Normative Values for the Sleep Study Report

**Epworth Sleepiness Scale scores**:  
0-5 Lower Normal Daytime Sleepiness  
6-10 Higher Normal Daytime Sleepiness  
11-12 Mild Excessive Daytime Sleepiness  
13-15 Moderate Excessive Daytime Sleepiness  
16-24 Severe Excessive Daytime Sleepiness

**Normal sleep efficiency based on age (means)**:

<table>
<thead>
<tr>
<th>Age:</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>37-54</td>
<td>78-94%</td>
</tr>
<tr>
<td>55-60</td>
<td>74-92%</td>
</tr>
<tr>
<td>61-70</td>
<td>68-93%</td>
</tr>
<tr>
<td>&gt;70</td>
<td>69-89%</td>
</tr>
</tbody>
</table>

For normal sleep efficiency refer to the table above  
>80% normal  
<80% reduced (this does not apply to patients >70 years)  
<60% severely reduced or impaired

**Spontaneous Arousals**

Normal = please refer to the table  
>10 = mildly increased  
>20 = moderately increased  
>30 = severely increased

**Awakening Index**

>5 = elevated

**Sleep Latency**

0-5 minutes = severely abbreviated  
5-10 = rapid  
10-20 = normal
Sleep architecture in teens and adults

Males (means)

<table>
<thead>
<tr>
<th>Age</th>
<th>13-15</th>
<th>16-19</th>
<th>20-29</th>
<th>30-36</th>
<th>37-53</th>
<th>55-60</th>
<th>61-70</th>
<th>&gt;70</th>
</tr>
</thead>
<tbody>
<tr>
<td>%N3</td>
<td>24</td>
<td>23</td>
<td>19-22</td>
<td>12-14</td>
<td>10-13</td>
<td>7-10</td>
<td>6-8</td>
<td>5-7</td>
</tr>
<tr>
<td>%R</td>
<td>27</td>
<td>22</td>
<td>27-29</td>
<td>22-24</td>
<td>19-20</td>
<td>18-20</td>
<td>18-19</td>
<td>17-19</td>
</tr>
</tbody>
</table>

Females (means)

<table>
<thead>
<tr>
<th>Age</th>
<th>13-15</th>
<th>16-19</th>
<th>20-29</th>
<th>30-36</th>
<th>37-53</th>
<th>55-60</th>
<th>61-70</th>
<th>&gt;70</th>
</tr>
</thead>
<tbody>
<tr>
<td>%N3</td>
<td>22</td>
<td>23</td>
<td>18-20</td>
<td>14-16</td>
<td>13-16</td>
<td>15-19</td>
<td>15-19</td>
<td>16-19</td>
</tr>
<tr>
<td>%R</td>
<td>26</td>
<td>22</td>
<td>24-26</td>
<td>25-27</td>
<td>20-22</td>
<td>19-21</td>
<td>18-20</td>
<td>17-19</td>
</tr>
</tbody>
</table>

REM sleep Latency (minutes)³,⁴

70-100 minutes = normal
<70 minutes = abbreviated
>120 minutes = delayed

Sleep Apnea in Adults

<table>
<thead>
<tr>
<th></th>
<th>AHI²</th>
<th>SaO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>5-15/hr</td>
<td>85-89%</td>
</tr>
<tr>
<td>Moderate</td>
<td>15-30/hr</td>
<td>75-84%</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt;30/hr</td>
<td>&lt;75%</td>
</tr>
</tbody>
</table>

Respiratory Disturbance Index (RDI)⁶

<20 events/hr = mildly elevated
20-40 events/hr = moderately elevated
40-60 events/hr = moderately to severely elevated
>60 events/hr = severely elevated

Apnea definition:

An apnea is scored when all of the following criteria are met:
1. There is a drop in airflow by 90% or more of the baseline
2. The duration of the event lasts at least 10 seconds
3. At least 90% of the event’s duration meets the amplitude criteria
**Hypopnea definition (criteria A):**

A hypopnea is scored when all of the following criteria are met:
1. The nasal pressure signal drops by 30% or more of the baseline
2. The duration of the event lasts at least 10 seconds
3. There is a 3% (or more) oximeter desaturation from the pre-event baseline, or the event is associated with an arousal
4. At least 90% of the duration of the event demonstrates the reduction in airflow

**Respiratory effort related arousal (RERA):**

A RERA is scored when all of the following criteria are met:
1. There is a sequence of breaths lasting at least 10 seconds, characterized by increased respiratory effort, or flattening of the nasal pressure waveform leading to an arousal.
2. A respiratory event is seen which does not meet the amplitude and/or desaturation criteria for hypopnea (as outlined above) but which does cause an arousal.

**Oxygen Desaturation**

Desaturations down to between 80-89% = mild
Desaturations down to between 70-79% = moderate
Desaturations down to below 70% = severe

**Periodic Leg Movement Index (PLMI)**

<5 events/hour = normal
5-25 events/hour = mildly elevated
26-50 events/hour = moderately elevated
>50 events/hour = severely elevated

**PLM Arousal Index**

<10 events/hour = normal
>10 events/hour = elevated
>25 events/hour = severely elevated

**Sleep Micro-architecture**

Alpha ratings:
1. <20% of NREM sleep occupied by alpha
2. 20-40% of NREM sleep occupied by alpha
3. 40-60% of NREM sleep occupied by alpha
4. 60-80% of NREM sleep occupied by alpha
5. >80% of NREM sleep occupied by alpha
Multiple Sleep Latency Test (MSLT)\textsuperscript{7}

Mean sleep latency of 10 to 20 minutes = normal
Mean sleep latency of ≤ 5 minutes = pathologic sleepiness
Mean sleep latency of 5-8 minutes = moderate sleepiness (\textit{not typically in the narcoleptic range})
Mean sleep latency of 8-10 minutes = mild sleepiness ("grey zone") (\textit{not classifiable as pathologic})

\textit{In the appropriate clinical context, the finding of 2 or more intrusions of REM sleep and a mean sleep latency of less than 5 minutes is consistent with a diagnosis of Narcolepsy syndrome.}

Maintenance of Wakefulness Test (MWT)

There is a paucity of data on the normative ranges for MWT which must be interpreted in the clinical context.

\textit{Interpretation:}
1. The sleep onset is defined as the first epoch of greater than 15 seconds of cumulative sleep in a 30 second epoch and the trials are ended after 40 minutes if no sleep occurs, or after unequivocal sleep, defined as 3 consecutive epochs of stage 1 sleep or one epoch of any other stage of sleep. The AASM suggests that a mean sleep latency below 8 minutes is abnormal and mean sleep latency of 8-40 minutes is of uncertain significance and must be interpreted within the clinical and occupational context.
2. The mean latency in normal volunteers is 30.4 ± 11.20 minutes.

References:
\begin{enumerate}
\item Keenan S, Hirshkowitz M. Monitoring and staging human sleep (page 1608). In: Principles and Practices of Sleep Medicine; Kryger, Roth, Dement, 5\textsuperscript{th} Edition, 2011.
\end{enumerate}

Nb: all other values listed in this document are taken from: