Final Sample Design and Weights for Wave 1, BYU-Wisconsin Election Panel

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1 Sample Design of the BYU/UW Election Panel

The BYU/UW Election Panel is designed to allow analysis of public opinion and voting behavior in both presidential and Senate battleground states plus those states without a hotly contested race. In addition, the sample design provides independent samples in two key states, Ohio and Florida. Finally, the entire dataset is a representative sample of the nation as a whole. In order to provide this flexibility, the design over-samples battleground states and under-samples non-battleground states. This design and the resulting standard error/margin of error are described below. The process of creating this design, and the tradeoffs and decisions taken, are presented in the memos named `sample3.pdf` through `sample5.pdf` (There are no memos named sample1 or sample2, those numbers were drafts only.) The current memo, `sample6.pdf`, is a summary of the design and presents the final sampling information for use with the BYU/UW Election Panel.

The BYU/UW sample defines five domains[1] within which samples were drawn: non-battleground states, senate ONLY battleground, presidential battleground, and two state samples: Ohio and Florida. The sample is designed to over-represent battleground states while retaining enough cases in the non-battleground states for analysis as a control group. The Ohio and Florida samples are stand-alone strata, intended to have enough cases for separate analysis.

When conducting Wave I interviews (June 24-July 3) the Florida Senate candidates had not yet been nominated. As a result, we decided

[1] I use the terms "domain" and "strata" interchangeably.

to reduce the Florida sample size to about what it would be in a national sample (201 cases), rather than the stand-alone sample size of 400. Florida was still sampled as a separate domain, not as part of the national presidential battleground stratum. Only the sample size was changed.

Ohio remained a separate domain with the full sample size of 400 cases originally allocated to it.

The final design called for completing 2802 interviews. Our actual number of completed interviews is 2782. I have created the survey weights so that the weighted N is equal to the actual sample size of 2782.

The weight variable, `weight`, *must be used* for analysis of a nationally representative sample and for most domains.

The weights, standard error and margin of error are presented in the final section of this document.

2 Frequently Asked Questions

1. *Do I have to weight the data?* Yes, if you want to properly represent the nation as a whole, you *must* weight the data by the variable named `weight`. This will appropriately take account of the oversample of battleground and the under-sample of non-battleground states, as well as the separate domains for Ohio and Florida.

2. *Is there any analysis that does not require weights?* Within domain the sample was drawn with probability proportionate to size. This means you *could* analyze each domain without weights. However, this is probably a *bad* idea because, for example, you almost certainly would want to include the Ohio and Florida domains within the presidential battleground analysis, and to do so requires weighting for the oversamples in those two states.

3. *What about the Senate battleground states?* You *must* weight the data for any analysis of Senate battleground states. This is because the Senate battlegrounds include states that are Senate only battleground plus states that are presidential battleground plus Florida. These three strata have different weights, and so *weights must be used* for any analysis of Senate battleground respondents.

4. *What about Ohio and Florida?* These two states are sampled separately and so the cases need no weights when analyzed alone. For Ohio, this means your sample size is 400, while the weighted N for Ohio in the national sample is $.3044 \times 400 \approx 122$. Therefore you probably want to not use weights if you are only interested in the Ohio sample. The Florida sample is also self-weighting, though with only 201 cases the Florida margin of error is relatively large ($\pm 7\%$).

5. *What weight variable should I use?* The variable named `weight` is the proper weight to use for any weighted analysis, whether for the nationally representative sample or for the Senate or presidential battleground strata.

6. *What states are included in each stratum?* Non-battleground: (AL, CT, DC, DE, ID, IN, KS, MA, MD, MS, MT, ND, NE, NJ, NY, RI, TN, TX, UT, VA, VT, WY). Senate only battleground: (CA, GA, IL, KY, NC, OK, SC, SD). Presidential battleground: (AR, AZ, CO, IA, LA, ME, MI, MN, MO, NH, NM, NV, OR, PA, WA, WI, WV). Ohio and Florida are separate domains, though both should be included with Presidential battlegrounds. Among the presidential battleground states, the following are also *Senate* battlegrounds: (CO, FL, LA, MO, NV, PA, WA, WI). Alaska and Hawaii are omitted from the sample.

7. *What variables code these battleground strata?* The variable `battle` codes the domains used for sampling: 0=non-battleground, 1=Senate only battleground, 2=presidential battleground, 3=Ohio, 4=Florida. The variable `bgsen` is coded 1 if the state is a Senate battleground and zero otherwise. The variable `bgpres` is coded 1 for presidential battleground states and zero otherwise.

8. *What was the basis of the assignment of states to battleground status?* We used the Cook Political Report and supplemented this with the Washington Post's and ABC News's public analysis of competitive states as of early June. If two of the three sources agreed we considered a state to be a battleground.

3 Calculation of Sample Characteristics

The code below computes the standard errors and margin of error based on the final design of the BYU/UW Election Panel. The weights for all

strata are also calculated, using the final sample size so that the weighted N will equal the actual N.

Note that the sample design here calls for 2201 cases outside of the Ohio and Florida over-samples. The final completed interviews include 2181 cases in these strata (plus 400 in Ohio and 201 in Florida.) The slight shortfall of 20 cases makes no practical difference for the achieved standard errors within and across strata. However, I DO recalculate the sample weights in the end to provide a weighted sample size equal to the actual size of 2782 for the nationally representative sample.

The summary of results, and the table of weights (Table 6), appears in the final section below.

```
> rm(list = ls(all = TRUE))
> setwd("c:/data/campaign2004/BYUWisc")
> library(foreign)
> library(xtable)
> pop <- read.dta("statetoandpop.dta")
> attach(pop)
> pop$bgpres[state == "CO"] <- 1
> pop$bgpres[state == "LA"] <- 1
> attach(pop)
> pop$bg <- bgpres
> pop$bg[bgpres == 0 & bgsen == 0] <- 0
> pop$bg[bgpres == 0 & bgsen == 1] <- 1
> pop$bg[bgpres == 1] <- 2
> pop$bg[state == "OH"] <- 3
> pop$bg[state == "FL"] <- 4
> attach(pop)
> pop3 <- subset(pop, state != "AK" & state != "HI")
> attach(pop3)
> table(bg)

bg
 0  1  2  3  4
22  8 17  1  1

> table(state, bg)

     bg
state 0 1 2 3 4
   AL 1 0 0 0 0
```

AR 0 0 1 0 0
AZ 0 0 1 0 0
CA 0 1 0 0 0
CO 0 0 1 0 0
CT 1 0 0 0 0
DC 1 0 0 0 0
DE 1 0 0 0 0
FL 0 0 0 0 1
GA 0 1 0 0 0
IA 0 0 1 0 0
ID 1 0 0 0 0
IL 0 1 0 0 0
IN 1 0 0 0 0
KS 1 0 0 0 0
KY 0 1 0 0 0
LA 0 0 1 0 0
MA 1 0 0 0 0
MD 1 0 0 0 0
ME 0 0 1 0 0
MI 0 0 1 0 0
MN 0 0 1 0 0
MO 0 0 1 0 0
MS 1 0 0 0 0
MT 1 0 0 0 0
NC 0 1 0 0 0
ND 1 0 0 0 0
NE 1 0 0 0 0
NH 0 0 1 0 0
NJ 1 0 0 0 0
NM 0 0 1 0 0
NV 0 0 1 0 0
NY 1 0 0 0 0
OH 0 0 0 1 0
OK 0 1 0 0 0
OR 0 0 1 0 0
PA 0 0 1 0 0
RI 1 0 0 0 0
SC 0 1 0 0 0
SD 0 1 0 0 0
TN 1 0 0 0 0

```
   TX 1 0 0 0 0
   UT 1 0 0 0 0
   VA 1 0 0 0 0
   VT 1 0 0 0 0
   WA 0 0 1 0 0
   WI 0 0 1 0 0
   WV 0 0 1 0 0
   WY 1 0 0 0 0
```

```
> Npop <- sum(to2000)
> Npoph0 <- sum(to2000[bg == 0])
> Npoph1 <- sum(to2000[bg == 1])
> Npoph2 <- sum(to2000[bg == 2])
> Npoph3 <- sum(to2000[bg == 3])
> Npoph4 <- sum(to2000[bg == 4])
> Npoph <- c(Npoph0, Npoph1, Npoph2, Npoph3, Npoph4)
> n <- 3000
> pq <- c(0.65 * 0.35, 0.25, 0.25, 0.25, 0.25)
> nhnps <- c(600, 500, 1100, 400, 400)
> whnps <- nhnps/((Npoph/sum(Npoph)) * n)
> pop3$ninps[bg == 0] <- whnps[1] * to2000[bg == 0]/Npop *
+     n
> pop3$ninps[bg == 1] <- whnps[2] * to2000[bg == 1]/Npop *
+     n
> pop3$ninps[bg == 2] <- whnps[3] * to2000[bg == 2]/Npop *
+     n
> pop3$ninps[bg == 3] <- whnps[4] * to2000[bg == 3]/Npop *
+     n
> pop3$ninps[bg == 4] <- whnps[5] * to2000[bg == 4]/Npop *
+     n
> attach(pop3)
> sum(ninps)

[1] 3000

> pop3$ninps <- round(pop3$ninps + 0.01, digits = 0)
> pop3$ninps[state == "FL"] <- 201
> attach(pop3)
> sum(ninps)

[1] 2802
```

```
> print(cbind(state, ninps, bgsen, bgpres, bg))

      state ninps bgsen bgpres bg
 [1,] "AL"  "29"  "0"   "0"    "0"
 [2,] "AZ"  "57"  "0"   "1"    "2"
 [3,] "AR"  "32"  "0"   "1"    "2"
 [4,] "CA"  "209" "1"   "0"    "1"
 [5,] "CO"  "56"  "1"   "1"    "2"
 [6,] "CT"  "20"  "0"   "0"    "0"
 [7,] "DE"  "5"   "0"   "0"    "0"
 [8,] "DC"  "4"   "0"   "0"    "0"
 [9,] "FL"  "201" "1"   "1"    "4"
[10,] "GA"  "51"  "1"   "0"    "1"
[11,] "ID"  "8"   "0"   "0"    "0"
[12,] "IL"  "92"  "1"   "0"    "1"
[13,] "IN"  "38"  "0"   "0"    "0"
[14,] "IA"  "47"  "0"   "1"    "2"
[15,] "KS"  "17"  "0"   "0"    "0"
[16,] "KY"  "30"  "1"   "0"    "1"
[17,] "LA"  "70"  "1"   "1"    "2"
[18,] "ME"  "23"  "0"   "1"    "2"
[19,] "MD"  "33"  "0"   "0"    "0"
[20,] "MA"  "42"  "0"   "0"    "0"
[21,] "MI"  "150" "0"   "1"    "2"
[22,] "MN"  "82"  "0"   "1"    "2"
[23,] "MS"  "18"  "0"   "0"    "0"
[24,] "MO"  "92"  "1"   "1"    "2"
[25,] "MT"  "6"   "0"   "0"    "0"
[26,] "NE"  "11"  "0"   "0"    "0"
[27,] "NV"  "22"  "1"   "1"    "2"
[28,] "NH"  "20"  "0"   "1"    "2"
[29,] "NJ"  "51"  "0"   "0"    "0"
[30,] "NM"  "22"  "0"   "1"    "2"
[31,] "NY"  "105" "0"   "0"    "0"
[32,] "NC"  "55"  "1"   "0"    "1"
[33,] "ND"  "5"   "0"   "0"    "0"
[34,] "OH"  "400" "0"   "1"    "3"
[35,] "OK"  "26"  "1"   "0"    "1"
[36,] "OR"  "53"  "0"   "1"    "2"
[37,] "PA"  "172" "1"   "1"    "2"
```

```
[38,] "RI"  "7"   "0"   "0"    "0"
[39,] "SC"  "31"  "1"   "0"    "1"
[40,] "SD"  "6"   "1"   "0"    "1"
[41,] "TN"  "33"  "0"   "0"    "0"
[42,] "TX"  "105" "0"   "0"    "0"
[43,] "UT"  "12"  "0"   "0"    "0"
[44,] "VT"  "4"   "0"   "0"    "0"
[45,] "VA"  "44"  "0"   "0"    "0"
[46,] "WA"  "87"  "1"   "1"    "2"
[47,] "WV"  "25"  "0"   "1"    "2"
[48,] "WI"  "91"  "1"   "1"    "2"
[49,] "WY"  "3"   "0"   "0"    "0"
```

```
> anhnps <- c(0, 0, 0, 0, 0)
> anhnps[1] <- sum(ninps[bg == 0])
> anhnps[2] <- sum(ninps[bg == 1])
> anhnps[3] <- sum(ninps[bg == 2])
> anhnps[4] <- sum(ninps[bg == 3])
> anhnps[5] <- sum(ninps[bg == 4])
> print(anhnps)

[1]  600  500 1101  400  201

> an <- 2802
> awhnps <- anhnps/((Npoph/sum(Npoph)) * an)
> nallsenatebg <- sum(ninps * bgsen)
> nallpresbg <- sum(ninps * bgpres)
> print(c(nallsenatebg, nallpresbg))

[1] 1291 1702

> senatepoph <- c(sum(to2000[bgsen == 1 & state !=
+     "FL"]), to2000[state == "FL"])
> senatenh <- c(sum(ninps[bgsen == 1 & state != "FL"]),
+     ninps[state == "FL"])
> senatepq <- c(0.25, 0.25)
> senatese <- sqrt(sum(((senatepoph/sum(senatepoph))^2) *
+     ((senatepoph - senatenh)/senatepoph) * senatepq/senatenh))
> senatemoe <- 2 * senatese
> print(c(senatepoph, senatenh, senatepq))
```

```
[1] 4.4563e+07 6.0060e+06 1.0900e+03 2.0100e+02 2.5000e-01
[6] 2.5000e-01

> print(c(senatese, senatemoe))

[1] 0.01398756 0.02797513

> prespoph <- c(sum(to2000[bgpres == 1 & state != "FL" &
+     state != "OH"]), to2000[state == "OH"], to2000[state ==
+     "FL"])
> presnh <- c(sum(ninps[bgpres == 1 & state != "FL" &
+     state != "OH"]), ninps[state == "OH"], ninps[state ==
+     "FL"])
> prespq <- c(0.25, 0.25, 0.25)
> presse <- sqrt(sum(((prespoph/sum(prespoph))^2) *
+     ((prespoph - presnh)/prespoph) * prespq/presnh))
> presmoe <- 2 * presse
> print(c(prespoph, presnh, prespq))

[1] 3.1918e+07 4.8230e+06 6.0060e+06 1.1010e+03 4.0000e+02
[6] 2.0100e+02 2.5000e-01 2.5000e-01 2.5000e-01

> print(c(presse, presmoe))

[1] 0.01261337 0.02522674

> nobgpop <- sum(to2000[bg == 0])
> nobgn <- sum(ninps[bg == 0])
> nobgpq <- 0.65 * 0.35
> nobgse <- sqrt(nobgpq/nobgn)
> nobgmoe <- 2 * nobgse
> print(c(nobgpop, nobgn, nobgpq))

[1] 4.0015e+07 6.0000e+02 2.2750e-01

> print(c(nobgse, nobgmoe))

[1] 0.01947220 0.03894440

> OHse <- sqrt(0.25/anhnps[4])
> OHmoe <- 2 * OHse
> FLse <- sqrt(0.25/anhnps[5])
```

```
> FLmoe <- 2 * FLse
> POPpoph <- c(sum(to2000[bg == 0]), sum(to2000[bg ==
+     1]), sum(to2000[bg == 2]), to2000[state == "OH"],
+     to2000[state == "FL"])
> POPnh <- c(sum(ninps[bg == 0]), sum(ninps[bg == 1]),
+     sum(ninps[bg == 2]), ninps[state == "OH"], ninps[state ==
+         "FL"])
> POPpq <- c(0.65 * 0.35, 0.25, 0.25, 0.25, 0.25)
> POPse <- sqrt(sum(((POPpoph/sum(POPpoph))^2) * ((POPpoph -
+     POPnh)/POPpoph) * POPpq/POPnh))
> POPmoe <- 2 * POPse
> print(c(POPpoph, POPnh, POPpq))

 [1] 4.0015e+07 2.7453e+07 3.1918e+07 4.8230e+06 6.0060e+06
 [6] 6.0000e+02 5.0000e+02 1.1010e+03 4.0000e+02 2.0100e+02
[11] 2.2750e-01 2.5000e-01 2.5000e-01 2.5000e-01 2.5000e-01

> print(c(POPse, POPmoe))

[1] 0.01024369 0.02048737
```

4 Final Sample Characteristics and Weights

The tables in this section provide the sampling characteristics for the final BYU/UW Election Panel design, based on a design sample size of 2802. The final number of completed interviews was 2782, which makes no practical difference for the results here.

The sample sizes for each stratum are given in Table 1 for the design sample size and the actual sample.

Stratum	Sample design	Actual sample n
NonBattleground	600	578
Senate only battleground	500	498
Presidential battleground	1101	1105
Ohio	400	400
Florida	201	201
ALL Senate battleground	1291	1293
ALL Presidential battleground	1702	1706
Total	2802	2782

Table 1: Sample sizes and actual cases for each stratum, with oversampling of battleground states and state samples for Ohio and Florida. The sample size for ALL Senate battleground respondents includes those that are also in presidential battleground states and the 201 case oversample in Florida. The ALL Presidential cases include those in the Ohio and Florida oversamples. Note that these are UNweighted sample sizes.

With this sample design, if all cases were collected exactly as designed, the standard errors and margins of error within each stratum and for the population are given in Table 2. These are the characteristics of the sample as *designed*. Table 5 gives the characteristics of the sample as realized in the completed interviews. Comparison of the two tables shows close agreement, as expected since the completed cases closely mirror the sample design.

Stratum	Std. Error	Margin of Error
NonBattleground	0.0195	0.0389
All Senate battleground	0.014	0.028
Presidential battleground	0.0126	0.0252
Ohio	0.025	0.05
Florida	0.0353	0.0705
Population	0.0102	0.0205

Table 2: Standard errors and margin of error for each stratum. Note that the Senate here is for ALL Senate battleground cases, not just those in the Senate ONLY battleground states. The Presidential estimates also include the oversample cases from Ohio and Florida.

The allocation of cases to states is given in Table 3. *This is the allocation as called for by the design. The actual number of completed interviews per state is slightly different.* The distribution of completed interviews is shown in Table 4.

	State	n	State	n
1	AL	29	NE	11
2	AZ	57	NV	22
3	AR	32	NH	20
4	CA	209	NJ	51
5	CO	56	NM	22
6	CT	20	NY	105
7	DE	5	NC	55
8	DC	4	ND	5
9	FL	201	OH	400
10	GA	51	OK	26
11	ID	8	OR	53
12	IL	92	PA	172
13	IN	38	RI	7
14	IA	47	SC	31
15	KS	17	SD	6
16	KY	30	TN	33
17	LA	70	TX	105
18	ME	23	UT	12
19	MD	33	VT	4
20	MA	42	VA	44
21	MI	150	WA	87
22	MN	82	WV	25
23	MS	18	WI	91
24	MO	92	WY	3
25	MT	6		

Table 3: State sample sizes.

The completed interviews produced the distribution of cases across the states shown in Table 4. This is quite close to the design allocation.

	State	n	State	n
1	AL	29	NE	11
2	AZ	57	NV	22
3	AR	32	NH	20
4	CA	218	NJ	43
5	CO	57	NM	22
6	CT	19	NY	90
7	DE	5	NC	51
8	DC	2	ND	6
9	FL	201	OH	400
10	GA	44	OK	26
11	ID	8	OR	53
12	IL	92	PA	174
13	IN	40	RI	7
14	IA	47	SC	31
15	KS	17	SD	6
16	KY	30	TN	33
17	LA	70	TX	105
18	ME	23	UT	12
19	MD	33	VT	4
20	MA	42	VA	45
21	MI	150	WA	87
22	MN	82	WV	25
23	MS	18	WI	91
24	MO	93	WY	3
25	MT	6		

Table 4: Completed state sample sizes.

The *actual sample* comes quite close to this design target. The sample characteristics based on the achieved sample are given in Table 5.

Stratum	Std. Error	Margin of Error
NonBattleground	0.0198	0.0397
All Senate battleground	0.014	0.028
Presidential battleground	0.0126	0.0252
Ohio	0.025	0.05
Florida	0.0353	0.0705
Population	0.0103	0.0207

Table 5: Standard errors and margin of error for the achieved sample.

The weights are calculated as follows, taking account of the final sample of completed interviews.

```
> an <- 2782
> anhnps <- c(578, 498, 1105, 400, 201)
> awhnps <- anhnps/((Npoph/sum(Npoph)) * an)
> wt <- round(1/awhnps, digits = 4)
```

The sample can be weighted to provide population inferences while maintaining a weighted n equal to the actual n of 2782 (within rounding error— with four decimal points for weights, the weighted n is 2782.0317). These weights and the weighted n are given in Table 6.

The following weights take account of the completion rate within each stratum.

Stratum	Weight	Weighted n
Nonbattleground	1.7475	1010.055
Senate only battleground	1.3915	692.967
Presidential battleground	0.7291	805.655
Ohio	0.3044	121.76
Florida	0.7542	151.594
ALL Senate battleground		1277.647
ALL Presidential battleground		1079.01
Total		2782.0317

Table 6: Sample weights and weighted sample size for each stratum. All Senate battleground states are included in the ALL Senate line. The ALL presidential line includes the weighted samples from Ohio and Florida.

As a final check of the results, I use the calculated weights to compute the (weighted) state sample sizes as a proportion of the total sample. This is then compared to the state proportions in the population. The results should be a very close match. The lack of perfect fit is due to variation in response rates across states within the same stratum (which therefore share the same weight). The match is quite good, as both the regression fit and the plot demonstrate. The weighted sample is a close approximation of the population proportions.

```
> pisample <- rep(0, 49)
> for (i in 0:4) {
+     pisample[bg == i] <- (ninps[bg == i]/awhnps[i +
+         1])/an
+ }
> pipop <- to2000/sum(to2000)
> summary(lm(pisample ~ pipop))

Call:
lm(formula = pisample ~ pipop)

Residuals:
       Min         1Q     Median         3Q        Max
-7.364e-03 -5.937e-05  8.565e-05  3.765e-04  4.120e-03

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -0.0001645  0.0003257  -0.505    0.616
pipop        1.0080586  0.0114625  87.944   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.001586 on 47 degrees of freedom
Multiple R-Squared: 0.994,        Adjusted R-squared: 0.9938
F-statistic:  7734 on 1 and 47 DF,  p-value: < 2.2e-16
```

```
> plot(pisample ~ pipop)
> abline(0, 1)
```

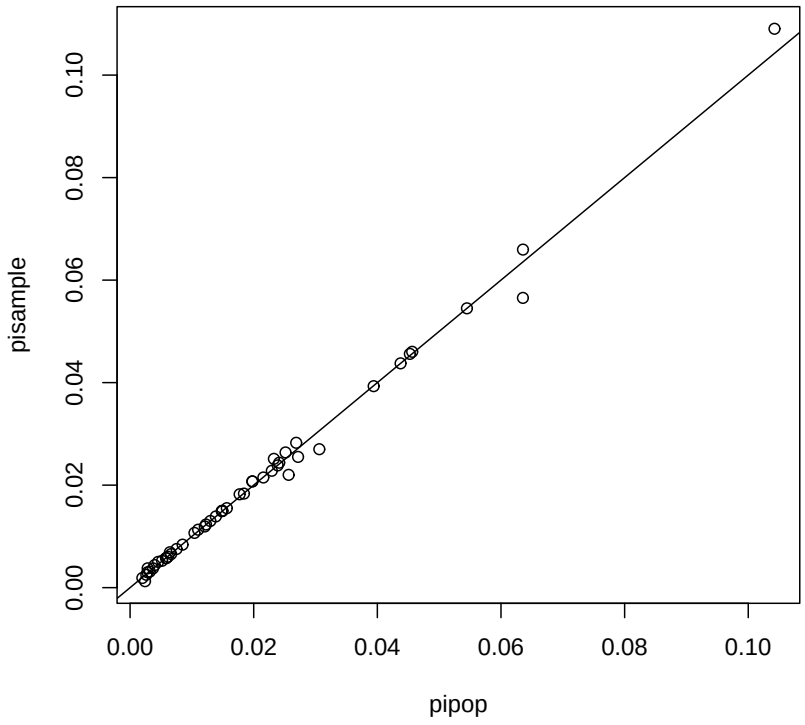

Figure 1: Weighted sample proportions vs population proportions