

Package ‘VOWR’

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Title Vital Operational Waiting Risk for Healthcare Systems

Version 0.1.0

Description Vital Operational Waiting Risk (VOWR) provides tools for analysing monthly Referral-to-Treatment (RTT) panel data in healthcare systems. The package supports provider-level profiling, operational risk classification, waiting-time volatility assessment, Kaplan-Meier survival analysis, Cox proportional hazards modelling, and visualisation of time-to-threshold breach patterns. It is designed to help analysts and decision-makers identify providers with high waiting times, unstable performance, and increased risk of earlier threshold breach. The survival modelling methods follow Cox (1972) [<doi:10.1111/j.2517-6161.1972.tb00899.x>](https://doi.org/10.1111/j.2517-6161.1972.tb00899.x) and Kaplan and Meier (1958) [<doi:10.1080/01621459.1958.10501452>](https://doi.org/10.1080/01621459.1958.10501452).

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RoxygenNote 7.3.3

Imports dplyr, ggplot2, survival, stats, utils, survminer

Suggests testthat (>= 3.0.0),

Config/testthat/edition 3

URL <https://github.com/zerish12/VOWR>

BugReports <https://github.com/zerish12/VOWR/issues>

NeedsCompilation no

Author Muhammad Zahir Khan [aut, cre] (ORCID:
 [<https://orcid.org/0009-0005-7645-8960>](https://orcid.org/0009-0005-7645-8960))

Maintainer Muhammad Zahir Khan <zahirstat007@gmail.com>

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Contents

plot_km_by_delay	2
vowr_cox_model	3
vowr_flag	3
vowr_import	4
vowr_km_by_risk	4
vowr_plot	5
vowr_profile	5
vowr_survival	6
vowr_survival_merge	6
vowr_workflow	7
Index	8

plot_km_by_delay	<i>Kaplan-Meier plot by group</i>
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Description

Kaplan-Meier plot by group

Usage

```
plot_km_by_delay(data, time, event, group)
```

Arguments

data	A data frame.
time	Name of duration/time variable.
event	Name of event variable: 1 = event occurred, 0 = censored.
group	Name of grouping variable.

Value

A survminer ggsurvplot object.

vowr_cox_model	<i>Estimate Cox proportional hazards model for threshold breach</i>
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Description

Estimate Cox proportional hazards model for threshold breach

Usage

```
vowr_cox_model(surv_profile)
```

Arguments

surv_profile Data frame from vowr_survival_merge()

Value

A fitted Cox proportional hazards model

vowr_flag	<i>Flag high-risk providers</i>
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Description

Flag high-risk providers

Usage

```
vowr_flag(profile, wait_threshold = 18, vol_percentile = 0.9)
```

Arguments

profile A data frame produced by vowr_profile()
wait_threshold The mean wait time threshold (default 18 weeks)
vol_percentile The percentile for volatility (default 0.90)

Value

The profile data frame with a 'risk_flag' column

vowr_import	<i>Import and validate RTT data</i>
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Description

Import and validate RTT data

Usage

```
vowr_import(path = NULL)
```

Arguments

path	Optional path to an NHS Referral-to-Treatment (RTT) CSV file. If NULL, the example data included in the package is loaded.
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Value

A cleaned data frame.

Examples

```
sample_path <- system.file(  
  "extdata",  
  "rtt_trust_month_panel_last24_FIXED-2.csv",  
  package = "VOWR"  
)  
  
data <- vowr_import(sample_path)  
head(data)
```

vowr_km_by_risk	<i>Kaplan-Meier plot by provider risk group</i>
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Description

Kaplan-Meier plot by provider risk group

Usage

```
vowr_km_by_risk(surv_profile)
```

Arguments

surv_profile	Data frame from <code>vowr_survival_merge()</code>
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Value

A survminer Kaplan-Meier plot object

vowr_plot	<i>Visualize provider risk distribution</i>
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Description

Visualize provider risk distribution

Usage

```
vowr_plot(flagged_data)
```

Arguments

flagged_data A data frame produced by vowr_flag()

Value

A ggplot object

vowr_profile	<i>Profile National Health Service provider performance</i>
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Description

Profile National Health Service provider performance

Usage

```
vowr_profile(data)
```

Arguments

data A data frame from vowr_import().

Value

A summary table with the number of months, mean waiting time, median waiting time, waiting-time volatility, and total backlog for each provider.

vowr_survival	<i>Estimate time-to-breach survival model</i>
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Description

Estimate time-to-breach survival model

Usage

```
vowr_survival(data, threshold = 18)
```

Arguments

data	A data frame from <code>vowr_import()</code> .
threshold	Mean waiting-time threshold in weeks. Default is 18.

Value

A list containing a Kaplan-Meier survival model object and the data used to fit the model.

vowr_survival_merge	<i>Merge survival output with provider profile and risk flags</i>
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Description

Merge survival output with provider profile and risk flags

Usage

```
vowr_survival_merge(surv_result, profile, flagged)
```

Arguments

surv_result	Output from <code>vowr_survival()</code>
profile	Output from <code>vowr_profile()</code>
flagged	Output from <code>vowr_flag()</code>

Value

A provider-level survival analysis data frame

`vowr_workflow`*Run complete Volatility-Oriented Waiting-time Risk workflow*

Description

Run complete Volatility-Oriented Waiting-time Risk workflow

Usage

```
vowr_workflow(data, wait_threshold = 18, vol_percentile = 0.9)
```

Arguments

`data` A data frame from `vowr_import()`
`wait_threshold` Waiting-time breach threshold. Default is 18 weeks.
`vol_percentile` Volatility percentile for risk flagging. Default is 0.90.

Value

A list containing profile, flagged data, risk plot, survival output, survival profile, Cox model, and Kaplan-Meier plot by risk group.

Index

`plot_km_by_delay`, 2

`vowr_cox_model`, 3

`vowr_flag`, 3

`vowr_import`, 4

`vowr_km_by_risk`, 4

`vowr_plot`, 5

`vowr_profile`, 5

`vowr_survival`, 6

`vowr_survival_merge`, 6

`vowr_workflow`, 7