

CriticalWindow-24 (CW-24) Benchmark MIMIC-IV Subset Variable Specification

1 Overview

This document provides a comprehensive specification of variables included in the **MIMIC-IV 24-hour benchmark dataset**. All variables have been **carefully curated** to ensure **strict temporal constraints** and **prevent data leakage**.

1.1 Key Design Principles

- **Temporal Integrity:** All predictive variables are recorded within a **24-hour window** from ICU admission
- **No Data Leakage:** Variables are strictly limited to information available **before or during** the prediction window
- **Clinical Relevance:** Selected variables represent **clinically meaningful** predictors of patient outcomes
- **Standardized Recording:** All temporal windows are **consistently defined** across the dataset

2 Dataset Baseline Characteristics

The following table presents the baseline characteristics of the **MIMIC-IV 24-hour benchmark dataset**, stratified by **hospital mortality outcome**:

Table 1: **Baseline Characteristics by Hospital Mortality Outcome**

Characteristic	Survived (N=58,280)	Died (N=7,086)	Overall (N=65,366)
Demographics & Anthropometrics			
Admission Age (Mean \pm SD)	64.30 \pm 17.17	71.08 \pm 15.53	65.03 \pm 17.13
Height (Mean \pm SD)	169.93 \pm 10.61	168.22 \pm 10.62	169.72 \pm 10.63
Weight (Mean \pm SD)	82.05 \pm 34.86	78.68 \pm 24.32	81.69 \pm 33.90
Clinical Severity Scores			
APACHE III (Mean \pm SD)	38.90 \pm 17.16	65.53 \pm 26.95	41.79 \pm 20.24
SAPS II (Mean \pm SD)	32.90 \pm 12.62	50.24 \pm 16.24	34.78 \pm 14.13
LODS (Mean \pm SD)	3.72 \pm 2.56	7.18 \pm 3.55	4.10 \pm 2.89
MELD (Mean \pm SD)	12.50 \pm 6.92	19.47 \pm 10.06	13.26 \pm 7.64
OASIS (Mean \pm SD)	29.58 \pm 7.96	38.63 \pm 9.06	30.57 \pm 8.56

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Table 1: **Baseline Characteristics by Hospital Mortality Outcome (continued)**

Characteristic	Survived (N=58,280)	Died (N=7,086)	Overall (N=65,366)
Dynamic Clinical Assessments - Glasgow Coma Scale			
GCS Maximum (Mean \pm SD)	14.88 \pm 0.59	14.59 \pm 1.50	14.85 \pm 0.75
GCS Minimum (Mean \pm SD)	13.82 \pm 2.48	12.76 \pm 3.70	13.70 \pm 2.66
GCS First (Mean \pm SD)	14.40 \pm 1.96	14.04 \pm 2.40	14.36 \pm 2.02
GCS Last (Mean \pm SD)	14.65 \pm 1.12	13.89 \pm 2.72	14.57 \pm 1.40
GCS Average (Mean \pm SD)	14.56 \pm 1.00	14.01 \pm 1.98	14.50 \pm 1.16
GCS Std Dev (Mean \pm SD)	0.45 \pm 1.01	0.83 \pm 1.53	0.49 \pm 1.08
Dynamic Clinical Assessments - SOFA Score			
SOFA Maximum (Mean \pm SD)	3.66 \pm 2.83	6.92 \pm 4.18	4.02 \pm 3.18
SOFA Minimum (Mean \pm SD)	1.42 \pm 1.91	2.71 \pm 2.87	1.56 \pm 2.08
SOFA First (Mean \pm SD)	1.47 \pm 1.95	2.77 \pm 2.92	1.61 \pm 2.12
SOFA Last (Mean \pm SD)	3.56 \pm 2.80	6.78 \pm 4.16	3.91 \pm 3.14
SOFA Average (Mean \pm SD)	3.05 \pm 2.51	5.63 \pm 3.57	3.33 \pm 2.77
SOFA Std Dev (Mean \pm SD)	0.70 \pm 0.63	1.28 \pm 1.01	0.76 \pm 0.70
Categorical Variables			
Gender (n (%))			
Female	25,402 (43.59%)	3,244 (45.78%)	28,646 (43.82%)
Male	32,878 (56.41%)	3,842 (54.22%)	36,720 (56.18%)
Marital Status (n (%))			
Divorced	4,138 (7.10%)	405 (5.72%)	4,543 (6.95%)
Married	26,509 (45.49%)	2,740 (38.67%)	29,249 (44.75%)
Single	15,944 (27.36%)	1,426 (20.12%)	17,370 (26.57%)
Widowed	6,479 (11.12%)	1,026 (14.48%)	7,505 (11.48%)
Unknown	5,210 (8.94%)	1,489 (21.01%)	6,699 (10.25%)
Insurance (n (%))			
Medicaid	8,502 (14.59%)	851 (12.01%)	9,353 (14.31%)
Medicare	29,947 (51.38%)	4,517 (63.75%)	34,464 (52.72%)
No Charge	6 (0.01%)	1 (0.01%)	7 (0.01%)
Other	1,608 (2.76%)	125 (1.76%)	1,733 (2.65%)
Private	17,172 (29.46%)	1,275 (17.99%)	18,447 (28.22%)

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Table 1: **Baseline Characteristics by Hospital Mortality Outcome (continued)**

Characteristic	Survived (N=58,280)	Died (N=7,086)	Overall (N=65,366)
Unknown	1,045 (1.79%)	317 (4.47%)	1,362 (2.08%)
Smoker (n (%))			
No	54,432 (93.40%)	6,742 (95.15%)	61,174 (93.59%)
Yes	3,848 (6.60%)	344 (4.85%)	4,192 (6.41%)
Alcohol Abuse (n (%))			
No	57,733 (99.06%)	7,040 (99.35%)	64,773 (99.09%)
Yes	547 (0.94%)	46 (0.65%)	593 (0.91%)
SIRS Score (n (%))			
0	1,418 (2.43%)	46 (0.65%)	1,464 (2.24%)
1	8,628 (14.80%)	377 (5.32%)	9,005 (13.78%)
2	19,723 (33.84%)	1,665 (23.50%)	21,388 (32.72%)
3	21,187 (36.35%)	3,024 (42.68%)	24,211 (37.04%)
4	7,324 (12.57%)	1,974 (27.86%)	9,298 (14.22%)

3 Variable Specifications

The following table details all variables included in the benchmark dataset, with their descriptions and precise recording windows:

Table 2: **MIMIC-IV 24-Hour Benchmark Variables**

Variable	Description	Record Window
Baseline Demographics & Admission Characteristics		
gender	Biological sex of the patient (male/female)	Admission (baseline)
admission_age	Age at hospital admission (years)	Admission (baseline)
marital_status	Marital status documented at admission	Admission (baseline)
race	Self-reported race or ethnicity	Admission (baseline)
insurance	Primary insurance / payer type	Admission (baseline)
language	Primary language spoken by the patient	Admission (baseline)
admission_type	Admission category (elective, emergency, urgent , etc.)	Admission (baseline)
admission_location	Location/service from which the patient was admitted	Admission (baseline)
careunit	First ICU care unit for the stay	Admission (baseline)
height	Patient height (centimetres)	Admission (baseline)
weight	Patient weight (kilograms)	Admission (baseline)

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Table 2: **MIMIC-IV 24-Hour Benchmark Variables (continued)**

Variable	Description	Record Window
smoker	Documented current or past smoking status	Admission (baseline)
alcohol_abuse	Documented history of alcohol abuse	Admission (baseline)
Outcome Variable		
hospital_expire_flag	Indicator of in-hospital mortality (1 = died, 0 = survived)	Entire hospitalization (outcome label)
Clinical Severity Scores		
apsiii	APACHE III severity score	6h to +24h of ICU admission
sapsii	Simplified Acute Physiology Score II	6h to +24h of ICU admission
sirs	Systemic Inflammatory Response Syndrome score	6h to +24h of ICU admission
lods	Logistic Organ Dysfunction System score	6h to +24h of ICU admission
meld	Model for End-Stage Liver Disease score	6h to +24h of ICU admission
oasis	Oxford Acute Severity of Illness Score	6h to +24h of ICU admission
Dynamic Clinical Assessments		
gcs_dynamic_max	Maximum Glasgow Coma Scale observed in window	6h to +24h
sofa_dynamic_max	Maximum Sequential Organ Failure Assessment observed in window	6h to +24h
gcs_dynamic_min	Minimum Glasgow Coma Scale observed in window	6h to +24h
sofa_dynamic_min	Minimum SOFA observed in window	6h to +24h
gcs_dynamic_first	First Glasgow Coma Scale recorded within window	6h to +24h
sofa_dynamic_first	First SOFA recorded within window	6h to +24h
gcs_dynamic_last	Last Glasgow Coma Scale recorded within window	6h to +24h
sofa_dynamic_last	Last SOFA recorded within window	6h to +24h
gcs_dynamic_avg	Mean Glasgow Coma Scale across window	6h to +24h
sofa_dynamic_avg	Mean SOFA across window	6h to +24h
gcs_dynamic_stddev	Standard deviation of Glasgow Coma Scale within window	6h to +24h
sofa_dynamic_stddev	Standard deviation of SOFA within window	6h to +24h

4 Data Integrity Guarantees

4.1 Temporal Constraints

- **Baseline variables:** Recorded at or before ICU admission
- **Clinical scores:** Limited to **6 hours to +24 hours** from ICU admission
- **Dynamic assessments:** Aggregated within the **24-hour prediction window**
- **Outcome variable:** Hospital mortality status (no temporal restrictions)

4.2 Data Leakage Prevention

- **No future information:** All predictive variables precede or occur within the defined prediction window
- **Strict cutoffs:** No data beyond the 24-hour mark is included in any predictive variable
- **Validated extraction:** Automated checks ensure temporal consistency across all records

4.3 Dataset Summary

- **Total patients:** 65,366 ICU admissions
- **Hospital mortality rate:** 10.84% (7,086 deaths)
- **Multi-center data:** Represents diverse geographic regions and ICU types across the United States