# Polysomnographic predictors of incident pre-diabetes and diabetes: A secondary analysis of the DREAM Cohort

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## Background

Our understanding of the polysomnographic measures that best predict the adverse health consequences of sleep apnea remains poorly developed. Obstructive sleep apnea is characterized by repeated upper airway occlusion during sleep that cause airflow cessation or reduction. The diagnosis, severity, and management of obstructive sleep apnea are derived bases on the average number of apneas and hypopneas per hour of sleep which does not take into account important factors, such as oxygen desaturation severity or time. There is evidence that diabetes has been associated with hypoxemia more significantly than with apnea hypopnea index (1). It is unclear whether AHI alone is the best predictor for clinicaly relevant outcomes such as survival, cardiovascular events, hypertension and metabolic dysfunction (2, 3).

## Objectives

Specific Aim 1: Among veterans who have undergone evaluation of sleep-disordered breathing with overnight polysomnography, identify more detailed sleep measures beyond AHI that predict incident pre-diabetes and diabetes.

Specific Aim 2: From the sleep measures identified in Aim 1, develop a predictive model for the development of pre-diabetes and diabetes.

## Methods

This retrospective observational secondary analysis of the consists of 650 patients referred consecutively to three VHA sleep centers from 2000 to 2004 for overnight polysomnography. The participants are retrospectively followed through 12/31/07 for the development of pre-diabetes and diabetes. Raw data from individual scored sleep studies was abstracted for prognostic sleep variables. The VA electronic medical record were used for the abstraction of baseline characteristics and follow-up of outcomes. Data was adjusted with multivariate cox regression for the possible confounders of baseline BMI, age, race, gender, change in BMI over time, and CPAP use.

## Preliminary Results

**Table 1 Modeling: Cox Model with time to Incident diabetes as outcome, and baseline BMI, age, race, gender, change in BMI over time, CPAPuse and one of the following baseline characteristic as predictors**

| Baseline Characteristic | HazardRatio | HRLowerCL | HRUpperCL | pval |
|---|---|---|---|---|
| Epworth Sleepiness Scale | 1.017 | 0.976 | 1.059 | 0.4244 |
| SleepLatency, %of TST | 1 | 0.995 | 1.005 | 0.9414 |
| REMlatency,%of TST | 1.002 | 0.997 | 1.007 | 0.4391 |
| SupineApneas events/hr | 1.495 | 0.962 | 2.323 | 0.0738 |
| WASO, %of TST | 1 | 0.988 | 1.012 | 0.9869 |
| Respiratory Arousal Index, events/hr | 1.009 | 1.003 | 1.015 | 0.0026 |
| Spontaneous Arousal Index, events/hr | 1 | 0.988 | 1.013 | 0.9699 |
| Total Arousal Index, events/hour | 1.006 | 1.001 | 1.011 | 0.0275 |
| Snoring Index, events/hr | 0.896 | 0.576 | 1.393 | 0.6253 |
| Obstructive Apnea Index, events/hr | 1.123 | 0.762 | 1.657 | 0.5574 |
| Central Apnea Index, events/hr | 1.017 | 0.992 | 1.043 | 0.1731 |
| Hypopnea Index, events/hr, (n)median (IQR) | 1.009 | 0.998 | 1.02 | 0.1087 |
| REM related Apnea Index, events/hr | 0.997 | 0.989 | 1.006 | 0.5669 |
| Cheyne Strokes Pattern | 1.281 | 0.591 | 2.776 | 0.5304 |
| PLMindex, events/hr | 0.702 | 0.412 | 1.194 | 0.1919 |
| Desaturation >4%_index, events/hr | 1.001 | 0.995 | 1.008 | 0.7101 |
| LowNoctOxyDest, events/hr | 1.005 | 0.983 | 1.027 | 0.6763 |
| T=60-89% Index, %of TST | 1.009 | 1.001 | 1.017 | 0.0228 |
| T=90-99% Index,%of TST | 0.996 | 0.989 | 1.004 | 0.3567 |
| Mean Nocturnal Oxygen Saturation | 0.933 | 0.886 | 0.983 | 0.0087 |
| Apnea hypopnea index, events/hr | 1.003 | 0.998 | 1.009 | 0.2372 |

## Conclusions

Increases in the respiratory arousal index, total arousal index and time spent with oxygen saturation<90% was associated with increased rates of incident diabetes. Higher mean oxygen saturation was found to be protective against incident diabetes and prediabetes.

## References

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