Total Sample Size for a $\chi^2$ Test

$\alpha = .05$

Cohen (1988) has classified effect sizes as follows -

Small - $w = 0.1$
Medium - $w = 0.3$
Large - $w = 0.5$

<table>
<thead>
<tr>
<th>df = 1</th>
<th>Power (1-(\beta))</th>
<th>Effect Size (w)</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td></td>
<td></td>
<td>382</td>
<td>97</td>
<td>62</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>0.60</td>
<td></td>
<td></td>
<td>486</td>
<td>123</td>
<td>78</td>
<td>32</td>
<td>34</td>
</tr>
<tr>
<td>0.70</td>
<td></td>
<td></td>
<td>610</td>
<td>155</td>
<td>98</td>
<td>40</td>
<td>42</td>
</tr>
<tr>
<td>0.75</td>
<td></td>
<td></td>
<td>686</td>
<td>174</td>
<td>110</td>
<td>44</td>
<td>46</td>
</tr>
<tr>
<td>0.80</td>
<td></td>
<td></td>
<td>776</td>
<td>197</td>
<td>124</td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td>0.85</td>
<td></td>
<td></td>
<td>886</td>
<td>225</td>
<td>142</td>
<td>57</td>
<td>58</td>
</tr>
<tr>
<td>0.90</td>
<td></td>
<td></td>
<td>1038</td>
<td>263</td>
<td>164</td>
<td>67</td>
<td>68</td>
</tr>
<tr>
<td>0.95</td>
<td></td>
<td></td>
<td>1282</td>
<td>325</td>
<td>202</td>
<td>83</td>
<td>82</td>
</tr>
<tr>
<td>0.99</td>
<td></td>
<td></td>
<td>1810</td>
<td>460</td>
<td>284</td>
<td>117</td>
<td>114</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>df = 2</th>
<th>Power (1-(\beta))</th>
<th>Effect Size (w)</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td></td>
<td></td>
<td>499</td>
<td>125</td>
<td>56</td>
<td>31</td>
<td>20</td>
</tr>
<tr>
<td>0.60</td>
<td></td>
<td></td>
<td>625</td>
<td>156</td>
<td>70</td>
<td>39</td>
<td>25</td>
</tr>
<tr>
<td>0.70</td>
<td></td>
<td></td>
<td>775</td>
<td>193</td>
<td>86</td>
<td>48</td>
<td>31</td>
</tr>
<tr>
<td>0.75</td>
<td></td>
<td></td>
<td>864</td>
<td>216</td>
<td>96</td>
<td>54</td>
<td>35</td>
</tr>
<tr>
<td>0.80</td>
<td></td>
<td></td>
<td>969</td>
<td>242</td>
<td>108</td>
<td>60</td>
<td>39</td>
</tr>
<tr>
<td>0.85</td>
<td></td>
<td></td>
<td>1098</td>
<td>274</td>
<td>122</td>
<td>68</td>
<td>44</td>
</tr>
<tr>
<td>0.90</td>
<td></td>
<td></td>
<td>1272</td>
<td>317</td>
<td>141</td>
<td>79</td>
<td>51</td>
</tr>
<tr>
<td>0.95</td>
<td></td>
<td></td>
<td>1553</td>
<td>387</td>
<td>172</td>
<td>96</td>
<td>62</td>
</tr>
<tr>
<td>0.99</td>
<td></td>
<td></td>
<td>2151</td>
<td>536</td>
<td>238</td>
<td>133</td>
<td>86</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>df = 3</th>
<th>Power (1-(\beta))</th>
<th>Effect Size (w)</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td></td>
<td></td>
<td>577</td>
<td>149</td>
<td>64</td>
<td>37</td>
<td>23</td>
</tr>
<tr>
<td>0.60</td>
<td></td>
<td></td>
<td>716</td>
<td>185</td>
<td>80</td>
<td>45</td>
<td>29</td>
</tr>
<tr>
<td>0.70</td>
<td></td>
<td></td>
<td>880</td>
<td>227</td>
<td>98</td>
<td>55</td>
<td>36</td>
</tr>
<tr>
<td>0.75</td>
<td></td>
<td></td>
<td>977</td>
<td>252</td>
<td>108</td>
<td>62</td>
<td>39</td>
</tr>
<tr>
<td>0.80</td>
<td></td>
<td></td>
<td>1091</td>
<td>281</td>
<td>121</td>
<td>69</td>
<td>44</td>
</tr>
<tr>
<td>0.85</td>
<td></td>
<td></td>
<td>1231</td>
<td>317</td>
<td>136</td>
<td>77</td>
<td>50</td>
</tr>
<tr>
<td>0.90</td>
<td></td>
<td></td>
<td>1418</td>
<td>365</td>
<td>157</td>
<td>89</td>
<td>57</td>
</tr>
<tr>
<td>0.95</td>
<td></td>
<td></td>
<td>1718</td>
<td>443</td>
<td>190</td>
<td>108</td>
<td>69</td>
</tr>
<tr>
<td>0.99</td>
<td></td>
<td></td>
<td>2354</td>
<td>606</td>
<td>260</td>
<td>148</td>
<td>94</td>
</tr>
</tbody>
</table>

(continued on next page)
### df = 4

<table>
<thead>
<tr>
<th>Effect Size (w)</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td>644</td>
<td>164</td>
<td>73</td>
<td>41</td>
<td>26</td>
</tr>
<tr>
<td>0.60</td>
<td>795</td>
<td>202</td>
<td>90</td>
<td>50</td>
<td>32</td>
</tr>
<tr>
<td>0.70</td>
<td>971</td>
<td>247</td>
<td>110</td>
<td>61</td>
<td>40</td>
</tr>
<tr>
<td>0.75</td>
<td>1075</td>
<td>273</td>
<td>121</td>
<td>68</td>
<td>44</td>
</tr>
<tr>
<td>0.80</td>
<td>1197</td>
<td>304</td>
<td>135</td>
<td>75</td>
<td>49</td>
</tr>
<tr>
<td>0.85</td>
<td>1346</td>
<td>342</td>
<td>152</td>
<td>85</td>
<td>55</td>
</tr>
<tr>
<td>0.90</td>
<td>1544</td>
<td>393</td>
<td>174</td>
<td>97</td>
<td>63</td>
</tr>
<tr>
<td>0.95</td>
<td>1862</td>
<td>473</td>
<td>210</td>
<td>117</td>
<td>75</td>
</tr>
<tr>
<td>0.99</td>
<td>2531</td>
<td>643</td>
<td>285</td>
<td>159</td>
<td>102</td>
</tr>
</tbody>
</table>

### df = 5

<table>
<thead>
<tr>
<th>Effect Size (w)</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td>675</td>
<td>181</td>
<td>78</td>
<td>44</td>
<td>28</td>
</tr>
<tr>
<td>0.60</td>
<td>829</td>
<td>223</td>
<td>95</td>
<td>55</td>
<td>35</td>
</tr>
<tr>
<td>0.70</td>
<td>1009</td>
<td>271</td>
<td>116</td>
<td>66</td>
<td>42</td>
</tr>
<tr>
<td>0.75</td>
<td>1114</td>
<td>299</td>
<td>128</td>
<td>73</td>
<td>47</td>
</tr>
<tr>
<td>0.80</td>
<td>1238</td>
<td>332</td>
<td>142</td>
<td>81</td>
<td>52</td>
</tr>
<tr>
<td>0.85</td>
<td>1388</td>
<td>373</td>
<td>160</td>
<td>91</td>
<td>58</td>
</tr>
<tr>
<td>0.90</td>
<td>1589</td>
<td>427</td>
<td>183</td>
<td>104</td>
<td>66</td>
</tr>
<tr>
<td>0.95</td>
<td>1908</td>
<td>512</td>
<td>219</td>
<td>125</td>
<td>79</td>
</tr>
<tr>
<td>0.99</td>
<td>2578</td>
<td>692</td>
<td>296</td>
<td>169</td>
<td>107</td>
</tr>
</tbody>
</table>

### df = 6

<table>
<thead>
<tr>
<th>Effect Size (w)</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td>750</td>
<td>186</td>
<td>84</td>
<td>47</td>
<td>31</td>
</tr>
<tr>
<td>0.60</td>
<td>919</td>
<td>228</td>
<td>103</td>
<td>58</td>
<td>37</td>
</tr>
<tr>
<td>0.70</td>
<td>1114</td>
<td>276</td>
<td>125</td>
<td>70</td>
<td>45</td>
</tr>
<tr>
<td>0.75</td>
<td>1229</td>
<td>305</td>
<td>137</td>
<td>77</td>
<td>50</td>
</tr>
<tr>
<td>0.80</td>
<td>1362</td>
<td>338</td>
<td>152</td>
<td>86</td>
<td>55</td>
</tr>
<tr>
<td>0.85</td>
<td>1525</td>
<td>378</td>
<td>170</td>
<td>96</td>
<td>62</td>
</tr>
<tr>
<td>0.90</td>
<td>1741</td>
<td>432</td>
<td>194</td>
<td>109</td>
<td>70</td>
</tr>
<tr>
<td>0.95</td>
<td>2085</td>
<td>517</td>
<td>233</td>
<td>131</td>
<td>84</td>
</tr>
<tr>
<td>0.99</td>
<td>2803</td>
<td>695</td>
<td>313</td>
<td>176</td>
<td>113</td>
</tr>
</tbody>
</table>

(continued on next page)
<table>
<thead>
<tr>
<th>df = 7</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect Size (w)</td>
<td>Power (1-β)</td>
<td>0.50</td>
<td>0.60</td>
<td>0.70</td>
<td>0.75</td>
</tr>
<tr>
<td>0.50</td>
<td>577</td>
<td>146</td>
<td>65</td>
<td>36</td>
<td>24</td>
</tr>
<tr>
<td>0.60</td>
<td>716</td>
<td>192</td>
<td>80</td>
<td>45</td>
<td>29</td>
</tr>
<tr>
<td>0.70</td>
<td>880</td>
<td>223</td>
<td>99</td>
<td>55</td>
<td>36</td>
</tr>
<tr>
<td>0.75</td>
<td>977</td>
<td>248</td>
<td>110</td>
<td>61</td>
<td>39</td>
</tr>
<tr>
<td>0.80</td>
<td>1091</td>
<td>277</td>
<td>122</td>
<td>68</td>
<td>44</td>
</tr>
<tr>
<td>0.85</td>
<td>1231</td>
<td>312</td>
<td>138</td>
<td>77</td>
<td>50</td>
</tr>
<tr>
<td>0.90</td>
<td>1418</td>
<td>360</td>
<td>159</td>
<td>89</td>
<td>57</td>
</tr>
<tr>
<td>0.95</td>
<td>1718</td>
<td>435</td>
<td>192</td>
<td>109</td>
<td>69</td>
</tr>
<tr>
<td>0.99</td>
<td>2354</td>
<td>596</td>
<td>263</td>
<td>147</td>
<td>95</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>df = 8</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect Size (w)</td>
<td>Power (1-β)</td>
<td>0.50</td>
<td>0.60</td>
<td>0.70</td>
<td>0.75</td>
</tr>
<tr>
<td>0.50</td>
<td>645</td>
<td>161</td>
<td>72</td>
<td>41</td>
<td>26</td>
</tr>
<tr>
<td>0.60</td>
<td>795</td>
<td>198</td>
<td>89</td>
<td>50</td>
<td>32</td>
</tr>
<tr>
<td>0.70</td>
<td>970</td>
<td>242</td>
<td>108</td>
<td>61</td>
<td>39</td>
</tr>
<tr>
<td>0.75</td>
<td>1075</td>
<td>268</td>
<td>120</td>
<td>68</td>
<td>43</td>
</tr>
<tr>
<td>0.80</td>
<td>1196</td>
<td>298</td>
<td>133</td>
<td>75</td>
<td>48</td>
</tr>
<tr>
<td>0.85</td>
<td>1345</td>
<td>336</td>
<td>150</td>
<td>85</td>
<td>54</td>
</tr>
<tr>
<td>0.90</td>
<td>1544</td>
<td>385</td>
<td>172</td>
<td>97</td>
<td>62</td>
</tr>
<tr>
<td>0.95</td>
<td>1861</td>
<td>464</td>
<td>207</td>
<td>117</td>
<td>75</td>
</tr>
<tr>
<td>0.99</td>
<td>2530</td>
<td>631</td>
<td>282</td>
<td>159</td>
<td>102</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>df = 9</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect Size (w)</td>
<td>Power (1-β)</td>
<td>0.50</td>
<td>0.60</td>
<td>0.70</td>
<td>0.75</td>
</tr>
<tr>
<td>0.50</td>
<td>646</td>
<td>162</td>
<td>72</td>
<td>41</td>
<td>26</td>
</tr>
<tr>
<td>0.60</td>
<td>798</td>
<td>200</td>
<td>89</td>
<td>50</td>
<td>32</td>
</tr>
<tr>
<td>0.70</td>
<td>975</td>
<td>244</td>
<td>108</td>
<td>61</td>
<td>39</td>
</tr>
<tr>
<td>0.75</td>
<td>1079</td>
<td>270</td>
<td>120</td>
<td>68</td>
<td>44</td>
</tr>
<tr>
<td>0.80</td>
<td>1201</td>
<td>300</td>
<td>133</td>
<td>75</td>
<td>48</td>
</tr>
<tr>
<td>0.85</td>
<td>1351</td>
<td>338</td>
<td>149</td>
<td>84</td>
<td>54</td>
</tr>
<tr>
<td>0.90</td>
<td>1550</td>
<td>387</td>
<td>172</td>
<td>97</td>
<td>62</td>
</tr>
<tr>
<td>0.95</td>
<td>1869</td>
<td>467</td>
<td>207</td>
<td>117</td>
<td>75</td>
</tr>
<tr>
<td>0.99</td>
<td>2540</td>
<td>635</td>
<td>281</td>
<td>158</td>
<td>102</td>
</tr>
</tbody>
</table>

(continued on next page)
<table>
<thead>
<tr>
<th>Power (1-β)</th>
<th>Effect Size (w)</th>
<th>df = 10</th>
<th>df = 12</th>
<th>df = 14</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
<td>0.4</td>
</tr>
<tr>
<td>0.50</td>
<td>1110</td>
<td>233</td>
<td>103</td>
<td>58</td>
</tr>
<tr>
<td>0.60</td>
<td>1126</td>
<td>282</td>
<td>125</td>
<td>70</td>
</tr>
<tr>
<td>0.70</td>
<td>1353</td>
<td>339</td>
<td>150</td>
<td>85</td>
</tr>
<tr>
<td>0.75</td>
<td>1639</td>
<td>411</td>
<td>181</td>
<td>102</td>
</tr>
<tr>
<td>0.80</td>
<td>1826</td>
<td>457</td>
<td>202</td>
<td>114</td>
</tr>
<tr>
<td>0.85</td>
<td>2072</td>
<td>519</td>
<td>229</td>
<td>129</td>
</tr>
<tr>
<td>0.90</td>
<td>2461</td>
<td>616</td>
<td>272</td>
<td>153</td>
</tr>
<tr>
<td>0.95</td>
<td>2883</td>
<td>714</td>
<td>330</td>
<td>182</td>
</tr>
<tr>
<td>0.99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>