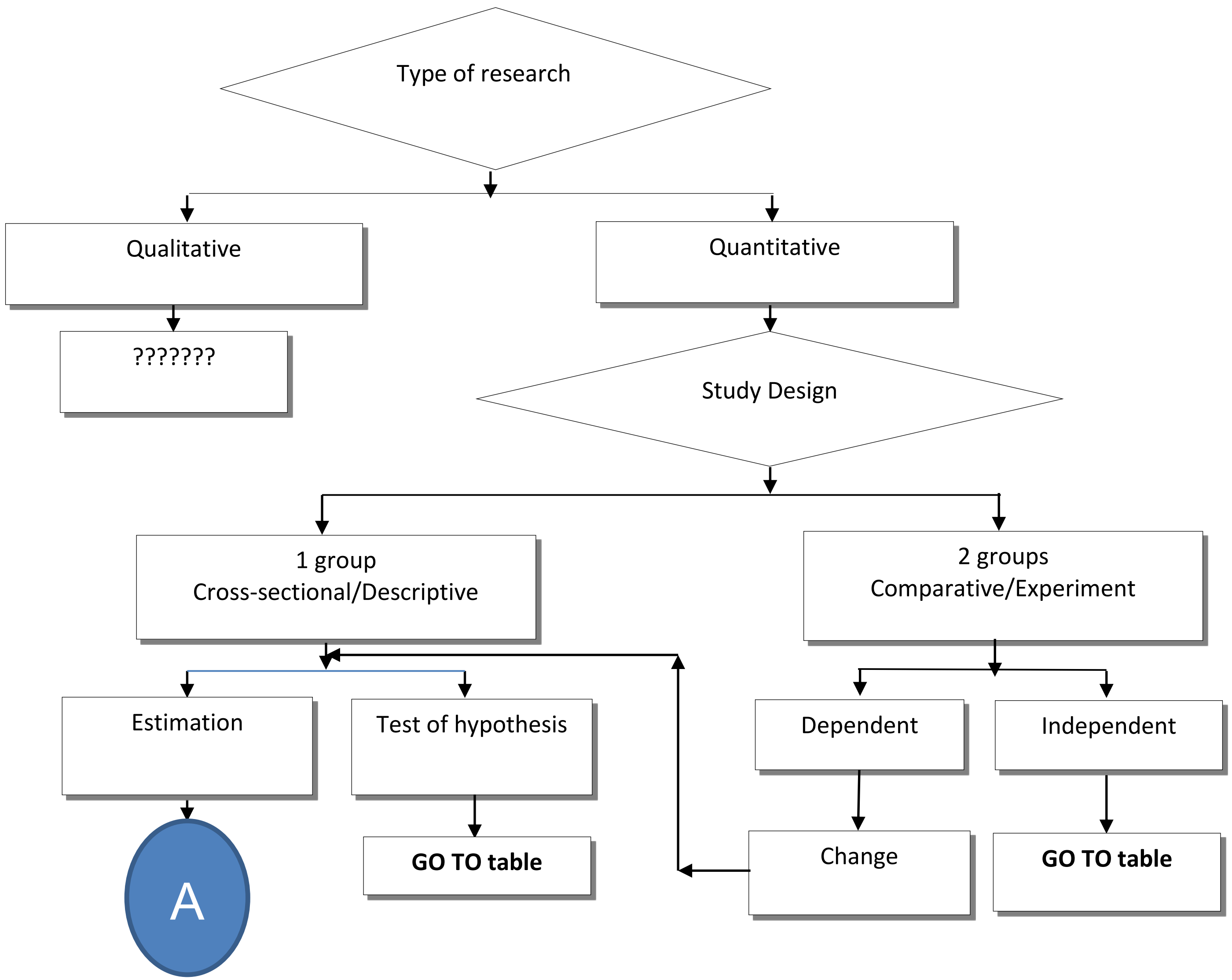
SAMPLE SIZE ESTIMATION



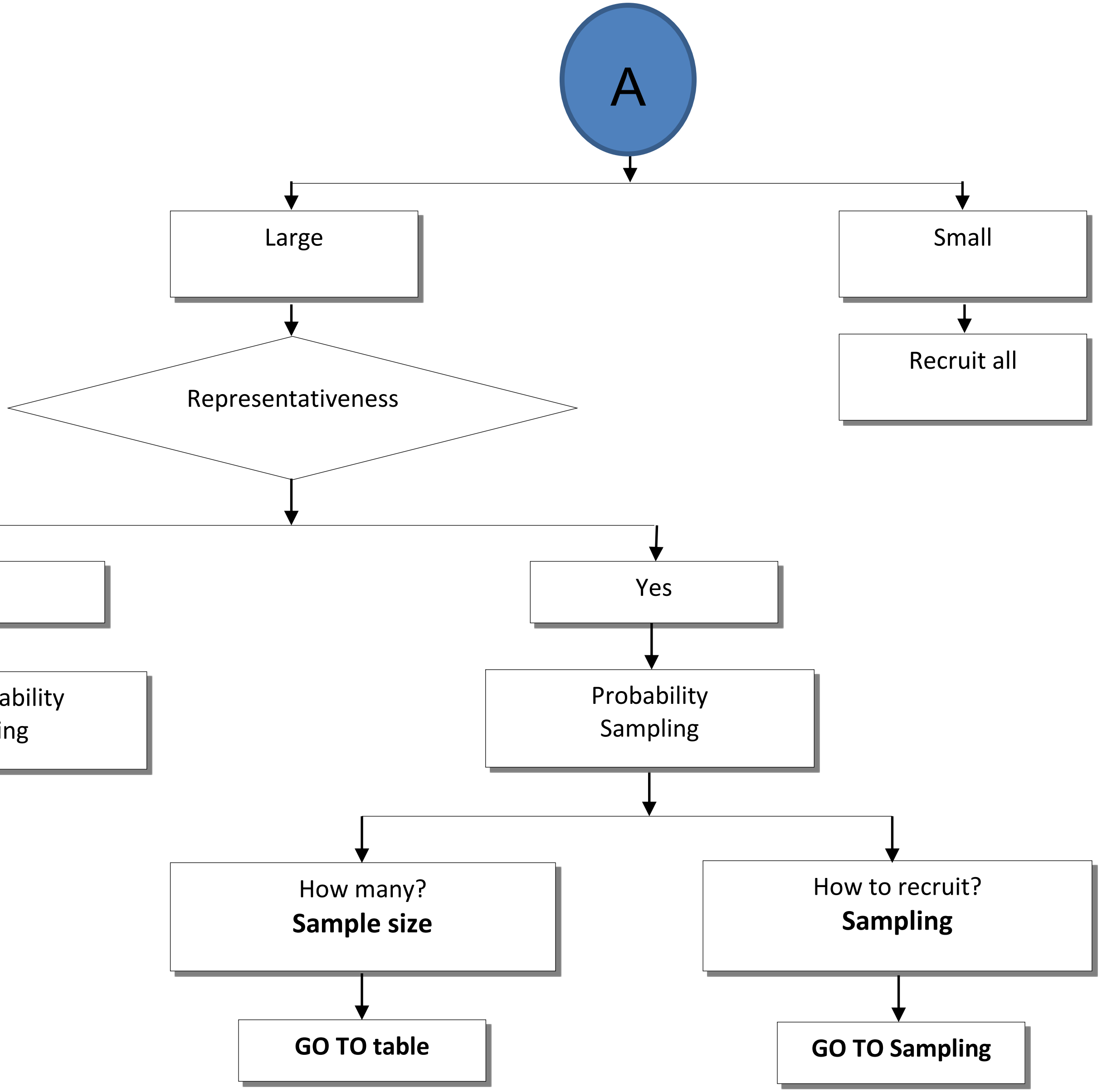

A
Large
Small
Recruit all
Representativeness
No
Yes
Non-probability Sampling
Probability Sampling
How many?
Sample size
How to recruit?
Sampling
GO TO table
GO TO Sampling

TABLE :Formulas for Sample Size Estimation

		Information needed	Formulas for Minimum Sample Size
I. Estimation			
	α	Type I - error	
1.1 Mean	μ	Population mean	1. Simple Random Sampling
	σ	Population standard deviation	1.1 Large size of population $n = \frac{z^2_{\alpha/2}\sigma^2}{d^2}$
	$\bar{x}$	Sample mean	1.2 Small size of population $n_f = \frac{n}{1+\frac{n}{N}}$
	d	Maximum allowable error = $\lvert \bar{x} - \mu \rvert$	2. Cluster sampling
	Deff.	Design Effect = $[\frac{s.e(\bar{x})_{cls}}{s.e(\bar{x})srs}]^2$	$n_{clus} = n_{srs} x Deff$
	N	Size of Population	n_{srs} = Sample size of Simple random sampling
1.2 Proportion	P	Population proportion	1. Simple Random Sampling
	p	Sample proportion	1.1 Large size of population $n = \frac{z^2_{\alpha/2}P(1-P)}{d^2}$
	d	Maximum allowable error = $\lvert P - p \rvert$	1.2 Small size of population $n_f = \frac{n}{1+\frac{n}{N}}$
	Deff.	Design Effect = $[\frac{s.e(p)_{clus}}{s.e(p)srs}]^2$	2. Cluster sampling
	N	Size of population	$n_{clus} = n_{srs} x Deff$
			n_{srs} = Sample size of Simple random sampling

	Information needed		Formulas for Minimum Sample Size
II. Significant results	α β	Type I - error Type II - error	
2.1 Single mean	$\mu_0 - \mu_a$ σ	Difference between μ_a mean under H_a, and μ_0 mean under H_o Standard deviation	$n = \frac{(z_\alpha + z_\beta)^2 \sigma^2}{(\mu_0 - \mu_a)^2}$
2.2 Single proportion	P_o-P_a	Difference between Pa proportion under H_a, and P_o proportion Ho	$n = \frac{[z_\alpha \sqrt{P_0(1-P_0)} + z_\beta \sqrt{P_a(1-P_a)}]^2}{(P_0 - P_a)^2}$
2.3 Single rate	P P_o	Rate Rate under H_o	$n = \frac{(z_\alpha + z_\beta)^2 P}{(P - P_0)^2}$ In this cases , n refers to the unit used for the denominator of the rate… person-year
2.4 Comparisons of two means	$\mu_1 - \mu_2$ σ_1, σ_2 c n_1,n_2	Difference between means of two groups (effect size) Standard deviations Ratio of the sample size of the two groups $c=n_2/n_1$ and $n_1=m$ Sample size of group 1 and of group 2	$m = \frac{(z_\alpha + z_\beta)^2 (\sigma_1^2 + \frac{\sigma_2^2}{c})}{(\mu_1 - \mu_2)^2}$

	Information needed		Formulas for Minimum Sample Size
2.5 Comparison of two Proportions	$P_1 - P_2$ c n_1, n_2 P	Difference between proportions of two groups (effect size) Ratio of the sample size of the two groups $c = n_2/n_1$ and $n_1 = m$ Sample size of group 1 and of group 2 Combined proportions $P = (P_1 + cP_2)/(c+1)$	$m = \dfrac{[z_\alpha\sqrt{\frac{(c+1)}{c}P(1-P)} + z_\beta\sqrt{P_1(1-P_1) + \frac{P_2(1-P_2)}{c}}]^2}{(P_1 - P_2)^2}$
2.6 Comparison of two rates	P_1, P_2 m	Rates of the two groups Sample size of each group	$m = \dfrac{(z_\alpha + z_\beta)^2(P_1 + P_2)}{(P_1 - P_2)^2}$ In this cases , m refers to the unit used for the denominator of the rate… person-year
2.7 Case-Control study	P_1 P_2 OR c P	Proportion of exposed in cases Proportion of exposed in control Odds Ratio $= \dfrac{P_1/(1-P_1)}{P_2/(1-P_2)}$ Ratio of the sample size of the two groups $c = n_2/n_1$ and $n_1 = m$ Combined proportions $P = (P_1 + cP_2)/(c+1)$	$m = \dfrac{[z_\alpha\sqrt{\frac{(c+1)}{c}P(1-P)} + z_\beta\sqrt{P_1(1-P_1) + \frac{P_2(1-P_2)}{c}}]^2}{(P_1 - P_2)^2}$

	Information needed		Formulas for Minimum Sample Size
2.8 Matched or Paired case	P_0	Proportion under true null hypothesis, which is expected to be 0.5.	$n = \frac{\left(z_{\alpha/2} + 2z_{\beta}\sqrt{P_a(1-P_a)}\right)^2}{4P_d(P_a - 0.5)^2}$
	P_a	Proportion under true H_a (Proportion of discordant pairs of type A among discordant pairs)	
	P_d	Proportion of discordance pairs among all pairs	
	n	number of pairs	
2.9 Cohort study	P_1	Proportion of exposed in controls	$m = \frac{[z_{\alpha}\sqrt{\frac{(c+1)}{c}P(1-P)} + z_{\beta}\sqrt{P_1(1-P_1) + \frac{P_2(1-P_2)}{c}}]^2}{(P_1 - P_2)^2}$
	P_2	Proportion of exposed in cases	
	RR	Risk Ratio $= P_2 / P_1$	
	c	Ratio of the sample size of the two groups $c = n_2/n_1$ and $n_1 = m$	
	P	Combined proportions $P = (P_1 + cP_2)/(c+1)$	

	Information needed		Formulas for Minimum Sample Size
2.10 Two incidence rates	P_0	$\frac{t_1}{(t_1+t_2)}$	
	P_1	$\frac{t_1 RR}{(t_1 RR+t_2)}$	
	m	Expected number of events in the two groups combined $=m_1+m_2$	$m=\frac{[z_{\alpha/2}\sqrt{P_0(1-P_0)}+z_\beta\sqrt{P_a(1-P_a)}]^2}{(P_0-P_a)^2}$
	m_1	Expected number of events in the 1st groups $=n_1[1-\exp(-ID_1 t_1^*)]$	$m=m_1+m_2=n_1[1-\exp(-ID_1 t_1^*)]+n_2[1-\exp(-ID_2 t_2^*)]$
	m_2	Expected number of events in the 2nd groups $=n_2[1-\exp(-ID_2 t_2^*)]$	Let $\frac{n_2}{n_1}=c$, $n_2=cn_1$
	n_1, n_2	Number of subjects in the 1st and 2nd group	$n_1=\frac{m}{[1-\exp(-ID_1 t_1^*)]+c[1-\exp(-ID_2 t_2^*)]}$
	t_1, t_2	Total number of person-years in the 1st and 2nd group	
	t_1^*, t_2^*	Average number of person-years in the 1st and 2nd group	
	ID_1, ID_2	Incidence density in the 1st and 2nd group under H_a	Example 14.16 P694 Rosner(2010)

	Information needed		Formulas for Minimum Sample Size
2.11 Proportional Hazards Model	m	Expected total number of events over both groups $= n_1 P_E + n_2 P_C$	$m = \frac{1}{c}(\frac{cRR+1}{RR-1})(z_{\alpha/2} + z_{\beta})^2$
	n_1, n_2	Number of subjects in the 1st and 2nd group (E and C group)	$n_1 = \frac{cm}{(cP_E + P_C)}$, $n_2 = \frac{m}{(cP_E + P_C)}$
	P_E	Probability of failure in group E over the maximum time period of the study (t years)	
	P_C	Probability of failure in group C over the maximum time period of the study (t years)	Example P735 Rosner(2010), 7th ed.