Awesomeness Distribution of Two-sided P-values for the X^2 distribution with 1 d.f.

(C.Higgs, 9 June 2014)

Higher chi-squared (X^2) results indicate greater difference between observed values and those expected under the null hypothesis, with P-values indicating probability that an observed difference of such a magnitude could have arisen by chance. This table is intended for use with the Mantel Haenszel X^2 which only has 1 degree of freedom irrespective of strata.

X^2 test statistic: Cross reference approximate score result for corresponding *P* -value (e.g. for X^2=15.15, *P* =0.0001)

	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	
0.000	1.00	0.32	0.157	0.083	0.0455	0.0253	0.0143	0.0082	0.0047	0.0027	0.0016	0.00091	0.00053	0.00031	0.00018	0.00011	**0.000**
0.025	0.87	0.31	0.155	0.082	0.0448	**0.025**	0.0141	0.0080	0.0046	0.0027	0.0015	0.00090	0.00052	0.00031	0.00018	0.00011	**0.025**
0.050	0.82	0.31	0.152	0.081	0.0442	0.0246	0.0139	0.0079	0.0046	0.0026	0.0015	0.00089	0.00052	0.00030	0.00018	0.000105	**0.050**
0.075	0.78	0.30	0.150	0.080	0.0435	0.0243	0.0137	0.0078	0.0045	0.0026	0.0015	0.00087	0.00051	0.00030	0.00018	0.000103	**0.075**
0.100	0.75	0.29	0.147	0.078	0.0429	0.0239	0.0135	0.0077	0.0044	0.0026	0.0015	0.00086	**0.0005**	0.00030	0.00017	0.000102	**0.100**
0.125	0.72	0.29	0.145	0.077	0.0423	0.0236	0.0133	0.0076	0.0044	0.0025	0.0015	0.00085	0.000498	0.00029	0.00017	0.000101	**0.125**
0.150	0.70	0.28	0.143	0.076	0.0416	0.0232	0.0131	0.0075	0.0043	0.0025	0.0014	0.00084	0.00049	0.00029	0.00017	**0.0001**	**0.150**
0.175	0.68	0.28	0.140	0.075	0.0410	0.0229	0.0130	0.0074	0.0042	0.0025	0.0014	0.00083	0.00048	0.00028	0.00017	0.000098	**0.175**
0.200	0.65	0.27	0.138	0.074	0.0404	0.0226	0.0128	0.0073	0.0042	0.0024	0.0014	0.00082	0.00048	0.00028	0.00016	0.000097	**0.200**
0.225	0.64	0.27	0.136	0.073	0.0398	0.0223	0.0126	0.0072	0.0041	0.0024	0.0014	0.00081	0.00047	0.00028	0.00016	0.000095	**0.225**
0.250	0.62	0.26	0.134	0.071	0.0393	0.0219	0.0124	0.0071	0.0041	0.0024	0.0014	0.00080	0.00047	0.00027	0.00016	0.000094	**0.250**
0.275	0.60	0.26	0.131	0.070	0.0387	0.0216	0.0122	0.0070	0.0040	0.0023	0.0013	0.00079	0.00046	0.00027	0.00016	0.000093	**0.275**
0.300	0.58	0.254	0.129	0.069	0.0381	0.0213	0.0121	0.0069	0.0040	0.0023	0.0013	0.00078	0.00045	0.00027	0.00016	0.000092	**0.300**
0.325	0.57	**0.25**	0.127	0.068	0.0376	0.0210	0.0119	0.0068	0.0039	0.0023	0.0013	0.00076	0.00045	0.00026	0.00015	0.000091	**0.325**
0.350	0.55	0.245	0.125	0.067	0.0370	0.0207	0.0117	0.0067	0.0039	0.0022	0.0013	0.00075	0.00044	0.00026	0.00015	0.000089	**0.350**
0.375	0.54	0.241	0.123	0.066	0.0365	0.0204	0.0116	0.0066	0.0038	0.0022	0.0013	0.00074	0.00044	0.00026	0.00015	0.000088	**0.375**
0.400	0.53	0.237	0.121	0.065	0.0359	0.0201	0.0114	0.0065	0.0038	0.0022	0.0013	0.00073	0.00043	0.00025	0.00015	0.000087	**0.400**
0.425	0.51	0.233	0.119	0.064	0.0354	0.0199	0.0113	0.0064	0.0037	0.0021	0.0012	0.00072	0.00042	0.00025	0.00015	0.000086	**0.425**
0.450	**0.5**	0.229	0.118	0.063	0.0349	0.0196	0.0111	0.0063	0.0037	0.0021	0.0012	0.00071	0.00042	0.00025	0.00014	0.000085	**0.450**
0.475	0.49	0.225	0.116	0.062	0.0344	0.0193	0.0109	0.0063	0.0036	0.0021	0.0012	0.00071	0.00041	0.00024	0.00014	0.000084	**0.475**
0.500	0.48	0.221	0.114	0.061	0.0339	0.0190	0.0108	0.0062	0.0036	0.0021	0.0012	0.00070	0.00041	0.00024	0.00014	0.000083	**0.500**
0.525	0.47	0.217	0.112	0.060	0.0334	0.0187	0.0106	0.0061	0.0035	0.0020	0.0012	0.00069	0.00040	0.00024	0.00014	0.000081	**0.525**
0.550	0.46	0.213	0.110	0.060	0.0329	0.0185	0.0105	0.0060	0.0035	0.0020	0.0012	0.00068	0.00040	0.00023	0.00014	0.000080	**0.550**
0.575	0.45	0.209	0.109	0.059	0.0324	0.0182	0.0103	0.0059	0.0034	0.0020	0.0011	0.00067	0.00039	0.00023	0.00013	0.000079	**0.575**
0.600	0.44	0.206	0.107	0.058	0.0320	0.0180	0.0102	0.0058	0.0034	0.0019	0.0011	0.00066	0.00039	0.00023	0.00013	0.000078	**0.600**
0.625	0.43	0.202	0.105	0.057	0.0315	0.0177	**0.01**	0.0058	0.0033	0.0019	0.0011	0.00065	0.00038	0.00022	0.00013	0.000077	**0.625**
0.650	0.42	0.199	0.104	0.056	0.0311	0.0175	0.0099	0.0057	0.0033	0.0019	0.0011	0.00064	0.00038	0.00022	0.00013	0.000076	**0.650**
0.675	0.41	0.196	0.102	0.055	0.0306	0.0172	0.0098	0.0056	0.0032	0.0019	0.0011	0.00063	0.00037	0.00022	0.00013	0.000075	**0.675**
0.700	0.40	0.192	**0.1**	0.054	0.0302	0.0170	0.0096	0.0055	0.0032	0.0018	0.0011	0.00063	0.00037	0.00021	0.00013	0.000074	**0.700**
0.725	0.39	0.189	0.099	0.054	0.0297	0.0167	0.0095	0.0054	0.0031	0.0018	0.0011	0.00062	0.00036	0.00021	0.00012	0.000073	**0.725**
0.750	0.39	0.186	0.097	0.053	0.0293	0.0165	0.0094	0.0054	0.0031	0.0018	0.00104	0.00061	0.00036	0.00021	0.00012	0.000072	**0.750**
0.775	0.38	0.183	0.096	0.052	0.0289	0.0163	0.0092	0.0053	0.0031	0.0018	0.00103	0.00060	0.00035	0.00021	0.00012	0.000071	**0.775**
0.800	0.37	0.180	0.094	0.051	0.0285	0.0160	0.0091	0.0052	0.0030	0.0017	0.00102	0.00059	0.00035	0.00020	0.00012	0.000070	**0.800**
0.825	0.36	0.177	0.093	**0.05**	0.0280	0.0158	0.0090	0.0052	0.0030	0.0017	**0.001**	0.00058	0.00034	0.00020	0.00012	0.000069	**0.825**
0.850	0.36	0.174	0.091	0.0497	0.0276	0.0156	0.0089	0.0051	0.0029	0.0017	0.00099	0.00058	0.00034	0.00020	0.00012	0.000069	**0.850**
0.875	0.35	0.171	0.090	0.0490	0.0272	0.0154	0.0087	**0.005**	0.0029	0.0017	0.00097	0.00057	0.00033	0.00020	0.00011	0.000068	**0.875**
0.900	0.34	0.168	0.089	0.0483	0.0269	0.0151	0.0086	0.0049	0.0029	0.0017	0.00096	0.00056	0.00033	0.00019	0.00011	0.000067	**0.900**
0.925	0.34	0.165	0.087	0.0476	0.0265	0.0149	0.0085	0.0049	0.0028	0.0016	0.00095	0.00055	0.00032	0.00019	0.00011	0.000066	**0.925**
0.950	0.33	0.163	0.086	0.0469	0.0261	0.0147	0.0084	0.0048	0.0028	0.0016	0.00094	0.00055	0.00032	0.00019	0.00011	0.000065	**0.950**
0.975	0.32	0.160	0.085	0.0462	0.0257	0.0145	0.0083	0.0047	0.0027	0.0016	0.00092	0.00054	0.00032	0.00019	0.00011	0.000064	**0.975**
	0.0	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**	**6.0**	**7.0**	**8.0**	**9.0**	**10.0**	**11.0**	**12.0**	**13.0**	**14.0**	**15.0**	

Summary of percentage points of the X2 distribution for d.f. = 1

	The probability that the observed difference in percentages resulting in the outcome could have arisen by chance, if there were no real difference between two exposures is less than:										
	100%	50%	25%	10%	5%	2.5%	1%	0.5%	0.1%	0.05%	0.01%
X^2 of > than:	0	0.45	1.32	2.71	3.84	5.02	6.63	7.88	10.83	12.1	15.136
P-value of < than:	1	0.5	0.25	0.1	0.05	0.025	0.01	0.005	0.001	0.0005	0.0001

$$X^2_{MH} = \frac{(Observed - Expected)^2}{\sum Variance}, where\ Observed = \sum d_{1i}, and\ Expected = \sum \frac{d_i \times n_{1i}}{n_i}$$ (K & S, p184)

Quick Formula for chi-squared (X^2) $= \frac{n(d_1 h_0 - d_0 h_1)^2}{dhn_1 n_0}$ (K & S, p167)

Note that *n* should be >40, else use continuity correction

Kirkwood and Sterne example:

"A total *O* =60 persons in rural areas had antibodies to leptospirosis compared with an expected total of *E* =49.07, based on assuming no difference in prevalence between rural and urban areas. Thus the Mantel-Haenszel X^2 statistic is [formula] 7.82, d.f.=1, *P* =0.0052. After controlling for gender, there is good evidence of an increase in the prevalence of antibodies to leptospirosis among those living in rural compared to urban areas."

References:

Kirkwood BR, Sterne JAC. Essential medical statistics. Malden: Blackwell Science; 2003.