ICD-9-CM codes

Usage

```
clean_icd_9_cm(code, keep_unknown = FALSE)
```

Arguments

code	A character vector of ICD-9-CM codes.
keep_unknown	Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and the ICD-9-CM code for "unknown" ("00000") are replaced with NA.

clean_icd_code	<i>Clean cause of death codes</i>
----------------	-----------------------------------

Description

Clean cause of death codes

Usage

```
clean_icd_code(code, keep_unknown = FALSE)
```

Arguments

code	A character vector of ICD-7, ICD-8, ICD-9, and/or ICD-10 codes.
keep_unknown	Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and the ICD codes for "unknown" ("0000", "7777" and "7797") are replaced with NA.

clean_physician_id	<i>Clean physician identification numbers</i>
--------------------	---

Description

Clean physician identification numbers

Usage

```
clean_physician_id(physician, keep_unknown = FALSE)
```

Arguments

physician	A character vector of medical license number or facility-generated codes.
keep_unknown	Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and values representing unknown physicians or non-applicable are replaced with NA.

clean_postal	<i>Clean postal codes</i>
--------------	---------------------------

Description

Clean postal codes

Usage

```
clean_postal(postal, keep_unknown = FALSE)
```

Arguments

postal	A character vector of postal codes.
keep_unknown	Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and values representing uncertain postal codes are replaced with NA.

clean_ssn	<i>Clean Social Security ID numbers</i>
-----------	---

Description

Clean Social Security ID numbers

Usage

```
clean_ssn(number, keep_unknown = FALSE)
```

Arguments

number	A character vector of Social Security identification numbers. No spaces or punctuation, only numbers.
keep_unknown	Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and values representing unknown Social Security ID numbers are replaced with NA.

clean_telephone	<i>Clean telephone numbers</i>
-----------------	--------------------------------

Description

Clean telephone numbers

Usage

```
clean_telephone(number, keep_unknown = FALSE)
```

Arguments

number	A character vector of telephone numbers. No spaces or punctuation, only numbers.
keep_unknown	Replace values for "unknown" with NA?

Value

A character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blanks and values representing unknown numbers or patients without a number are replaced with NA.

clean_text	<i>Clean free-form text</i>
------------	-----------------------------

Description

Clean free-form text

Usage

```
clean_text(text, keep_unknown = FALSE)
```

Arguments

text	A character vector of free text values.
keep_unknown	Replace values for "unknown" with NA?

Value

An character vector with leading and trailing whitespace removed. If keep_unknown is FALSE, blank values are replaced with NA.

field_levels	<i>List of possible values for a field</i>
--------------	--

Description

These lists gives the levels for each categorical or flag field from the NAACCR formats. It is intended to help researchers

Usage

```
field_levels
```

```
field_levels_all
```

Format

A named list, where the names are for categorical fields or sentinel flags, and the values are the possible levels for each field.

Details

field_levels does not include levels representing "unknown." field_levels_all does include the "unknown" levels.

naaccr_boolean	<i>Interpret NAACCR-style booleans</i>
----------------	--

Description

Interpret NAACCR-style booleans

Usage

```
naaccr_boolean(flag, false_value = c("0", "1"))
```

Arguments

flag Character vector of flags.

false_value The flag value to interpret as FALSE. If "0" (default), then "1" is interpreted as TRUE. If "1", then "2" is interpreted as TRUE.

Value

A logical vector with the interpreted values of flag. Any original values not seen as TRUE or FALSE are converted to NA.

Examples

```
x <- c("0", "1", "2", "9", NA)
naaccr_boolean(x)
naaccr_boolean(x, false_value = "1")
```

naaccr_date	<i>Parse NAACCR-formatted dates</i>
-------------	-------------------------------------

Description

Parse NAACCR-formatted dates

Usage

```
naaccr_date(date)
```

Arguments

date Character vector of dates in NAACCR format ("YYYYMMDD").

Value

A Date vector. Any incomplete or invalid dates are converted to NA. The original strings can be retrieved with the [naaccr_encode](#) function.

Examples

```
input <- c("20151031", "201408 ", "99999999")
d <- naaccr_date(input)
d
naaccr_encode(d, "dateOfDiagnosis")
```

naaccr_datetime	<i>Parse NAACCR-formatted datetimes</i>
-----------------	---

Description

Parse NAACCR-formatted datetimes

Usage

```
naaccr_datetime(datetime)
```

Arguments

datetime Character vector of datetimes in NAACCR format ("YYYYMMDDHHMMSS").

Value

A POSIXct vector. Any incomplete or invalid datetimes are converted to NA. The original strings can be retrieved with the [naaccr_encode](#) function.

Examples

```
input <- c("20151031100856", "20140822   ", "99999999")
d <- naaccr_datetime(input)
d
naaccr_encode(d, "pathDateSpecCollect1")
```

naaccr_encode	<i>Format a value as a string according to the NAACCR format</i>
---------------	--

Description

Format a value as a string according to the NAACCR format

Usage

```
naaccr_encode(x, field, flag = NULL, version = NULL, format = NULL)
```

Arguments

x	Vector of values.
field	Character string naming the field.
flag	Character vector of flags for the field. Only needed if the field contains sentinel values.
version	An integer specifying the NAACCR format version for parsing the records. Use this or format, not both. If both version and format are NULL (the default), the most recent version is used.
format	A record_format object for writing the records.

Value

Character vector of the values as they would be encoded in a NAACCR-formatted text file.

See Also

[split_sentineled](#)

Examples

```
r <- naaccr_record(
  ageAtDiagnosis = c("089", "000", "200"),
  dateOfDiagnosis = c("20070402", "201709   ", "   ")
)
r
mapply(FUN = naaccr_encode, x = r, field = names(r))
```

naaccr_factor *Replace NAACCR codes with understandable factors*

Description

Replace NAACCR codes with understandable factors

Usage

```
naaccr_factor(x, field, keep_unknown = FALSE, ...)
```

Arguments

x	Vector (usually character) of codes.
field	String giving the XML name of the NAACCR field to code.
keep_unknown	Logical indicating whether values of "unknown" should be a level in the factor or NA.
...	Additional arguments passed onto factor .

Value

A factor vector version of x. The levels are short descriptions instead of the basic NAACCR codes. Codes which stood for "unknown" with no further information are replaced with NA.

If field names a text or site-specific field, x will be returned unchanged with a warning.

Examples

```
naaccr_factor(c("20", "43", "99"), "radRegionalRxModality")
naaccr_factor(c("USA", "GER", "XEN"), "addrAtDxCountry")
# Default: NA for unknowns,
naaccr_factor(c("1", "8", "9"), "tumorGrowthPattern")
naaccr_factor(c("1", "8", "9"), "tumorGrowthPattern", keep_unknown = TRUE)
```

naaccr_format_12 *Field definitions from all NAACCR format versions*

Description

See [record_format](#).

Usage

```
naaccr_format_12
```

```
naaccr_format_13
```

```
naaccr_format_14
```

```
naaccr_format_15
```

```
naaccr_format_16
```

```
naaccr_format_18
```

Format

An object of class `record_format` (inherits from `data.table`, `data.frame`) with 509 rows and 8 columns.

Details

A `data.table` object defining the fields for each version of NAACCR's fixed-width record file format.

naaccr_override	<i>Interpret basic over-ride flags</i>
-----------------	--

Description

Interpret basic over-ride flags

Usage

```
naaccr_override(flag)
```

Arguments

`flag` Character vector of over-ride flags. Its values should only include "" (blank), "1", and possibly NA.

Value

A logical vector with the interpreted values of `flag`. The interpretation follows these rules: "1" goes to TRUE (reviewed and confirmed as reported), "" (blank) goes to FALSE (not reviewed or reviewed and corrected), and all other values go to NA.

Examples

```
naaccr_override(c("", "1", NA, "9"))
```

naaccr_record	<i>Analysis-ready NAACCR records</i>
---------------	--------------------------------------

Description

Subclass of `data.frame` for doing analysis with NAACCR records.

Usage

```
naaccr_record(..., keep_unknown = FALSE, version = NULL,
              format = NULL)
```

Arguments

<code>...</code>	Arguments of the form <code>tag = value</code> , where <code>tag</code> is a valid NAACCR data item name and <code>value</code> is the vector of the item's values from the NAACCR format.
<code>keep_unknown</code>	Logical indicating whether values of "unknown" should be a level in the factor or NA.
<code>version</code>	An integer specifying the NAACCR format version for parsing the records. Use this or <code>format</code> , not both. If both <code>version</code> and <code>format</code> are NULL (default), the most recent NAACCR format will be used.
<code>format</code>	A record_format object for parsing the records.

Details

`naaccr_record` creates a `data.frame` of cancer incidence records ready for analysis: columns are of appropriate classes, coded values are replaced with factors, and unknowns are replaced with NA.

Value

A `data.frame` with columns named using the NAACCR XML scheme.

read_naaccr_plain	<i>Read NAACCR records</i>
-------------------	----------------------------

Description

Read and parse cancer incidence records according to a NAACCR format. `read_naaccr` returns a data set suited for analysis in R, and `read_naaccr_plain` returns a data set with the unchanged record values.

Usage

```
read_naaccr_plain(input, version = NULL, format = NULL,
  keep_fields = NULL, skip = 0, nrows = Inf, buffersize = 10000,
  encoding = getOption("encoding"))

read_naaccr(input, version = NULL, format = NULL, keep_fields = NULL,
  keep_unknown = FALSE, skip = 0, nrows = Inf, buffersize = 10000,
  encoding = getOption("encoding"), ...)
```

Arguments

input	Either a string with a file name (containing no \n character), a connection object, or the text records themselves as a character vector.
version	An integer specifying the NAACCR format version for parsing the records. Use this or format, not both. If both version and format are NULL (default), the most recent NAACCR format will be used.
format	A record_format object for parsing the records.
keep_fields	Character vector of XML field names to keep in the dataset. If NULL (default), all columns are kept.
skip	An integer specifying the number of lines of the data file to skip before beginning to read data.
nrows	A number specifying the maximum number of records to read. Inf (the default) means "all records."
buffersize	Maximum number of lines to read at one time.
encoding	String giving the input's encoding. See the 'Encoding' section of file in the base package.
keep_unknown	Logical indicating whether values of "unknown" should be a level in the factor or NA.
...	Additional arguments passed onto as.naaccr_record .

Details

Anyone who wants to analyze the records in R should use `read_naaccr`. In the returned `data.frame`, columns are of appropriate classes, coded values are replaced with factors, and unknowns are replaced with NA.

`read_naaccr_plain` is a "format strict" way to read incidence records. All values returned are the literal character values from the records. The only processing done is that leading and trailing whitespace is trimmed. This is useful if the values will be passed to other software that expects the plain NAACCR values.

Value

For `read_naaccr`, a `data.frame` of the records. The columns included depend on the NAACCR record format version. Columns are atomic vectors; there are too many to describe them all.

For `read_naaccr_plain`, a `data.frame` with the columns specified by `start_cols`, `end_cols`, and `col_names`. All columns are character vectors.

Note

Some of the parameter text was shamelessly copied from the [read.table](#) and [read.fwf](#) help pages.

See Also

[naaccr_record](#)

Examples

```
# This file has synthetic abstract records
incfile <- system.file(
  "extdata", "synthetic-naaccr-18-abstract.txt",
  package = "naaccr"
)
fields <- c("ageAtDiagnosis", "sex", "sequenceNumberCentral")
read_naaccr(incfile, version = 18, keep_fields = fields)
recs <- read_naaccr_plain(incfile, version = 18, keep_fields = fields)
recs
# Note sequenceNumberCentral has been split in two: a number and a flag
summary(recs[["sequenceNumberCentral"]])
summary(recs[["sequenceNumberCentralFlag"]])
```

record_format

Define custom fields for NAACCR records

Description

Create a record_format object, which is used to read NAACCR records.

Usage

```
record_format(name, item, start_col, end_col, type, alignment = "left",
  padding = " ", name_literal = NULL)
```

```
as.record_format(x, ...)
```

Arguments

name	Item name appropriate for a data.frame column name.
item	NAACCR item number.
start_col	First column of the field in a fixed-width record.
end_col	Last column of the field in a fixed-width record.
type	Name of the column class.
alignment	Alignment of the field in fixed-width files. Either "left" (default) or "right".
padding	Single-character strings to use for padding in fixed-width files.
name_literal	(Optional) Item name in plain language.
x	Object to be coerced to a record_format, usually a data.frame or list.
...	Other arguments passed to record_format.

Details

To define registry-specific fields in addition to the standard fields, create a `record_format` object for the registry-specific fields and combine it with one of the formats provided with the package using `rbind`.

Value

An object of class "record_format" which has the following columns:

`name` (character) XML field name.

`item` (integer) Field item number.

`start_col` (integer) First column of the field in a fixed-width text file.

`end_col` (integer) Last column of the field in a fixed-width text file.

`type` (factor) R class for the column vector.

`alignment` (factor) Alignment of the field's values in a fixed-width text file.

`padding` (character) String used for padding field values in a fixed-width text file.

`name_literal` (character) Field name in plain language.

Format Types

The levels type can take, along with the functions used to process them when reading a file:

`address` (`clean_address_number_and_street`) Street number and street name parts of an address.

`age` (`clean_age`) Age in years.

`boolean01` (`naaccr_boolean`, with `false_value = "0"`) True/false, where "0" means false and "1" means true.

`boolean12` (`naaccr_boolean`, with `false_value = "1"`) True/false, where "1" means false and "2" means true.

`census_block` (`clean_census_block`) Census Block ID number.

`census_tract` (`clean_census_tract`) Census Tract ID number.

`character` (`clean_text`) Miscellaneous text.

`city` (`clean_address_city`) City name.

`count` (`clean_count`) Integer count.

`county` (`clean_county_fips`) County FIPS code.

`Date` (`as.Date`, with `format = "%Y%m%d"`) NAACCR-formatted date (YYYYMMDD).

`datetime` (`as.POSIXct`, with `format = "%Y%m%d%H%M%S"`) NAACCR-formatted datetime (YYYYMMDDHHMMSS)

`facility` (`clean_facility_id`) Facility ID number.

`icd_9` (`clean_icd_9_cm`) ICD-9-CM code.

`icd_code` (`clean_icd_code`) ICD-9 or ICD-10 code.

`integer` (`as.integer`) Miscellaneous whole number.

numeric (`as.numeric`) Miscellaneous decimal number.
 override (`naaccr_override`) Field describing why another field's value was over-ridden.
 physician (`clean_physician_id`) Physician ID number.
 postal (`clean_postal`) Postal code for an address (a.k.a. ZIP code in the United States).
 ssn (`clean_ssn`) Social Security Number.
 telephone (`clean_telephone`) 10-digit telephone number.

Examples

```

my_fields <- record_format(
  name      = c("foo", "bar"),
  item      = c(2163, 1180),
  start_col = c(975, 1381),
  end_col   = c(975, 1435),
  type      = c("numeric", "facility")
)
my_format <- rbind(naaccr_format_16, my_fields)

```

<code>split_senteined</code>	<i>Separate a field's continuous and sentinel values</i>
------------------------------	--

Description

Separate a sentineled field's values into two vectors: one with the continuous data and one with the sentinel values.

Usage

```
split_senteined(x, field)
```

Arguments

<code>x</code>	Vector (usually character) of codes.
<code>field</code>	String giving the XML name of the NAACCR field to code.

Value

If `field` is a sentineled field, a `data.frame` with two columns. The first is a numeric version of the continuous values from `x`. Its name is the value of `field`. The second is a factor with levels representing the sentinel values. For all non-missing values in the numeric vector, the respective value in the factor is NA. If a value of `x` was not valid, the respective row will be NA for the continuous and flag values.

If `field` is not a sentineled field, a `data.frame` with just `x` is returned with a warning.

Examples

```
node_codes <- c("10", "20", "90", "95", "99", NA)
s <- split_sentineled(node_codes, "regionalNodesPositive")
print(s)
s[is.na(s[["regionalNodesPositive"]]), "regionalNodesPositiveFlag"]
```

split_sequence_number *Unpack tumor sequence number data*

Description

Separate the multiple types of information in `sequenceNumberCentral` and `sequenceNumberHospital` into multiple columns.

Usage

```
split_sequence_number(x)
```

Arguments

`x` Vector (usually character) of sequence number codes.

Value

A `data.frame` with three columns:

sequenceNumber (integer) The number of the tumor in chronological sequence for the patient.

reportable (logical) If TRUE, then the tumor is required to be reported by SEER/NPCR standards. If FALSE, it is either non-malignant or defined as reportable by the registry.

onlyTumor (logical) If TRUE, this is the only known SEER/NPCR-reportable or the only known non-SEER/NPCR-reportable tumor for the patient.

sequenceFlag (factor) Special flags, such as unknowns or changes in reporting requirements. Created using [split_sentineled](#).

See Also

[split_sentineled](#)

unknown_to_na	<i>Replace labels for unknown with NA</i>
---------------	---

Description

Replace labels for unknown with NA

Usage

```
unknown_to_na(x, ...)  
  
## S3 method for class 'naaccr_record'  
unknown_to_na(x, ...)  
  
## S3 method for class 'factor'  
unknown_to_na(x, field, ...)
```

Arguments

x	Either a factor created with <code>naaccr_factor</code> , or a <code>naaccr_record</code> object.
...	Further arguments passed to or from other methods.
field	String giving the XML name of the NAACCR field to code.

Value

If x was a factor, then the result is a vector with the values of x, except all levels which effectively mean "unknown" are replaced with NA. The returned factor won't have those in its levels, either.

If x is a `naaccr_record` object, then the result is the `naaccr_record` created by applying this function to all columns of x.

Examples

```
r <- naaccr_record(  
  sex = c("1", "2", "9"),  
  kras = c("8", "9", "3"),  
  keep_unknown = TRUE  
)  
r  
unknown_to_na(r[["sex"]], field = "sex")  
unknown_to_na(r)
```

write_naaccr	<i>Arrange the format for writing Write records in NAACCR format</i>
--------------	--

Description

Write records from a [naaccr_record](#) object to a connection in fixed-width format, according to a specific version of the NAACCR format.

Usage

```
write_naaccr(records, con, version = NULL, format = NULL)
```

Arguments

records	A naaccr_record object.
con	Either a character string naming a file or a connection open for writing.
version	An integer specifying the NAACCR format version for parsing the records. Use this or format, not both. If both version and format are NULL (the default), the most recent version is used.
format	A record_format object for writing the records.

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