

# Package ‘PCAWG7’

January 6, 2022

**Title** Repository of Data from paper 'The repertoire of Mutational Signatures in Human Cancer'

**Version** 0.1.3

**Description** Contains data from the paper by Alexandrov, Kim, Haradhvala, Huang et al.,  
'The repertoire of Mutational Signatures in Human Cancer' <[doi:10.1038/s41586-020-1943-3](https://doi.org/10.1038/s41586-020-1943-3)>.  
Please see ?PCAWG7. The funny name  
comes from the fact that this paper was generated by  
Working Group 7 of the Pan Cancer Analysis of Whole Genomes  
(PCAWG) consortium. The signature profiles were later placed on the COSMIC  
web site and have been subsequently updated.

**License** GPL-3

**Language** en-US

**Encoding** UTF-8

**LazyData** true

**LazyDataCompression** bzip2

**Depends** R (>= 3.5),

**RoxygenNote** 7.1.2

**URL** <https://github.com/steverozen/PCAWG7>

**BugReports** <https://github.com/steverozen/PCAWG7/issues>

**Suggests** ICAMS (>= 2.3.6),  
usethis,  
testthat (>= 3.0.0)

**Config/testthat/edition** 3

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CancerTypes	<i>Return a character vector of some common cancer types</i>
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### Description

Return a character vector of some common cancer types

### Usage

```
CancerTypes()
```

### Examples

```
CancerTypes()[1:5]
```

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exposure	<i>PCAWG7 SigProfiler signature assignments (numbers of mutations due to each signature in each tumor)</i>
----------	--

---

### Description

PCAWG7 SigProfiler signature assignments (numbers of mutations due to each signature in each tumor)

### Usage

```
exposure
```

### Format

A list with the elements:

**PCAWG** A list with the elements:

**SBS96** Strand-agnostic single-base substitutions in trinucleotide context.

**DBS78** Strand-agnostic doublet-base substitutions.

**ID** Strand-agnostic indels. These are signature assignments for the PCAWG platinum genomes.

**TCGA** A list with the elements:

**SBS96** As above.

**ID** As above. These are signature assignments for the TCGA exomes.

**other.genome** A list with the element:

**SBS96** As above. This contains signature assignments for non-TCGA genomes.

**other.exome** A list with the element:

**SBS96** As above. This contains signature assignments for non-TCGA exomes.

**Source**

Files of <https://www.synapse.org/#!Synapse:syn12009743>, 2019 Oct 09,  
populated by `data-raw/sig.profiler.sures/load.package.variable.exposure.R`.

**Examples**

```
SBS96.exposure <- exposure$PCAWG$SBS96
```

---

`exposure.stats`

*Exposure statistics from the PCAWG7 paper*

---

**Description**

Exposure statistics from the PCAWG7 paper

**Usage**

```
exposure.stats
```

**Format**

A list with one element, `PCAWG`, which has the sub-elements `SBS96`, `DBS78`, `ID` with statistics for the corresponding mutation types by cancer type. I.e. each element has a sub-element for each cancer type, and this element is a `data.frame` with one row for each signature and columns `mean.of.those.present` (the mean number of mutations for those tumors that have the mutation) and `proportion.present` (the proportion of tumors in which the signature is present).

**Source**

Computed from other package variables using `GatherPCAWG7ExposureStatsSBS96`.

**Examples**

```
exposure.stats$PCAWG$SBS96$`Biliary-AdenoCA`[1:3, ]
```

---

`map_aliquot_ID_to_SP_ID`

*Translate aliquot IDs (e.g. e0fccaf5-925a-41f9-b87c-cd5ee4aecb59)  
to "SP" IDs (e.g. SP1682)*

---

**Description**

Translate aliquot IDs (e.g. e0fccaf5-925a-41f9-b87c-cd5ee4aecb59) to "SP" IDs (e.g. SP1682)

**Usage**

```
map_aliquot_ID_to_SP_ID(aliquot.ids)
```

**Arguments**

aliquot.ids      Character vector of aliquot IDs.

**Details**

If there are aliquot IDs that cannot be matched to any "SP" IDs, return NA with a warning.

**Value**

Character vector of corresponding "SP" IDs. If a corresponding aliquot ID cannot be found, then return NA with a warning.

**Note**

This function is mainly designed to translate the file names of PCAWG consensus callsets for SNV/Indel ([https://dcc.icgc.org/api/v1/download?fn=/PCAWG/consensus\\_snv\\_indel/final\\_consensus\\_snv\\_indel\\_passon](https://dcc.icgc.org/api/v1/download?fn=/PCAWG/consensus_snv_indel/final_consensus_snv_indel_passon)

**Examples**

```
aliquot.ids <- c("e0fccaf5-925a-41f9-b87c-cd5ee4aecb59", "foo")
SP.ids <- map_aliquot_ID_to_SP_ID(aliquot.ids)
```

---

map\_SP\_ID\_to\_tumor\_type

*Given PCAWG "SP" IDs (e.g. SP123958) return either the "full" IDs (Kidney-ChRCC::SP123958) or just the tumor type (Kidney-ChRCC)*

---

**Description**

Given PCAWG "SP" IDs (e.g. SP123958) return either the "full" IDs (Kidney-ChRCC::SP123958) or just the tumor type (Kidney-ChRCC)

**Usage**

```
map_SP_ID_to_tumor_type(SP.IDs, merge = TRUE)
```

**Arguments**

SP.IDs            A character vector of PCAWG "SP" IDs.

merge            If TRUE return a parallel vector of <tumor\_type>::<SP\_ID>; otherwise just <tumor\_type>.

**Details**

Fails with an "subscript out of bounds" error if any of the elements of SP.IDs is unknown.

**Examples**

```
map_SP_ID_to_tumor_type(c("SP123958", "SP43633"))
map_SP_ID_to_tumor_type(c("SP123958", "SP43633"), merge = FALSE)
```

---

PCAWG.sample.id	<i>Vectors of the PCAWG tumor_wgs_icgc_specimen_ids</i>
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---

### Description

Note that the PCAWG7 spectra catalogs have 2 sample ids that were blacklisted after the mutational signature analysis was underway. The blacklisted samples are SP116419 and SP116883, which are in `PCAWG.sample.id$black`.

### Usage

```
PCAWG.sample.id
```

### Format

A list with the elements:

**white** Whitelisted IDs

**grey** Greylisted IDs

**black** Blacklisted IDs

### Source

[https://dcc.icgc.org/api/v1/download?fn=/PCAWG/data\\_releases/latest/release\\_may2016.v1.4.with\\_consensus\\_calls.tsv](https://dcc.icgc.org/api/v1/download?fn=/PCAWG/data_releases/latest/release_may2016.v1.4.with_consensus_calls.tsv), 2019 Oct 09

### Examples

```
PCAWG.white.ids <- PCAWG.sample.id$white
```

---

PCAWG.sample.sheet	<i>PCAWG sample sheet which contains various sample information</i>
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---

### Description

PCAWG sample sheet which contains various sample information

### Usage

```
PCAWG.sample.sheet
```

## Format

A data table with the following columns:

- donor\_unique\_id
- donor\_wgs\_exclusion\_white\_gray
- submitter\_donor\_id
- icgc\_donor\_id
- dcc\_project\_code
- aliquot\_id
- submitter\_specimen\_id
- icgc\_sample\_id
- dcc\_specimen\_type
- library\_strategy

## Source

[https://dcc.icgc.org/api/v1/download?fn=/PCAWG/data\\_releases/latest/pcawg\\_sample\\_sheet.v1.4.2016-09-14.tsv](https://dcc.icgc.org/api/v1/download?fn=/PCAWG/data_releases/latest/pcawg_sample_sheet.v1.4.2016-09-14.tsv), 2019 Oct 15

## Examples

```
aliquot.ids <- PCAWG.sample.sheet$aliquot_id
```

---

PCAWG7

*PCAWG7: A package of data from paper 'Repertoire of Mutational Signatures in Human Cancer'*

---

## Description

This is a data package with 2 main package variables: `exposure` and `spectra`.

## Details

There are also PDF plots of the signatures in `data-raw/plots/`.

There are also several functions for handling PCAWG identifiers:

- \* `map_SP_ID_to_tumor_type`
- \* `map_aliquot_ID_to_SP_ID`
- \* `SampleIDToCancerType`
- \* `SplitPCAWGMatrixByTumorType`
- \* `SplitMatrixBySampleType`

The reference for the data is

Alexandrov, L.B., Kim, J., Haradhvala, N.J. et al. The repertoire of mutational signatures in human cancer. *Nature* 578, 94-101 (2020). doi: [10.1038/s4158602019433](https://doi.org/10.1038/s4158602019433).

---

SampleIDToCancerType	<i>Split out the cancer type from the sample ID for PCAWG IDs</i>
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---

**Description**

Split out the cancer type from the sample ID for PCAWG IDs

**Usage**

```
SampleIDToCancerType(PCAWGID)
```

**Arguments**

PCAWGID            A character vector of PCAWG IDs of the form <cancer.type>::<sample.id>.

**Value**

A character vector parallel to PCAWGID containing only the <cancer.type> strings.

**Examples**

```
cancer.type <- SampleIDToCancerType("Biliary-AdenoCA::SP117655")
```

---

SBS96_ID_to_SBS192_ID	<i>Translate SBS96 signature IDs to SBS192 signature IDs by adding "-E" if necessary</i>
-----------------------	--

---

**Description**

Translate SBS96 signature IDs to SBS192 signature IDs by adding "-E" if necessary

**Usage**

```
SBS96_ID_to_SBS192_ID(sig.ids)
```

**Arguments**

sig.ids            Character vector of SBS96 signature IDs.

**Value**

Character vector of corresponding SBS192 signature IDs; some have "-E" (for exome) post-pended.

**Examples**

```
SBS96.ids <- c("SBS1", "SBS23", "SBS25")
SBS192.ids <- SBS96_ID_to_SBS192_ID(SBS96.ids)
```

---

spectra	<i>PCAWG7 mutational spectra (catalogs)</i>
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---

**Description**

PCAWG7 mutational spectra (catalogs)

**Usage**

spectra

**Format**

A list with the elements:

**SBS96** Deprecated.

**DBS78** Deprecated.

**PCAWG** A list with the elements:

**SBS96** Strand-agnostic single-base substitutions in trinucleotide context.

**SBS192** Single-base substitutions in transcripts based on the sense strand.

**SBS1536** Strand-agnostic single-base substitutions in pentanucleotide context.

**DBS78** Strand-agnostic doublet-base substitutions.

**ID** Strand-agnostic indels.

**TCGA** A list with the same elements as the PCAWG element.

**other.genome** A list with the same elements as the PCAWG element but with ID omitted.

**other.exome** A list with the same elements as the PCAWG element but with ID omitted.

**Source**

Files below <https://www.synapse.org/#!Synapse:syn11801889>, 2019 Oct 09. Populated by data-raw/spectra/load.package.variable.specra.R.

**Examples**

```
SBS96.spectra <- spectra$PCAWG$SBS96
```

---

SplitMatrixBySampleType

*Split an exposure matrix or spectrum matrix into a list of matrices, each for a single sample type*

---

**Description**

Split an exposure matrix or spectrum matrix into a list of matrices, each for a single sample type

**Usage**

```
SplitMatrixBySampleType(M, sample.type)
```



**Arguments**

<code>M</code>	A numerical matrix or data frame or <a href="#">ICAMS</a> catalog in which columns are samples (e.g. tumors) and rows are either mutational signatures (for exposures) or mutation types (for spectra), and, each element is the number of mutations due to a given mutational signature or mutation type in a single sample
<code>sample.type</code>	A character or numeric vector, each element of which indicates a particular sample type.

**Value**

Invisibly, the list of exposure or spectrum matrices created by splitting `M` by `sample.type`.

**Examples**

```
ff <- matrix(1, nrow=3, ncol = 2)
colnames(ff) <- c("sample1", "sample2")
xx <- SplitMatrixBySampleType(ff, c("sample.type.x", "sample.type.y"))
xx
```

---

**SplitPCAWGMatrixByTumorType**

*Extract tumor type from column names and return the input matrix split by tumor type based on the PCAWG <tumor\_type>::<sample\_id> convention*

---

**Description**

Extract tumor type from column names and return the input matrix split by tumor type based on the PCAWG <tumor\_type>::<sample\_id> convention

**Usage**

```
SplitPCAWGMatrixByTumorType(M)
```

**Arguments**

<code>M</code>	A numerical matrix or data frame or <a href="#">ICAMS</a> catalog in which columns are samples (e.g. tumors) and rows are either mutational signatures (for exposures) or mutation types (for spectra), and each element is the number of mutations due to a given mutational signature or mutation type in a single sample. The column names must be of the the form <cancer.type>::<sample.ID>.
----------------	---

**Value**

Invisibly, the list of exposure matrices or [ICAMS](#) catalogs created by splitting `matrix` by the tumor type encoded in the column names.

**Examples**

```
mm <- SplitPCAWGMatrixByTumorType(spectra$PCAWG$DBS78)
```

---

TCGA_ID_to_ICGC_ID	<i>Translate TCGA (The Cancer Genome Atlas) IDs to ICGC (International Cancer Genome Consortium) IDs</i>
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---

**Description**

Translate TCGA (The Cancer Genome Atlas) IDs to ICGC (International Cancer Genome Consortium) IDs

**Usage**

```
TCGA_ID_to_ICGC_ID(tcga.ids)
```

**Arguments**

tcga.ids	Character vector of TCGA IDs.
----------	-------------------------------

**Details**

If there are TCGA IDs that cannot be matched to any ICGC IDs, return NA with a warning.

**Value**

Character vector of corresponding ICGC IDs. If a corresponding ICGC ID cannot be found, then return NA with a warning.

**Examples**

```
tcga.ids <- c("TCGA-AA-A01V", "foo", "TCGA-CA-6717", "bar")
icgc.ids <- TCGA_ID_to_ICGC_ID(tcga.ids)
icgc.ids <- icgc.ids[nzchar(icgc.ids)]
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