

Customisable Tables for Sample Size Planning

Sample Size Planning with the Wald, Wilson, Clopper-Pearson and Bayesian Methods

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2026-10-15

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1 Methodological Context of the Sample Size Tables

This report provides standardised reference tables for planning epidemiological prevalence studies (Cochran, 1977; Dohoo et al., 2003; Thrusfield et al., 2018). It is part of a framework for sample size planning of binomially distributed traits (Kulig et al., 2026). To provide a sound methodological basis, the sample sizes are calculated in parallel with four different interval methods. Tool B provides overview tables; detailed planning for a specific scenario is carried out with Tool A of the framework.

In the present configuration, the **finite population correction (FPC)** is applied. All values have been adjusted to the herd size (N) given in the respective row group (Cochran, 1977; Kish, 1965). Cluster effects are not taken into account (simple random sampling). In general, the sample size is calculated as

$$n = \frac{n_{\infty} \cdot D_{eff}}{1 + (n_{\infty} \cdot D_{eff} - 1)/N},$$

where n_{∞} is the sample size for an infinite population and simple random sampling. For the Wilson, Clopper-Pearson and Bayesian methods, n_{∞} is the smallest sample size whose interval width does not exceed twice the margin of error. Without FPC the denominator equals 1; without cluster sampling $D_{eff} = 1$.

1.1 Comparison of the Four Statistical Methods

1. **Wald / Cochran (normal approximation):** The most widely used standard method (Cochran, 1977). It goes back to Laplace (1812) and is named after the Wald test (Wald, 1943), from whose inversion the interval results (Agresti & Coull, 1998). It assumes that the estimated prevalence is symmetrically and normally distributed. **Limitation:** For small samples and prevalences near the boundaries (here operationalised as below 20 % or above 80 %), the actual coverage falls considerably below the nominal level, and confidence limits below 0 % or above 100 % can occur (Brown et al., 2001; Newcombe, 1998).
2. **Wilson score interval:** Derived by inverting the score test instead of the Wald test (Wilson, 1927). It takes the asymmetry of the binomial distribution into account and shifts the centre of the interval slightly towards 50 %. **Recommendation:** Its actual coverage is close to the nominal level across the whole range of proportions; it is therefore recommended as the default approximate method, particularly near the boundaries (Agresti, 2007; Brown et al., 2001; Newcombe, 1998).
3. **Clopper-Pearson (exact method):** Uses no approximation but derives the interval directly from the exact binomial distribution (Clopper & Pearson, 1934). **Characteristics:** Strictly conservative. It always guarantees at least the selected confidence level but tends to require systematically larger samples than approximate methods (Agresti & Coull, 1998; Brown et al., 2001).
4. **Bayesian credible interval:** Allows prior knowledge to be integrated via the conjugate Beta-binomial model (Gelman et al., 2013; Joseph et al., 2008). The present tables use the prior **Beta(1, 1)**. **Interpretation:** This corresponds to prior knowledge from 2 examined animals, of which 1 were positive. With the flat prior Beta(1,1), the method behaves similarly to the frequentist methods for moderate sample sizes (Gelman et al., 2013). Bayesian approaches to sample size determination for binomial proportions are described by Joseph et al. (1995) and Joseph et al. (2008).

1.2 Cluster Sampling and Design Effect

In livestock farming, animals are usually kept in groups such as pens. Animals within the same pen share management, feeding and microclimate and are therefore more similar to each other than animals from different pens (Dohoo et al., 2003; Thrusfield et al., 2018). This similarity is described by the intra-class correlation coefficient (ICC, ρ). It reduces the information content of the sample, which is compensated for by the design effect (Kish, 1965):

$$D_{eff} = 1 + (m - 1) \cdot \rho$$

The design effect inflates the variance of the estimate. It is therefore applied to the infinite-population sample size first, and the FPC is applied afterwards (Cochran, 1977; Kish, 1965). If cluster sampling is activated, a complete set of tables is generated for each configured value of ρ with a fixed number of 10 animals per pen, in addition to the tables for simple random sampling. These tables are intended as an overview; scenarios with other pen sizes are planned with Tool A.

1.3 Rounding Up (Ceiling) vs. Rounding Down (Floor)

Applying the finite population correction and the design effect generally yields non-integer sample sizes (e.g. 45.7 animals). For practical use in the field, integer values are required. Each method is therefore presented in a “rounded up” and a “rounded down” table:

- **Rounded up (ceiling):** Always achieves at least the required precision (conservative planning).
- **Rounded down (floor):** Often preferred for economic or animal welfare reasons (minimising the number of animals handled), accepting that the resulting interval may be marginally wider than the targeted margin of error.

1.4 Census (“N”)

With the finite population correction, the calculated sample size can approach but never exceed the herd size (N). If the rounded sample size reaches the herd size, which frequently occurs with strict precision requirements in small herds, the table shows the value “N”. This indicates that a **census** of the entire herd is required to achieve the targeted statistical parameters. The value “n/a” would indicate that no sample size could be determined within the search range.

1.5 Reading Guide for the Tables

- **Row groups:** The herd size N (or “Infinite population” if the FPC is deactivated).
- **Prev. (%) (first column):** The prevalence estimated a priori from the literature or experience.
- **% CI (main headings):** The targeted confidence level.
- **± pp (subheadings):** The maximum accepted margin of error in percentage points. A value of ±5 pp at a prevalence of 20 % means that the confidence interval after the study is expected to lie approximately between 15 % and 25 %.

2 Simple Random Sampling ($D_{eff} = 1$)

The tables in this section assume simple random sampling of individual animals.

2.1 Wald / Cochran: Rounded Up (Ceiling)

Wald / Cochran: rounded up

Prev. (%)	90 % CI				95 % CI				99 % CI			
	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp
N = 100												
1	74	41	10	3	80	49	14	4	87	63	21	7
5	93	77	35	12	95	83	43	16	97	89	57	25
10	97	87	50	20	98	90	59	26	99	94	71	38
20	98	92	64	31	99	94	72	39	N	97	82	52
30	99	94	70	37	99	96	77	45	N	98	85	59
40	99	95	73	40	99	96	79	49	N	98	87	62
50	99	95	74	41	99	97	80	50	N	98	88	63
60	99	95	73	40	99	96	79	49	N	98	87	62
70	99	94	70	37	99	96	77	45	N	98	85	59
80	98	92	64	31	99	94	72	39	N	97	82	52
90	97	87	50	20	98	90	59	26	99	94	71	38
95	93	77	35	12	95	83	43	16	97	89	57	25
99	74	41	10	3	80	49	14	4	87	63	21	7
N = 200												
1	115	51	11	3	132	65	15	4	154	91	24	7
5	174	124	42	13	181	140	54	17	189	160	78	28
10	185	151	66	22	190	163	83	30	194	177	110	47
20	192	169	94	36	194	178	111	48	197	187	137	70
30	194	176	107	45	196	183	124	58	198	190	148	83
40	195	179	114	50	196	185	130	64	198	191	153	89
50	195	179	116	51	196	185	132	66	198	191	154	91
60	195	179	114	50	196	185	130	64	198	191	153	89
70	194	176	107	45	196	183	124	58	198	190	148	83
80	192	169	94	36	194	178	111	48	197	187	137	70
90	185	151	66	22	190	163	83	30	194	177	110	47
95	174	124	42	13	181	140	54	17	189	160	78	28
99	115	51	11	3	132	65	15	4	154	91	24	7
N = 600												
1	186	61	11	3	234	83	15	4	314	130	26	7
5	410	210	48	13	452	260	66	18	505	341	105	30
10	482	303	84	24	512	355	113	33	546	429	172	55
20	528	387	135	41	547	432	175	56	568	490	249	91
30	543	423	166	52	559	463	211	72	576	512	290	114
40	550	439	182	59	564	477	229	81	579	522	310	127
50	552	444	187	61	565	481	235	83	580	525	316	131
60	550	439	182	59	564	477	229	81	579	522	310	127
70	543	423	166	52	559	463	211	72	576	512	290	114
80	528	387	135	41	547	432	175	56	568	490	249	91
90	482	303	84	24	512	355	113	33	546	429	172	55
95	410	210	48	13	452	260	66	18	505	341	105	30
99	186	61	11	3	234	83	15	4	314	130	26	7
N = 1000												
1	212	63	11	3	276	87	15	4	397	142	26	7
5	563	244	49	13	647	314	69	18	760	441	113	31
10	710	379	89	24	776	464	122	34	857	600	193	57
20	813	520	148	42	861	607	198	58	914	727	299	97
30	851	588	186	54	890	669	245	75	934	778	359	123
40	867	620	207	62	903	698	270	85	941	800	390	138
50	872	629	214	64	906	707	278	88	944	806	400	143
60	867	620	207	62	903	698	270	85	941	800	390	138
70	851	588	186	54	890	669	245	75	934	778	359	123
80	813	520	148	42	861	607	198	58	914	727	299	97
90	710	379	89	24	776	464	122	34	857	600	193	57
95	563	244	49	13	647	314	69	18	760	441	113	31
99	212	63	11	3	276	87	15	4	397	142	26	7

2.2 Wald / Cochran: Rounded Down (Floor)

Wald / Cochran: rounded down

Prev. (%)	90 % CI				95 % CI				99 % CI			
	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp
N = 100												
1	73	40	9	2	79	48	13	3	86	62	20	6
5	92	76	34	11	94	82	42	15	96	88	56	24
10	96	86	49	19	97	89	58	25	98	93	70	37
20	97	91	63	30	98	93	71	38	99	96	81	51
30	98	93	69	36	98	95	76	44	99	97	84	58
40	98	94	72	39	98	95	78	48	99	97	86	61
50	98	94	73	40	98	96	79	49	99	97	87	62
60	98	94	72	39	98	95	78	48	99	97	86	61
70	98	93	69	36	98	95	76	44	99	97	84	58
80	97	91	63	30	98	93	71	38	99	96	81	51
90	96	86	49	19	97	89	58	25	98	93	70	37
95	92	76	34	11	94	82	42	15	96	88	56	24
99	73	40	9	2	79	48	13	3	86	62	20	6
N = 200												
1	114	50	10	2	131	64	14	3	153	90	23	6
5	173	123	41	12	180	139	53	16	188	159	77	27
10	184	150	65	21	189	162	82	29	193	176	109	46
20	191	168	93	35	193	177	110	47	196	186	136	69
30	193	175	106	44	195	182	123	57	197	189	147	82
40	194	178	113	49	195	184	129	63	197	190	152	88
50	194	178	115	50	195	184	131	65	197	190	153	90
60	194	178	113	49	195	184	129	63	197	190	152	88
70	193	175	106	44	195	182	123	57	197	189	147	82
80	191	168	93	35	193	177	110	47	196	186	136	69
90	184	150	65	21	189	162	82	29	193	176	109	46
95	173	123	41	12	180	139	53	16	188	159	77	27
99	114	50	10	2	131	64	14	3	153	90	23	6
N = 600												
1	185	60	10	2	233	82	14	3	313	129	25	6
5	409	209	47	12	451	259	65	17	504	340	104	29
10	481	302	83	23	511	354	112	32	545	428	171	54
20	527	386	134	40	546	431	174	55	567	489	248	90
30	542	422	165	51	558	462	210	71	575	511	289	113
40	549	438	181	58	563	476	228	80	578	521	309	126
50	551	443	186	60	564	480	234	82	579	524	315	130
60	549	438	181	58	563	476	228	80	578	521	309	126
70	542	422	165	51	558	462	210	71	575	511	289	113
80	527	386	134	40	546	431	174	55	567	489	248	90
90	481	302	83	23	511	354	112	32	545	428	171	54
95	409	209	47	12	451	259	65	17	504	340	104	29
99	185	60	10	2	233	82	14	3	313	129	25	6
N = 1000												
1	211	62	10	2	275	86	14	3	396	141	25	6
5	562	243	48	12	646	313	68	17	759	440	112	30
10	709	378	88	23	775	463	121	33	856	599	192	56
20	812	519	147	41	860	606	197	57	913	726	298	96
30	850	587	185	53	889	668	244	74	933	777	358	122
40	866	619	206	61	902	697	269	84	940	799	389	137
50	871	628	213	63	905	706	277	87	943	805	399	142
60	866	619	206	61	902	697	269	84	940	799	389	137
70	850	587	185	53	889	668	244	74	933	777	358	122
80	812	519	147	41	860	606	197	57	913	726	298	96
90	709	378	88	23	775	463	121	33	856	599	192	56
95	562	243	48	12	646	313	68	17	759	440	112	30
99	211	62	10	2	275	86	14	3	396	141	25	6

2.3 Wilson score interval: Rounded Up (Ceiling)

Wilson score interval: rounded up

Prev. (%)	90 % CI				95 % CI				99 % CI			
	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp
N = 100												
1	77	52	24	11	83	61	31	15	89	73	43	24
5	93	77	38	16	95	83	46	21	97	90	60	31
10	97	87	51	21	98	90	59	28	99	94	72	40
20	98	92	64	31	99	94	72	38	N	97	81	52
30	99	94	70	36	99	96	77	45	N	98	85	58
40	99	95	73	39	99	96	79	48	N	98	87	61
50	99	95	74	40	99	97	80	49	N	98	87	62
60	99	95	73	39	99	96	79	48	N	98	87	61
70	99	94	70	36	99	96	77	45	N	98	85	58
80	98	92	64	31	99	94	72	38	N	97	81	52
90	97	87	51	21	98	90	59	28	99	94	72	40
95	93	77	38	16	95	83	46	21	97	90	60	31
99	77	52	24	11	83	61	31	15	89	73	43	24
N = 200												
1	124	70	27	12	140	86	36	16	160	113	54	27
5	174	125	46	17	181	141	59	23	189	161	84	36
10	185	151	67	24	190	163	83	32	194	177	111	49
20	192	169	93	36	194	178	111	47	197	187	136	69
30	194	176	107	44	196	183	124	57	198	190	148	81
40	195	179	113	49	196	185	130	62	198	191	153	87
50	195	179	115	50	196	185	132	64	198	191	154	90
60	195	179	113	49	196	185	130	62	198	191	153	87
70	194	176	107	44	196	183	124	57	198	190	148	81
80	192	169	93	36	194	178	111	47	197	187	136	69
90	185	151	67	24	190	163	83	32	194	177	111	49
95	174	125	46	17	181	141	59	23	189	161	84	36
99	124	70	27	12	140	86	36	16	160	113	54	27
N = 600												
1	209	91	29	12	259	121	41	17	341	181	66	29
5	411	214	54	18	453	264	74	25	505	345	117	41
10	482	303	86	25	512	356	115	35	546	429	174	58
20	528	387	134	41	547	432	175	55	568	490	248	89
30	543	422	165	51	559	463	209	70	576	512	288	110
40	550	439	181	58	564	477	228	78	579	522	308	123
50	552	443	186	59	565	481	234	81	580	525	314	127
60	550	439	181	58	564	477	228	78	579	522	308	123
70	543	422	165	51	559	463	209	70	576	512	288	110
80	528	387	134	41	547	432	175	55	568	490	248	89
90	482	303	86	25	512	356	115	35	546	429	174	58
95	411	214	54	18	453	264	74	25	505	345	117	41
99	209	91	29	12	259	121	41	17	341	181	66	29
N = 1000												
1	243	96	30	12	313	131	42	17	440	206	69	30
5	565	249	56	18	648	320	77	25	761	448	126	42
10	710	380	91	26	777	465	124	36	857	600	197	61
20	813	520	147	42	861	606	197	57	914	727	297	95
30	851	587	185	53	890	669	243	73	934	777	356	119
40	867	619	206	60	903	698	269	82	941	800	388	133
50	872	629	212	62	906	706	277	86	944	806	397	139
60	867	619	206	60	903	698	269	82	941	800	388	133
70	851	587	185	53	890	669	243	73	934	777	356	119
80	813	520	147	42	861	606	197	57	914	727	297	95
90	710	380	91	26	777	465	124	36	857	600	197	61
95	565	249	56	18	648	320	77	25	761	448	126	42
99	243	96	30	12	313	131	42	17	440	206	69	30

2.4 Wilson score interval: Rounded Down (Floor)

Wilson score interval: rounded down

Prev. (%)	90 % CI				95 % CI				99 % CI			
	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp
N = 100												
1	76	51	23	10	82	60	30	14	88	72	42	23
5	92	76	37	15	94	82	45	20	96	89	59	30
10	96	86	50	20	97	89	58	27	98	93	71	39
20	97	91	63	30	98	93	71	37	99	96	80	51
30	98	93	69	35	98	95	76	44	99	97	84	57
40	98	94	72	38	98	95	78	47	99	97	86	60
50	98	94	73	39	98	96	79	48	99	97	86	61
60	98	94	72	38	98	95	78	47	99	97	86	60
70	98	93	69	35	98	95	76	44	99	97	84	57
80	97	91	63	30	98	93	71	37	99	96	80	51
90	96	86	50	20	97	89	58	27	98	93	71	39
95	92	76	37	15	94	82	45	20	96	89	59	30
99	76	51	23	10	82	60	30	14	88	72	42	23
N = 200												
1	123	69	26	11	139	85	35	15	159	112	53	26
5	173	124	45	16	180	140	58	22	188	160	83	35
10	184	150	66	23	189	162	82	31	193	176	110	48
20	191	168	92	35	193	177	110	46	196	186	135	68
30	193	175	106	43	195	182	123	56	197	189	147	80
40	194	178	112	48	195	184	129	61	197	190	152	86
50	194	178	114	49	195	184	131	63	197	190	153	89
60	194	178	112	48	195	184	129	61	197	190	152	86
70	193	175	106	43	195	182	123	56	197	189	147	80
80	191	168	92	35	193	177	110	46	196	186	135	68
90	184	150	66	23	189	162	82	31	193	176	110	48
95	173	124	45	16	180	140	58	22	188	160	83	35
99	123	69	26	11	139	85	35	15	159	112	53	26
N = 600												
1	208	90	28	11	258	120	40	16	340	180	65	28
5	410	213	53	17	452	263	73	24	504	344	116	40
10	481	302	85	24	511	355	114	34	545	428	173	57
20	527	386	133	40	546	431	174	54	567	489	247	88
30	542	421	164	50	558	462	208	69	575	511	287	109
40	549	438	180	57	563	476	227	77	578	521	307	122
50	551	442	185	58	564	480	233	80	579	524	313	126
60	549	438	180	57	563	476	227	77	578	521	307	122
70	542	421	164	50	558	462	208	69	575	511	287	109
80	527	386	133	40	546	431	174	54	567	489	247	88
90	481	302	85	24	511	355	114	34	545	428	173	57
95	410	213	53	17	452	263	73	24	504	344	116	40
99	208	90	28	11	258	120	40	16	340	180	65	28
N = 1000												
1	242	95	29	11	312	130	41	16	439	205	68	29
5	564	248	55	17	647	319	76	24	760	447	125	41
10	709	379	90	25	776	464	123	35	856	599	196	60
20	812	519	146	41	860	605	196	56	913	726	296	94
30	850	586	184	52	889	668	242	72	933	776	355	118
40	866	618	205	59	902	697	268	81	940	799	387	132
50	871	628	211	61	905	705	276	85	943	805	396	138
60	866	618	205	59	902	697	268	81	940	799	387	132
70	850	586	184	52	889	668	242	72	933	776	355	118
80	812	519	146	41	860	605	196	56	913	726	296	94
90	709	379	90	25	776	464	123	35	856	599	196	60
95	564	248	55	17	647	319	76	24	760	447	125	41
99	242	95	29	11	312	130	41	16	439	205	68	29

2.5 Clopper-Pearson: Rounded Up (Ceiling)

Clopper-Pearson: rounded up

Prev. (%)	90 % CI				95 % CI				99 % CI			
	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp
N = 100												
1	78	54	23	13	84	59	27	15	89	70	42	20
5	94	79	41	19	96	84	48	21	98	90	60	31
10	97	87	54	25	98	91	62	30	99	94	73	40
20	98	92	66	34	99	95	73	42	N	97	82	54
30	99	94	72	40	99	96	78	48	N	98	86	60
40	99	95	74	43	99	96	80	51	N	98	87	63
50	99	95	75	44	99	97	81	52	N	98	88	64
60	99	95	74	43	99	96	80	51	N	98	87	63
70	99	94	72	40	99	96	78	48	N	98	86	60
80	98	92	66	34	99	95	73	42	N	97	82	54
90	97	87	54	25	98	91	62	30	99	94	73	42
95	94	79	41	19	96	84	48	21	98	90	60	31
99	78	54	23	13	84	59	27	15	89	70	42	20
N = 200												
1	127	74	26	14	143	82	31	16	159	107	53	22
5	175	130	51	20	182	144	62	24	189	162	85	36
10	186	154	73	28	190	165	89	35	194	178	114	50
20	192	171	98	41	194	178	115	53	197	187	138	73
30	194	177	111	50	196	183	127	62	198	190	149	85
40	195	179	117	54	196	185	132	67	198	191	154	91
50	195	180	119	56	196	185	134	69	198	191	155	93
60	195	179	117	54	196	185	132	67	198	191	154	91
70	194	177	111	50	196	183	127	62	198	190	149	85
80	192	171	98	41	194	178	115	53	197	187	138	73
90	186	154	73	28	190	165	88	35	194	178	113	53
95	175	130	51	20	182	144	62	24	189	162	85	36
99	127	74	26	14	143	82	31	16	159	107	53	22
N = 600												
1	220	98	28	14	273	112	35	17	334	165	64	24
5	419	228	61	22	458	275	77	25	507	351	117	41
10	486	315	96	31	514	363	126	40	547	433	182	59
20	529	393	146	48	548	436	185	63	569	492	255	95
30	544	427	175	60	559	466	218	77	576	513	294	118
40	551	442	191	66	564	479	236	86	579	523	313	131
50	552	447	196	68	566	483	241	89	580	525	319	134
60	551	442	191	66	564	479	236	86	579	523	313	131
70	544	427	175	59	559	466	218	77	576	513	294	117
80	529	393	146	48	548	436	185	63	569	492	255	95
90	486	314	96	31	514	363	124	40	547	433	180	63
95	419	228	61	22	458	275	77	25	507	351	117	41
99	220	98	28	14	273	112	35	17	334	165	64	24
N = 1000												
1	257	105	29	14	334	121	35	17	429	185	67	24
5	581	269	63	22	659	336	81	26	765	458	127	42
10	718	398	103	32	781	478	138	41	859	607	206	62
20	816	531	161	49	863	614	210	66	915	730	307	101
30	853	596	198	62	891	674	255	81	934	780	365	128
40	869	626	218	69	904	702	279	91	942	802	396	143
50	873	636	225	71	907	711	287	95	944	808	406	147
60	869	626	218	69	904	702	279	91	942	802	396	143
70	853	596	197	62	891	674	255	81	934	780	365	127
80	816	531	161	49	863	614	210	66	915	730	307	101
90	718	397	103	32	781	478	135	41	859	607	204	66
95	581	269	63	22	659	336	81	26	765	458	127	42
99	257	105	29	14	334	121	35	17	429	185	67	24

2.6 Clopper-Pearson: Rounded Down (Floor)

Clopper-Pearson: rounded down

Prev. (%)	90 % CI				95 % CI				99 % CI			
	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp
N = 100												
1	77	53	22	12	83	58	26	14	88	69	41	19
5	93	78	40	18	95	83	47	20	97	89	59	30
10	96	86	53	24	97	90	61	29	98	93	72	39
20	97	91	65	34	98	94	72	41	99	96	81	53
30	98	93	71	40	98	95	77	47	99	97	85	59
40	98	94	73	42	98	95	79	50	99	97	86	62
50	98	94	74	43	98	96	80	51	99	97	87	63
60	98	94	73	42	98	95	79	50	99	97	86	62
70	98	93	71	39	98	95	77	47	99	97	85	59
80	97	91	65	34	98	94	72	41	99	96	81	53
90	96	86	53	24	97	90	61	29	98	93	72	41
95	93	78	40	18	95	83	47	20	97	89	59	30
99	77	53	22	12	83	58	26	14	88	69	41	19
N = 200												
1	126	73	25	13	142	81	30	15	158	106	52	21
5	174	129	50	19	181	143	61	23	188	161	84	35
10	185	153	72	27	189	164	88	34	193	177	113	49
20	191	170	97	40	193	177	114	52	196	186	137	72
30	193	176	110	49	195	182	126	61	197	189	148	84
40	194	178	116	53	195	184	131	66	197	190	153	90
50	194	179	118	55	195	184	133	68	197	190	154	92
60	194	178	116	53	195	184	131	66	197	190	153	90
70	193	176	110	49	195	182	126	61	197	189	148	84
80	191	170	97	40	193	177	114	52	196	186	137	72
90	185	153	72	27	189	164	87	34	193	177	112	52
95	174	129	50	19	181	143	61	23	188	161	84	35
99	126	73	25	13	142	81	30	15	158	106	52	21
N = 600												
1	219	97	27	13	272	111	34	16	333	164	63	23
5	418	227	60	21	457	274	76	24	506	350	116	40
10	485	314	95	30	513	362	125	39	546	432	181	58
20	528	392	145	47	547	435	184	62	568	491	254	94
30	543	426	174	59	558	465	217	76	575	512	293	117
40	550	441	190	65	563	478	235	85	578	522	312	130
50	551	446	195	67	565	482	240	88	579	525	318	133
60	550	441	190	65	563	478	235	85	578	522	312	130
70	543	426	174	58	558	465	217	76	575	512	293	116
80	528	392	145	47	547	435	184	62	568	491	254	94
90	485	313	95	30	513	362	123	39	546	432	179	62
95	418	227	60	21	457	274	76	24	506	350	116	40
99	219	97	27	13	272	111	34	16	333	164	63	23
N = 1000												
1	256	104	28	13	333	120	34	16	428	184	66	23
5	580	268	62	21	658	335	80	25	764	457	126	41
10	717	397	102	31	780	477	137	40	858	606	205	61
20	815	530	160	48	862	613	209	65	914	730	306	100
30	852	595	197	61	890	673	254	80	933	779	364	127
40	868	625	217	68	903	701	278	90	941	801	395	142
50	872	635	224	70	906	710	286	94	943	807	405	146
60	868	625	217	68	903	701	278	90	941	801	395	142
70	852	595	196	61	890	673	254	80	933	779	364	126
80	815	530	160	48	862	613	209	65	914	730	306	100
90	717	396	102	31	780	477	134	40	858	606	203	65
95	580	268	62	21	658	335	80	25	764	457	126	41
99	256	104	28	13	333	120	34	16	428	184	66	23

2.7 Bayesian credible interval: Rounded Up (Ceiling)

Bayesian credible interval: rounded up

Prev. (%)	90 % CI				95 % CI				99 % CI			
	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp
N = 100												
1	77	52	22	12	82	57	26	14	88	69	34	19
5	93	77	38	17	95	83	46	20	97	89	57	29
10	97	87	51	20	98	90	59	26	99	94	71	39
20	98	92	64	30	99	94	72	38	N	97	81	52
30	99	94	70	36	99	96	77	45	N	98	85	58
40	99	95	73	39	99	96	79	48	N	98	87	62
50	99	95	74	40	99	97	80	49	N	98	87	63
60	99	95	73	39	99	96	79	48	N	98	87	62
70	99	94	70	37	99	96	77	45	N	98	85	58
80	98	92	64	30	99	94	72	38	N	97	81	52
90	97	87	51	20	98	90	59	26	99	94	71	39
95	93	77	38	17	95	83	46	20	97	89	57	29
99	77	52	22	12	82	57	26	14	88	69	34	19
N = 200												
1	123	70	24	13	137	80	30	15	157	105	41	21
5	174	125	47	18	181	140	59	22	189	161	80	34
10	185	151	67	22	190	163	83	30	194	177	110	47
20	192	169	93	35	194	178	111	47	197	187	136	70
30	194	176	107	44	196	183	124	57	198	190	148	81
40	195	179	113	49	196	185	130	63	198	191	153	88
50	195	179	115	50	196	185	132	64	198	191	154	90
60	195	179	113	49	196	185	130	63	198	191	153	88
70	194	176	107	44	196	183	124	57	198	190	148	82
80	192	169	93	35	194	178	111	47	197	187	136	70
90	185	151	67	22	190	163	83	30	194	177	110	47
95	174	125	47	18	181	140	59	22	189	161	80	34
99	123	70	24	13	137	80	30	15	157	105	41	21
N = 600												
1	208	91	26	13	250	107	33	16	328	161	47	23
5	410	212	55	19	452	262	73	24	505	344	107	38
10	482	303	86	24	512	355	115	33	546	429	173	56
20	528	387	134	40	547	432	175	55	568	490	248	90
30	543	422	165	51	559	463	209	70	576	512	289	111
40	550	439	181	58	564	477	228	79	579	522	309	124
50	552	443	186	59	565	481	234	81	580	525	315	128
60	550	439	181	58	564	477	228	79	579	522	309	124
70	543	422	164	52	559	463	209	70	576	512	289	112
80	528	387	134	40	547	432	175	55	568	490	248	90
90	482	303	86	24	512	355	115	33	546	429	173	56
95	410	212	55	19	452	262	73	24	505	344	107	38
99	208	91	26	13	250	107	33	16	328	161	47	23
N = 1000												
1	241	97	27	13	299	116	33	16	420	180	48	23
5	564	247	57	19	647	318	76	24	760	445	116	39
10	710	380	91	24	776	464	124	33	857	600	195	58
20	813	520	147	41	861	606	197	57	914	727	297	96
30	851	587	185	53	890	669	243	73	934	777	357	120
40	867	619	206	60	903	698	269	83	941	800	388	135
50	872	629	212	62	906	706	277	86	944	806	398	140
60	867	619	206	60	903	698	269	83	941	800	388	135
70	851	587	184	54	890	669	243	73	934	777	357	120
80	813	520	147	41	861	606	197	57	914	727	297	96
90	710	380	91	24	776	464	124	33	857	600	195	58
95	564	247	57	19	647	318	76	24	760	445	116	39
99	241	97	27	13	299	116	33	16	420	180	48	23

2.8 Bayesian credible interval: Rounded Down (Floor)

Bayesian credible interval: rounded down

Prev. (%)	90 % CI				95 % CI				99 % CI			
	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp	± 1 pp	± 2 pp	± 5 pp	± 10 pp
N = 100												
1	76	51	21	11	81	56	25	13	87	68	33	18
5	92	76	37	16	94	82	45	19	96	88	56	28
10	96	86	50	19	97	89	58	25	98	93	70	38
20	97	91	63	29	98	93	71	37	99	96	80	51
30	98	93	69	35	98	95	76	44	99	97	84	57
40	98	94	72	38	98	95	78	47	99	97	86	61
50	98	94	73	39	98	96	79	48	99	97	86	62
60	98	94	72	38	98	95	78	47	99	97	86	61
70	98	93	69	36	98	95	76	44	99	97	84	57
80	97	91	63	29	98	93	71	37	99	96	80	51
90	96	86	50	19	97	89	58	25	98	93	70	38
95	92	76	37	16	94	82	45	19	96	88	56	28
99	76	51	21	11	81	56	25	13	87	68	33	18
N = 200												
1	122	69	23	12	136	79	29	14	156	104	40	20
5	173	124	46	17	180	139	58	21	188	160	79	33
10	184	150	66	21	189	162	82	29	193	176	109	46
20	191	168	92	34	193	177	110	46	196	186	135	69
30	193	175	106	43	195	182	123	56	197	189	147	80
40	194	178	112	48	195	184	129	62	197	190	152	87
50	194	178	114	49	195	184	131	63	197	190	153	89
60	194	178	112	48	195	184	129	62	197	190	152	87
70	193	175	106	43	195	182	123	56	197	189	147	81
80	191	168	92	34	193	177	110	46	196	186	135	69
90	184	150	66	21	189	162	82	29	193	176	109	46
95	173	124	46	17	180	139	58	21	188	160	79	33
99	122	69	23	12	136	79	29	14	156	104	40	20
N = 600												
1	207	90	25	12	249	106	32	15	327	160	46	22
5	409	211	54	18	451	261	72	23	504	343	106	37
10	481	302	85	23	511	354	114	32	545	428	172	55
20	527	386	133	39	546	431	174	54	567	489	247	89
30	542	421	164	50	558	462	208	69	575	511	288	110
40	549	438	180	57	563	476	227	78	578	521	308	123
50	551	442	185	58	564	480	233	80	579	524	314	127
60	549	438	180	57	563	476	227	78	578	521	308	123
70	542	421	163	51	558	462	208	69	575	511	288	111
80	527	386	133	39	546	431	174	54	567	489	247	89
90	481	302	85	23	511	354	114	32	545	428	172	55
95	409	211	54	18	451	261	72	23	504	343	106	37
99	207	90	25	12	249	106	32	15	327	160	46	22
N = 1000												
1	240	96	26	12	298	115	32	15	419	179	47	22
5	563	246	56	18	646	317	75	23	759	444	115	38
10	709	379	90	23	775	463	123	32	856	599	194	57
20	812	519	146	40	860	605	196	56	913	726	296	95
30	850	586	184	52	889	668	242	72	933	776	356	119
40	866	618	205	59	902	697	268	82	940	799	387	134
50	871	628	211	61	905	705	276	85	943	805	397	139
60	866	618	205	59	902	697	268	82	940	799	387	134
70	850	586	183	53	889	668	242	72	933	776	356	119
80	812	519	146	40	860	605	196	56	913	726	296	95
90	709	379	90	23	775	463	123	32	856	599	194	57
95	563	246	56	18	646	317	75	23	759	444	115	38
99	240	96	26	12	298	115	32	15	419	179	47	22

3 References

- Agresti, A. (2007). *An introduction to categorical data analysis* (2nd ed., p. 372). John Wiley; Sons. <https://doi.org/10.1002/0470114754>
- Agresti, A., & Coull, B. A. (1998). Approximate is better than “exact” for interval estimation of binomial proportions. *The American Statistician*, 52(2), 119–126. <https://doi.org/10.2307/2685469>
- Brown, L. D., Cai, T. T., & DasGupta, A. (2001). Interval estimation for a binomial proportion. *Statistical Science*, 16(2). <https://doi.org/10.1214/ss/1009213286>
- Clopper, C. J., & Pearson, E. S. (1934). The use of confidence or fiducial limits illustrated in the case of the binomial. *Biometrika*, 26(4), 404. <https://doi.org/10.2307/2331986>
- Cochran, W. G. (1977). *Sampling techniques* (3rd ed.). John Wiley; Sons, Inc.
- Dohoo, I. Robert., Martin, S. Wayne., & Stryhn, Henrik. (2003). *Veterinary epidemiologic research* (p. 706). University of Prince Edward Island. <https://islandscholar.ca/islandora/object/ir%3Air-batch6-2657>
- Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). *Bayesian data analysis*. Chapman; Hall/CRC. <https://doi.org/10.1201/b16018>
- Joseph, L., M’Lan, C. E., & Wolfson, D. B. (2008). Bayesian sample size determination for binomial proportions. *Bayesian Analysis*, 3(2). <https://doi.org/10.1214/08-BA310>
- Joseph, L., Wolfson, D. B., & Du Berger, R. (1995). Sample size calculations for binomial proportions via highest posterior density intervals. *The Statistician*, 44(2), 143. <https://doi.org/10.2307/2348439>
- Kish, L. (1965). *Survey sampling* (p. 643). John Wiley; Sons, Inc.
- Kulig, B., Schäfer, B., Wilczek, U., Lange, A., Hensel, O., & Jung, L. (2026). *Statistical Framework not only for Precision Livestock Management and Ethology, but for performing Sample Size Calculation for Binomially Distributed Traits, Incorporating Simple Sample Size Planning, Post-Hoc Analysis, Confidence Interval Inflation, Baye*. DaKS, Universität Kassel.
- Laplace, P.-S. (1812). *Théorie analytique des probabilités*. Courcier.
- Newcombe, R. G. (1998). Two-sided confidence intervals for the single proportion: Comparison of seven methods. *Statistics in Medicine*, 17(8), 857–872. [https://doi.org/10.1002/\(SICI\)1097-0258\(19980430\)17:8%3C857::AID-SIM777%3E3.0.CO;2-E](https://doi.org/10.1002/(SICI)1097-0258(19980430)17:8%3C857::AID-SIM777%3E3.0.CO;2-E)
- Thrusfield, M., Christley, R., Brown, H., Diggle, P. J., French, N., Howe, K., Kelly, L., O’Connor, A., Wood, H., & Sargeant, J. (2018). *Veterinary epidemiology* (4th ed.). Wiley-Blackwell.
- Wald, A. (1943). Tests of statistical hypotheses concerning several parameters when the number of observations is large. *Transactions of the American Mathematical Society*, 54(3), 426–482. <https://doi.org/10.1090/S0002-9947-1943-0012401-3>
- Wilson, E. B. (1927). Probable inference, the law of succession, and statistical inference. *Journal of the American Statistical Association*, 22(158), 209. <https://doi.org/10.2307/2276774>