In [40]:

```python
import pandas as pd
from lifelines import CoxPHFitter
import numpy as np
from lifelines.utils import concordance_index
from sklearn.preprocessing import StandardScaler

# Read the Excel file into a pandas DataFrame
data = pd.read_excel('DATA1.xlsx')

# Standardize the covariates
scaler = StandardScaler()
data_scaled = pd.DataFrame(scaler.fit_transform(data.drop(['Months', 'DEATH'], axis=1)), columns=data.columns[2:])

# Add the 'Months' and 'DEATH' columns back to the scaled data
data_scaled[['Months', 'DEATH']] = data[['Months', 'DEATH']]

# Create a CoxPHFitter object
cph = CoxPHFitter()

# Fit the Cox proportional hazards model with the standardized covariates
cph.fit(data_scaled, duration_col='Months', event_col='DEATH')

# Print the summary of the model
cph.print_summary()
```

model	lifelines.CoxPHFitter
duration col	'Months'
event col	'DEATH'
baseline estimation	breslow
number of observations	343
number of events observed	176
partial log-likelihood	-881.93
time fit was run	2023-08-17 09:50:13 UTC

	coef	exp(coef)	se(coef)	coef lower 95%	coef upper 95%	exp(coef) lower 95%	exp(coef) upper 95%	cmp to	z	p	-log2(p)
AGE	0.22	1.24	0.09	0.04	0.39	1.04	1.48	0.00	2.44	0.01	6.09
SEX	-0.02	0.98	0.08	-0.17	0.13	0.84	1.14	0.00	-0.27	0.78	0.35
CompositeStage	0.89	2.43	0.09	0.71	1.07	2.03	2.91	0.00	9.64	<0.005	70.65
LNInvolment	-0.39	0.68	0.08	-0.55	-0.23	0.58	0.80	0.00	-4.72	<0.005	18.73
Comorbidity	-0.04	0.96	0.08	-0.20	0.12	0.82	1.12	0.00	-0.53	0.59	0.75
FamiliyHistoryOfCancer	-0.09	0.91	0.08	-0.25	0.06	0.78	1.06	0.00	-1.17	0.24	2.04

Concordance	0.72
Partial AIC	1775.85
log-likelihood ratio test	123.55 on 6 df
-log2(p) of ll-ratio test	78.18

In [42]:

```
concordance_scores = {}
for variable in data.columns:
    if variable not in ['Months', 'DEATH','ID']:
        concordance = concordance_index(data['Months'], -cph.predict_partial_hazard(data), data['DEATH'])
        concordance_scores[variable] = concordance

# Print the concordance index for each variable
for variable, concordance in concordance_scores.items():
    print(f"Concordance index for {variable}: {concordance}")
```

```
Concordance index for AGE: 0.5883362585174479
Concordance index for SEX: 0.5883362585174479
Concordance index for CompositeStage: 0.5883362585174479
Concordance index for LNInvolment: 0.5883362585174479
Concordance index for Comorbidity: 0.5883362585174479
Concordance index for FamiliyHistoryOfCancer: 0.5883362585174479
```

In [43]:

```
univariate_results = []
univariate_aic_bic = []
for col in data.columns:
    if col not in ['Months', 'ID']:
        cph_univariate = CoxPHFitter(penalizer=0.1)
        cph_univariate.fit(data[['Months', 'ID', col]], duration_col='Months', event_col='ID', show_progress=True)
        univariate_results.append((col, cph_univariate.print_summary()))
        n = len(data)
        llf = cph_univariate.log_likelihood_
        k = cph_univariate.params_.shape[0]
        aic = -2 * llf + 2 * k
        bic = -2 * llf + k * np.log(n)
        univariate_aic_bic.append((col, aic, bic))
        print(f"\nColumn: {col}")
        print(f"AIC value: {aic}")
        print(f"BIC value: {bic}")
```

```
Iteration 1: norm_delta = 0.77722, step_size = 0.9500, log_lik = -1663.17959, newton_decrement = 70.49318, seconds_since_start
= 0.0
Iteration 2: norm_delta = 0.01332, step_size = 0.9500, log_lik = -1595.37158, newton_decrement = 0.02032, seconds_since_start =
0.1
Iteration 3: norm_delta = 0.00069, step_size = 0.9500, log_lik = -1595.35129, newton_decrement = 0.00005, seconds_since_start =
0.1
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -1595.35124, newton_decrement = 0.00000, seconds_since_start =
0.1
Convergence success after 4 iterations.
```

model	lifelines.CoxPHFitter
duration col	'Months'
event col	'ID'
penalizer	0.1
l1 ratio	0.0
baseline estimation	breslow
number of observations	343
number of events observed	343
partial log-likelihood	-1595.35
time fit was run	2023-08-17 09:51:10 UTC

	coef	exp(coef)	se(coef)	coef lower 95%	coef upper 95%	exp(coef) lower 95%	exp(coef) upper 95%	cmp to	z	p	-log2(p)
DEATH	1.50	4.49	0.13	1.24	1.76	3.46	5.82	0.00	11.35	<0.005	96.84

Concordance	0.66
Partial AIC	3192.70
log-likelihood ratio test	135.66 on 1 df
-log2(p) of ll-ratio test	101.73

```
Column: DEATH
AIC value: 3192.7024728287324
BIC value: 3196.5402032758984
Iteration 1: norm_delta = 0.01879, step_size = 0.9500, log_lik = -1663.17959, newton_decrement = 0.06380, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.00085, step_size = 0.9500, log_lik = -1663.11614, newton_decrement = 0.00013, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00004, step_size = 0.9500, log_lik = -1663.11600, newton_decrement = 0.00000, seconds_since_start =
0.1
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -1663.11600, newton_decrement = 0.00000, seconds_since_start =
0.1
Convergence success after 4 iterations.
```

model	lifelines.CoxPHFitter
duration col	'Months'
event col	'ID'
penalizer	0.1
l1 ratio	0.0
baseline estimation	breslow
number of observations	343
number of events observed	343
partial log-likelihood	-1663.12
time fit was run	2023-08-17 09:51:10 UTC

	coef	exp(coef)	se(coef)	coef lower 95%	coef upper 95%	exp(coef) lower 95%	exp(coef) upper 95%	cmp to	z	p	-log2(p)
AGE	-0.00	1.00	0.00	-0.01	0.01	0.99	1.01	0.00	-0.36	0.72	0.47

Concordance	0.51
Partial AIC	3328.23
log-likelihood ratio test	0.13 on 1 df
-log2(p) of ll-ratio test	0.47

```
Column: AGE
AIC value: 3328.2320093107332
BIC value: 3332.0697397578992
Iteration 1: norm_delta = 0.01792, step_size = 0.9500, log_lik = -1663.17959, newton_decrement = 0.06049, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.00095, step_size = 0.9500, log_lik = -1663.11915, newton_decrement = 0.00017, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00005, step_size = 0.9500, log_lik = -1663.11898, newton_decrement = 0.00000, seconds_since_start =
0.0
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -1663.11898, newton_decrement = 0.00000, seconds_since_start =
0.1
Convergence success after 4 iterations.
```

model	lifelines.CoxPHFitter
duration col	'Months'
event col	'ID'
penalizer	0.1
l1 ratio	0.0
baseline estimation	breslow
number of observations	343
number of events observed	343
partial log-likelihood	-1663.12
time fit was run	2023-08-17 09:51:10 UTC

	coef	exp(coef)	se(coef)	coef lower 95%	coef upper 95%	exp(coef) lower 95%	exp(coef) upper 95%	cmp to	z	p	-log2(p)
SEX	0.04	1.04	0.11	-0.17	0.24	0.84	1.28	0.00	0.35	0.73	0.46

Concordance	0.50
Partial AIC	3328.24
log-likelihood ratio test	0.12 on 1 df
-log2(p) of ll-ratio test	0.46

```
Column: SEX
AIC value: 3328.2379525488923
BIC value: 3332.0756829960583
Iteration 1: norm_delta = 0.43056, step_size = 0.9500, log_lik = -1663.17959, newton_decrement = 27.12197, seconds_since_start
= 0.0
Iteration 2: norm_delta = 0.04153, step_size = 0.9500, log_lik = -1635.53782, newton_decrement = 0.22899, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00238, step_size = 0.9500, log_lik = -1635.30845, newton_decrement = 0.00074, seconds_since_start =
0.1
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -1635.30771, newton_decrement = 0.00000, seconds_since_start =
0.1
Convergence success after 4 iterations.
```

model	lifelines.CoxPHFitter
duration col	'Months'
event col	'ID'
penalizer	0.1
l1 ratio	0.0
baseline estimation	breslow
number of observations	343
number of events observed	343
partial log-likelihood	-1635.31
time fit was run	2023-08-17 09:51:10 UTC

	coef	exp(coef)	se(coef)	coef lower 95%	coef upper 95%	exp(coef) lower 95%	exp(coef) upper 95%	cmp to	z	p	-log2(p)
CompositeStage	0.50	1.64	0.07	0.36	0.63	1.44	1.88	0.00	7.29	<0.005	41.59

Concordance	0.63
Partial AIC	3272.62
log-likelihood ratio test	55.74 on 1 df
-log2(p) of ll-ratio test	43.46

```
Column: CompositeStage
AIC value: 3272.615419213587
BIC value: 3276.453149660753
Iteration 1: norm_delta = 0.13600, step_size = 0.9500, log_lik = -1663.17959, newton_decrement = 3.86282, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.01328, step_size = 0.9500, log_lik = -1659.23281, newton_decrement = 0.03364, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00074, step_size = 0.9500, log_lik = -1659.19915, newton_decrement = 0.00010, seconds_since_start =
0.0
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -1659.19905, newton_decrement = 0.00000, seconds_since_start =
0.1
Convergence success after 4 iterations.
```

model	lifelines.CoxPHFitter
duration col	'Months'
event col	'ID'
penalizer	0.1
l1 ratio	0.0
baseline estimation	breslow
number of observations	343
number of events observed	343
partial log-likelihood	-1659.20
time fit was run	2023-08-17 09:51:10 UTC

	coef	exp(coef)	se(coef)	coef lower 95%	coef upper 95%	exp(coef) lower 95%	exp(coef) upper 95%	cmp to	z	p	-log2(p)
LNInvolment	-0.32	0.73	0.11	-0.54	-0.09	0.58	0.91	0.00	-2.77	0.01	7.48

Concordance	0.56
Partial AIC	3320.40
log-likelihood ratio test	7.96 on 1 df
-log2(p) of ll-ratio test	7.71

```
Column: LNInvolment
AIC value: 3320.3980925560595
BIC value: 3324.2358230032255
Iteration 1: norm_delta = 0.06577, step_size = 0.9500, log_lik = -1663.17959, newton_decrement = 0.79658, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.00275, step_size = 0.9500, log_lik = -1662.38897, newton_decrement = 0.00141, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00014, step_size = 0.9500, log_lik = -1662.38756, newton_decrement = 0.00000, seconds_since_start =
0.0
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -1662.38756, newton_decrement = 0.00000, seconds_since_start =
0.1
Convergence success after 4 iterations.
```

model	lifelines.CoxPHFitter
duration col	'Months'
event col	'ID'
penalizer	0.1
l1 ratio	0.0
baseline estimation	breslow
number of observations	343
number of events observed	343
partial log-likelihood	-1662.39
time fit was run	2023-08-17 09:51:11 UTC

	coef	exp(coef)	se(coef)	coef lower 95%	coef upper 95%	exp(coef) lower 95%	exp(coef) upper 95%	cmp to	z	p	-log2(p)
Comorbidity	-0.13	0.88	0.10	-0.33	0.07	0.72	1.08	0.00	-1.26	0.21	2.27

Concordance	0.53
Partial AIC	3326.78
log-likelihood ratio test	1.58 on 1 df
-log2(p) of ll-ratio test	2.26

```
Column: Comorbidity
AIC value: 3326.7751119395402
BIC value: 3330.6128423867062
Iteration 1: norm_delta = 0.02937, step_size = 0.9500, log_lik = -1663.17959, newton_decrement = 0.15086, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.00064, step_size = 0.9500, log_lik = -1663.03168, newton_decrement = 0.00008, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00003, step_size = 0.9500, log_lik = -1663.03161, newton_decrement = 0.00000, seconds_since_start =
0.0
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -1663.03161, newton_decrement = 0.00000, seconds_since_start =
0.0
Convergence success after 4 iterations.
```

model	lifelines.CoxPHFitter
duration col	'Months'
event col	'ID'
penalizer	0.1
l1 ratio	0.0
baseline estimation	breslow
number of observations	343
number of events observed	343
partial log-likelihood	-1663.03
time fit was run	2023-08-17 09:51:11 UTC

	coef	exp(coef)	se(coef)	coef lower 95%	coef upper 95%	exp(coef) lower 95%	exp(coef) upper 95%	cmp to	z	p	-log2(p)
FamiliyHistoryOfCancer	0.09	1.09	0.16	-0.22	0.39	0.80	1.48	0.00	0.55	0.58	0.78

Concordance	0.50
Partial AIC	3328.06
log-likelihood ratio test	0.30 on 1 df
-log2(p) of ll-ratio test	0.77

```
Column: FamiliyHistoryOfCancer
AIC value: 3328.0632186349508
BIC value: 3331.9009490821168
```

In [25]:

```
# Calculate p-values for each variable
p_values = []
for col in data.columns:
    if col not in ['Months', 'DEATH']:
        cph_univariate = CoxPHFitter(penalizer=0.1)
        cph_univariate.fit(data[['Months', 'DEATH', col]], duration_col='Months', event_col='DEATH', show_progress=True)
        p_values.append((col, cph_univariate.summary['p'][col]))

# Sort the p-values list in ascending order
p_values.sort(key=lambda x: x[1])

# Get the significant variable with the lowest p-value
significant_variable_pvalue = p_values[0][0]
significant_variable_pvalue_value = data[significant_variable_pvalue].iloc[0]
print(f"\nSignificant variable based on p-value: {significant_variable_pvalue}")
#print(f"Value of the significant variable: {significant_variable_pvalue_value}")
```

```
Iteration 1: norm_delta = 0.35071, step_size = 0.9500, log_lik = -943.70062, newton_decrement = 15.41644, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.01406, step_size = 0.9500, log_lik = -928.49246, newton_decrement = 0.02456, seconds_since_start =
0.1
Iteration 3: norm_delta = 0.00073, step_size = 0.9500, log_lik = -928.46793, newton_decrement = 0.00007, seconds_since_start =
0.1
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -928.46787, newton_decrement = 0.00000, seconds_since_start =
0.1
Convergence success after 4 iterations.
Iteration 1: norm_delta = 0.09094, step_size = 0.9500, log_lik = -943.70062, newton_decrement = 0.84604, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.00646, step_size = 0.9500, log_lik = -942.84679, newton_decrement = 0.00411, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00033, step_size = 0.9500, log_lik = -942.84269, newton_decrement = 0.00001, seconds_since_start =
0.0
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -942.84268, newton_decrement = 0.00000, seconds_since_start =
0.0
Convergence success after 4 iterations.
Iteration 1: norm_delta = 0.02152, step_size = 0.9500, log_lik = -943.70062, newton_decrement = 0.04824, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.00117, step_size = 0.9500, log_lik = -943.65238, newton_decrement = 0.00014, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00006, step_size = 0.9500, log_lik = -943.65224, newton_decrement = 0.00000, seconds_since_start =
0.0
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -943.65224, newton_decrement = 0.00000, seconds_since_start =
0.0
Convergence success after 4 iterations.
Iteration 1: norm_delta = 0.60207, step_size = 0.9500, log_lik = -943.70062, newton_decrement = 33.86694, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.06882, step_size = 0.9500, log_lik = -909.00329, newton_decrement = 0.38483, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00442, step_size = 0.9500, log_lik = -908.61639, newton_decrement = 0.00154, seconds_since_start =
0.0
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -908.61485, newton_decrement = 0.00000, seconds_since_start =
0.0
Convergence success after 4 iterations.
Iteration 1: norm_delta = 0.20088, step_size = 0.9500, log_lik = -943.70062, newton_decrement = 4.61862, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.02598, step_size = 0.9500, log_lik = -938.91722, newton_decrement = 0.06679, seconds_since_start =
0.0
```

```
Iteration 3: norm_delta = 0.00161, step_size = 0.9500, log_lik = -938.85015, newton_decrement = 0.00025, seconds_since_start =
0.0
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -938.84989, newton_decrement = 0.00000, seconds_since_start =
0.0
Convergence success after 4 iterations.
Iteration 1: norm_delta = 0.07263, step_size = 0.9500, log_lik = -943.70062, newton_decrement = 0.54710, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.00311, step_size = 0.9500, log_lik = -943.15727, newton_decrement = 0.00102, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00016, step_size = 0.9500, log_lik = -943.15625, newton_decrement = 0.00000, seconds_since_start =
0.0
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -943.15625, newton_decrement = 0.00000, seconds_since_start =
0.0
Convergence success after 4 iterations.
Iteration 1: norm_delta = 0.02707, step_size = 0.9500, log_lik = -943.70062, newton_decrement = 0.07765, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.00205, step_size = 0.9500, log_lik = -943.62205, newton_decrement = 0.00043, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00011, step_size = 0.9500, log_lik = -943.62163, newton_decrement = 0.00000, seconds_since_start =
0.0
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -943.62163, newton_decrement = 0.00000, seconds_since_start =
0.0
Convergence success after 4 iterations.

Significant variable based on p-value: CompositeStage
```

In [52]:

```python
data['Significant_Category'] = ''

# Define the criteria for assigning categorical values
threshold = 0.05

# Assign categorical values based on the p-value
data.loc[data[significant_variable_pvalue] <= threshold, 'Significant_Category'] = 'Significant'
data.loc[data[significant_variable_pvalue] > threshold, 'Significant_Category'] = 'Not Significant'

# Print the updated dataset
print("Updated data with significant variables as categorical data:\n")
print(data)
```

```
Updated data with significant variables as categorical data:

      ID  Months  DEATH  AGE  SEX  CompositeStage  LNInvolment  Comorbidity  \
0      1      70      0   50    1               3            1            1   
1      2      68      0   50    2               1            0            1   
2      3      69      0   52    1               2            0            1   
3      4      43      1   55    2               2            0            0   
4      5      71      0   69    2               3            1            1   
..   ...     ...    ...  ...  ...             ...          ...          ...   
338  339      65      0   41    1               3            1            1   
339  340      61      0   52    1               2            0            1   
340  341      65      0   61    2               2            0            1   
341  342      16      1   71    2               4            0            0   
342  343      31      1   60    2               4            1            0   

     FamiliiyHistoryOfCancer Significant_Category  
0                          0      Not Significant  
1                          0      Not Significant  
2                          0      Not Significant  
3                          0      Not Significant  
4                          0      Not Significant  
..                       ...                  ...  
338                        0      Not Significant  
339                        0      Not Significant  
340                        0      Not Significant  
341                        0      Not Significant  
342                        0      Not Significant  

[343 rows x 10 columns]
```

In [53]:

```
cph_univariate = CoxPHFitter(penalizer=0.1)
cph_univariate.fit(data[['Months', 'DEATH', significant_variable_pvalue]], duration_col='Months', event_col='DEATH', show_prog
univariate_results = cph_univariate.print_summary()

# Print the univariate analysis result
print(univariate_results)
```

```
Iteration 1: norm_delta = 0.60207, step_size = 0.9500, log_lik = -943.70062, newton_decrement = 33.86694, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.06882, step_size = 0.9500, log_lik = -909.00329, newton_decrement = 0.38483, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00442, step_size = 0.9500, log_lik = -908.61639, newton_decrement = 0.00154, seconds_since_start =
0.1
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -908.61485, newton_decrement = 0.00000, seconds_since_start =
0.1
Convergence success after 4 iterations.
```

model	lifelines.CoxPHFitter
duration col	'Months'
event col	'DEATH'
penalizer	0.1
l1 ratio	0.0
baseline estimation	breslow
number of observations	343
number of events observed	176
partial log-likelihood	-908.61
time fit was run	2023-08-17 11:56:10 UTC

	coef	exp(coef)	se(coef)	coef lower 95%	coef upper 95%	exp(coef) lower 95%	exp(coef) upper 95%	cmp to	z	p	-log2(p)
CompositeStage	0.71	2.03	0.09	0.54	0.88	1.71	2.41	0.00	8.06	<0.005	50.27

Concordance	0.68
Partial AIC	1819.23
log-likelihood ratio test	70.17 on 1 df
-log2(p) of ll-ratio test	54.03

None

In [54]:

```
cph_multivariate = CoxPHFitter(penalizer=0.1)
cph_multivariate.fit(data[['Months', 'DEATH', significant_variable_pvalue]], duration_col='Months', event_col='DEATH', show_pr
multivariate_results = cph_multivariate.print_summary()
```

```python
# Print the multivariate analysis result
print(multivariate_results)
```

```
Iteration 1: norm_delta = 0.60207, step_size = 0.9500, log_lik = -943.70062, newton_decrement = 33.86694, seconds_since_start =
0.0
Iteration 2: norm_delta = 0.06882, step_size = 0.9500, log_lik = -909.00329, newton_decrement = 0.38483, seconds_since_start =
0.0
Iteration 3: norm_delta = 0.00442, step_size = 0.9500, log_lik = -908.61639, newton_decrement = 0.00154, seconds_since_start =
0.1
Iteration 4: norm_delta = 0.00000, step_size = 1.0000, log_lik = -908.61485, newton_decrement = 0.00000, seconds_since_start =
0.1
Convergence success after 4 iterations.
```

model	lifelines.CoxPHFitter
duration col	'Months'
event col	'DEATH'
penalizer	0.1
l1 ratio	0.0
baseline estimation	breslow
number of observations	343
number of events observed	176
partial log-likelihood	-908.61
time fit was run	2023-08-17 11:56:12 UTC

	coef	exp(coef)	se(coef)	coef lower 95%	coef upper 95%	exp(coef) lower 95%	exp(coef) upper 95%	cmp to	z	p	-log2(p)
CompositeStage	0.71	2.03	0.09	0.54	0.88	1.71	2.41	0.00	8.06	<0.005	50.27

Concordance	0.68
Partial AIC	1819.23
log-likelihood ratio test	70.17 on 1 df
-log2(p) of ll-ratio test	54.03

```
None
```

In [55]:

```
concordance_scores = {}
for variable in data[['Months', 'DEATH', significant_variable_pvalue]].columns:
    if variable not in ['Months', 'DEATH']:
        concordance = concordance_index(data['Months'], -cph_multivariate.predict_partial_hazard(data), data['DEATH'])
        concordance_scores[variable] = concordance
```

```python
# Print the concordance index for each variable
for variable, concordance in concordance_scores.items():
    print(f"Concordance index for {variable}: {concordance}")
```

```
Concordance index for CompositeStage: 0.6820927111294652
```

In [56]:

```python
# Calculate AIC and BIC
n = len(data)  # number of observations
k = len(cph_multivariate.params_)  # number of model parameters
llf = cph_multivariate.log_likelihood_  # log-likelihood of the model

aic = -2 * llf + 2 * k
bic = -2 * llf + k * np.log(n)

print("AIC:", aic)
print("BIC:", bic)
```

```
AIC: 1819.2296914692981
BIC: 1823.0674219164641
```

In [ ]: