Memorandum

Human Resources Division

TO: Todd Rent, Chief Examiner
Civil Service Commission

FROM: Human Resources Staff

RE: Establish a Passing Score for Entry-Level Police Officer

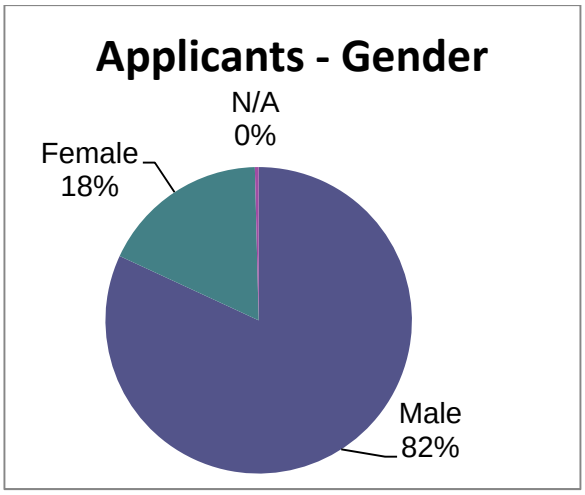
DATE: January 28, 2015

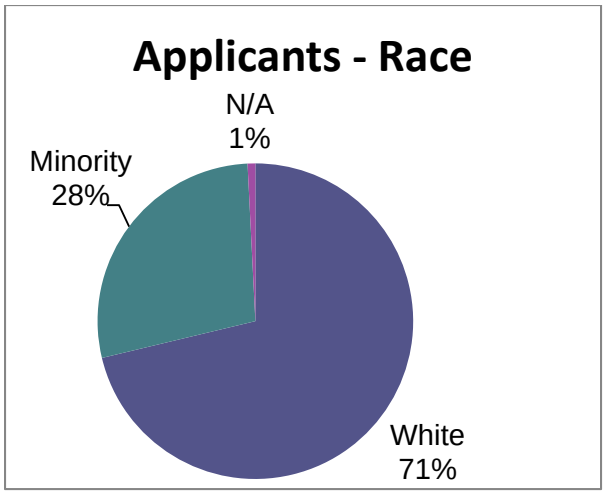
A. Summary

City of Urbana Human Resources staff recommends a passing score of 65.00% in each portion of the exam (human relations, written and reading). This would result in an eligibility register of 116 candidates (79% of the test group) with no adverse or disparate impact.

A. Background

The position was open for applications from Oct. 3, 2014 – Jan. 5, 2015 and Human Resources received 254 applications for the position.





Numerically, the breakdown of applicants is as follows:

Male	208	82%
Female	45	18%
No response or "n/a"	1	0.4%

Non-Minority	181	71%
Minority	71	28%
No response or "n/a"	2	1%

B. Application Screening

Of the 254 applicants, 227 (89%) were referred to the examination. A total of 27 applications were not referred to the examination; most of those who were excluded were due to the applicant not meeting the education/experience component of the position.

Disposition				# of Applicants
Did Not Meet Minimum Qualifications				
11NMQ – Does not meet min. qual. (age/DL/Citizen)				5
Non-Minority	5	Minority	0	
Male	4	Females	1	
13NMQ – Does not meet min. qual. (educ./law enf./military)				22
Non-Minority	16	Minority	6	
Male	17	Females	5	

C. Video/Written Exam

Of the 254 applicants, 227 were invited to test and 146 attended, making this one of the largest recruiting groups in recent memory. The test was offered on Saturday, January 17, 2015 at the Alice Campbell Alumni Center in Urbana. Demographics of the attendees are as follows:

	#	% of Invited	% of Test Group
Male	123	59%	84%
Female	22	49%	15%
No response or "n/a"	1	100%	<1%

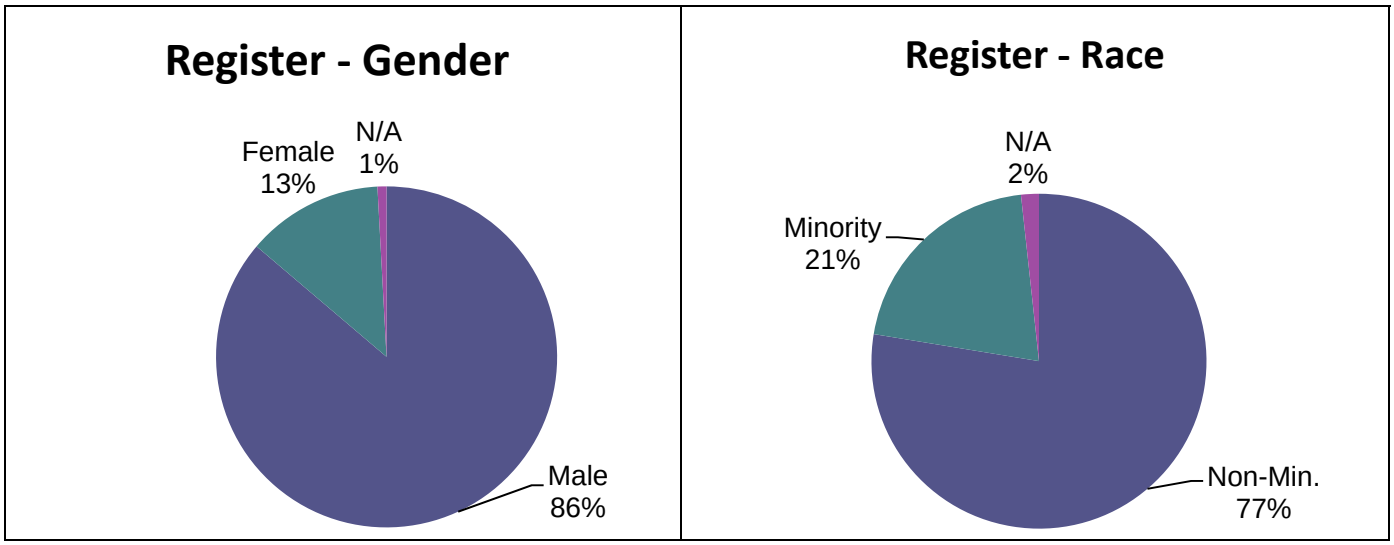
	#	% of Invited	% of Test Group
Non-Minority	110	61%	75%
Minority	34	48%	23%
No response or "n/a"	2	100%	1%

D. Passing Score

The testing vendor, Ergometrics, recommends a passing score of 65.00% for each component of the exam (human relations, written and reading), which would allow 116 applicants (79% of test takers) to be placed on the eligibility register for future consideration. At this passing score, adverse and/or disparate impact is not observed (additional data is attached).

65% Pass Rate				
	#	% of Total Tested	% of Like Group	% of Register
Male	**100**	68% (100/146)	81% (100/123)	86% (100/116)
Female	**15**	10% (15/146)	68% (15/22)	13% (15/116)
No answer	**1**	1% (1/146)	100% (1/1)	1% (1/116)

	#	% of Total Tested	% of Like Group	% of Register
Non-Minority	**90**	62% (90/146)	82% (90/110)	77% (90/116)
Minority	**24**	16% (24/146)	71% (24/34)	21% (24/116)
No answer	**2**	1% (2/146)	100% (2/2)	1% (2/116)



At this passing score, a total of 30 applicants would not pass the exam, which represents a 21% failure rate.

	#	% of Total Tested	% of Like Group		#	% of Total Tested	% of Like Group
Male	23	16%	19%	**Non-Minority**	20	14%	18%
Female	7	5%	32%	**Minority**	10	7%	29%
N/A	0	0	0	**N/A**	0	0	0

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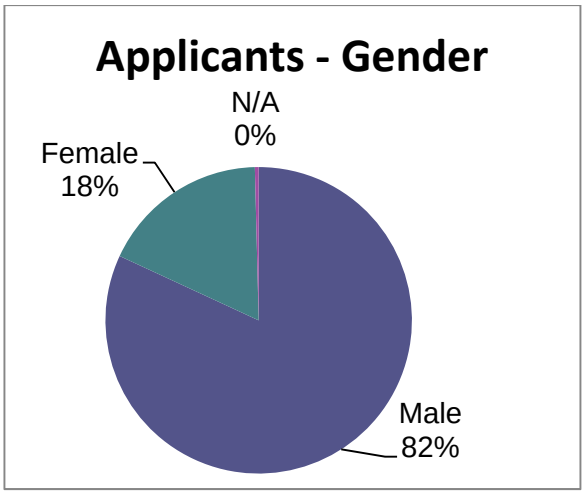

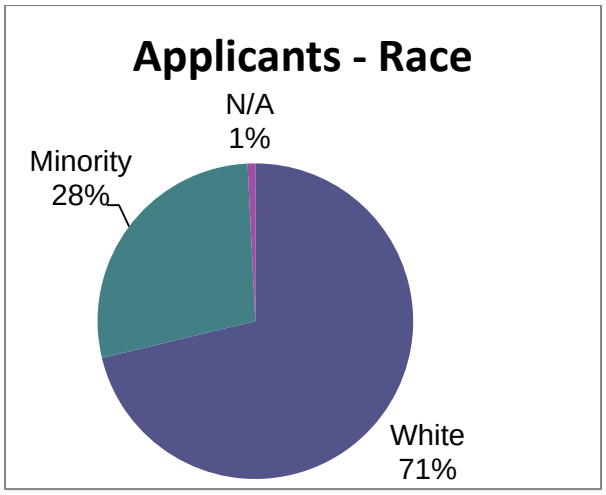

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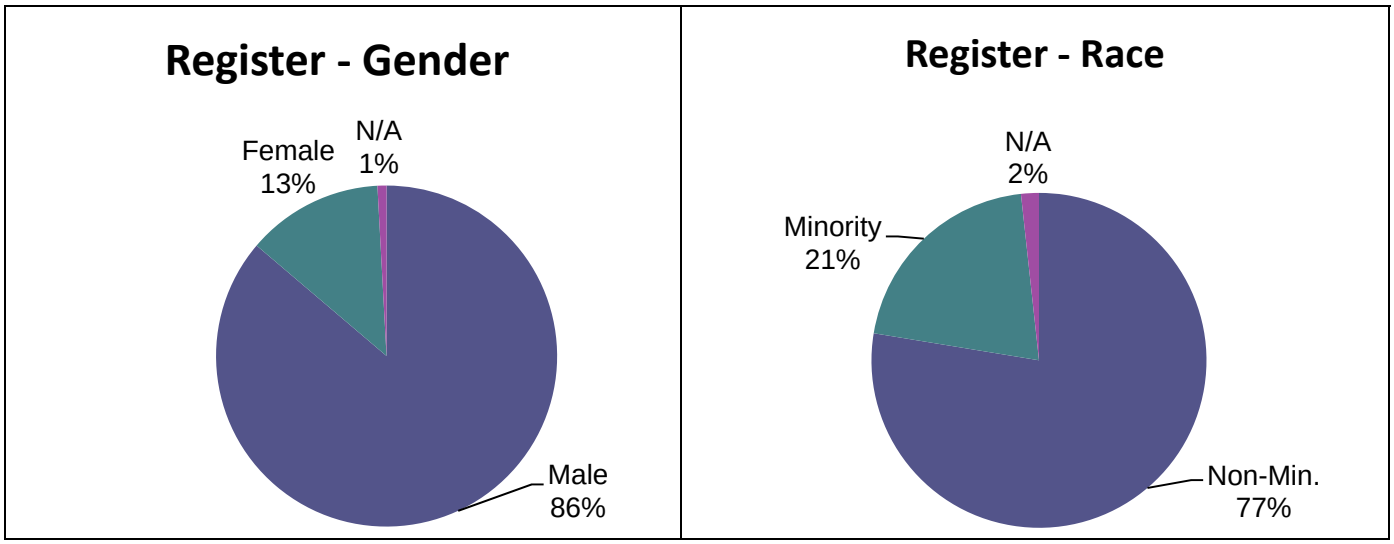
Minority	**24**	71%	21%
No answer	**2**	100%	1%



Disparate Impact Analysis

(an On-Line Internet based application)

Instructions: Please fill out the information into the form below. Once you have entered your data below, you may select the types of analysis to be conducted by checking the appropriate boxes. Then press the compute button at the bottom of the form to view the results.

Select the type of employment decision: Selection

Enter a title for your report: Police Officer (Entry-Level) Jan. 2015

Number of Male	Number of Non-Minority	Number of Younger	Number of Non-Disabled
123 Applicants	110 Applicants	Applicants	Applicants
100 Selected	90 Selected	Selected	Selected
Number of Female	**Number of Minority**	**Number of Older**	**Number of Disabled**
22 Applicants	34 Applicants	Applicants	Applicants
15 Selected	24 Selected	Selected	Selected

- ☑ -Adverse Impact
- ☑ -Chi-Square
- ☑ -Standard Deviation
- ☑ -Confidence Intervals
- ☑ Probability Distribution

Select the Statistical Tests you wish to execute by checking or unchecking the boxes on the left. Then press the 'Compute' button below.

Compute

Display: ☑ Description of Statistic ☑ Interpretation of Results

Police Officer (Entry-Level) Jan. 2015

Adverse-Impact Report

Adverse Impact **and the "four-fifths rule." - A selection rate for any race, sex, or ethnic group which is less than four-fifths (4/5ths) (or eighty percent) of the rate for the group with the highest rate will generally be regarded by the Federal enforcement agencies as evidence of adverse impact.** ***Uniform Guidelines on Employee Selection Procedures***

Rate of Females Applicants Selected	Rate of Males Applicants Selected	Adverse Impact Ratio for Females	Adverse Impact Ratio for Males
(15/ 22) = 0.6818	(100/ 123) = 0.813	(0.6818/ 0.813)= 0.84	(0.813/ 0.6818)= 1.19
Adverse impact as defined by the 4/5ths rule was not found in the above data.			

Rate of Minorities Applicants Selected	Rate of Non-Minorities Applicants Selected	Adverse Impact Ratio for Minorities	Adverse Impact Ratio for Non-Minorities
(24/ 34) = 0.7059	(90/ 110) = 0.8182	(0.7059/ 0.8182)= 0.86	(0.8182/ 0.7059)= 1.16
Adverse impact as defined by the 4/5ths rule was not found in the above data.			

Chi-Square Report

Observed Expected	Selected	Not Selected	Row Totals
Males	100 97.5517	23 25.4483	123
Females	15 17.4483	7 4.5517	22
Column Total	115	30	145

Chi-Square = 1.9574
The value of the statistic is less than 3.841. This indicates that there is a 95 percent chance that these results have been obtained absent any form of bias. Therefore, you may conclude that these results fall within normal random variations and are not the result of bias.

Observed Expected	Selected	Not Selected	Row Totals
Non-Minorities	90 87.0833	20 22.9167	110

Minorities	24 26.9167	10 7.0833	34
Column Total	114	30	144

Chi-Square = 1.9859
The value of the statistic is less than 3.841. This indicates that there is a 95 percent chance that these results have been obtained absent any form of bias. Therefore, you may conclude that these results fall within normal random variations and are not the result of bias.

Standard-Deviation Report

The difference between the proportion of the protected class Selected and the proportion of all Applicants Selected has a normal distribution with a mean and standard deviation. The statistic is shown below:

```
          (r / n) - p

 ------------------------------

 sqrt(p * (1-p) / n) * sqrt(1-q)
```

Analysis of proportion of Females Selected **where:**

- **r = number of Females Selected.**
- **n = number of Selected (Females and Males).**
- **p = proportion of Applicants that are Females.**
- **q = proportion of Applicants Selected.**

	Selected	Not Selected	Row Totals
Males	100	23	123
Females	15	7	22
Column Total	115	30	145

r = 15
n = 115
p = 22 / 145 = 0.152
q = (15 + 100) / (22 + 123) = 0.793

Standard Deviation Statistic = -1.399

These results show that the proportion of Females Selected is -1.399 standard deviations below the proportion of Applicants Selected. A result of less than 2 standard deviations is generally considered non-significant.

Analysis of proportion of Minorities Selected **where:**

- **r = number of Minorities Selected.**
- **n = number of Selected (Minorities and Non-Minorities).**
- **p = proportion of Applicants that are Minorities.**
- **q = proportion of Applicants Selected.**

	Selected	Not Selected	Row Totals
Non-Minorities	90	20	110
Minorities	24	10	34
Column Total	114	30	144

r = 24
n = 114
p = 34 / 144 = 0.236
q = (24 + 90) / (34 + 110) = 0.792

Standard Deviation Statistic = -1.409

These results show that the proportion of Minorities Selected is -1.409 standard deviations below the proportion of Applicants Selected. A result of less than 2 standard deviations is generally considered non-significant.

Confidence Interval Report

The proportion of the protected class Selected has an expected value that would fall within a specified confidence interval. The statistic is shown below:
Observed value = (r / n)
Expected value = p

Standard Deviation = sqrt(p * (1-p) / n) * sqrt(1-q)

Confidence Interval:
Lower Bound = p - 1.96 * Std Dev
Upper Bound = p + 1.96 * Std Dev

Analysis of proportion of Females Applicants Selected **where:**

- **r = number of Females Selected.**
- **n = number of Applicants Selected.**
- **p = proportion of Females among those Selected.**
- **q = proportion of Applicants Selected.**

r = 15
n = 115
p = (22/(22+123))=0.152
q = ((15 + 100)/(22 + 123))=0.793
(r/n)=15/115=0.1304

The lower bound of the confidence interval is: 0.152 -(1.96* 0.015)= 0.1219
The upper bound of the confidence interval is: 0.152 +(1.96* 0.015)= 0.1815

Confidence Interval = 0.1219 to 0.1815

These results show that the proportion of Females Females (r/n=0.1304) is contained in the confidence interval. Therefore a finding of disparate impact is not supported by this data.

Analysis of proportion of Minorities Applicants Selected **where:**

- **r = number of Minorities Selected.**
- **n = number of Applicants Selected.**
- **p = proportion of Minorities among those Selected.**
- **q = proportion of Applicants Selected.**

r = 24
n = 114
p = (34/(34+110))=0.236
q = ((24 + 90)/(34 + 110))=0.792
(r/n)=24/114=0.2105

The lower bound of the confidence interval is: 0.236 -(1.96* 0.018)= 0.2005
The upper bound of the confidence interval is: 0.236 +(1.96* 0.018)= 0.2717

Confidence Interval = 0.2005 to 0.2717

These results show that the proportion of Minorities Minorities (r/n=0.2105) is contained in the confidence interval. Therefore a finding of disparate impact is not supported by this data.

Probability Distribution Report

Please note:
Due to the large number selected, the results will be shown in increments of 2 which may have an effect on the probability distributions. *All* computed probabilities will be multiplied by the increment of 2. The use of the increment was necessary to reduce the processing load on our web server which has to compute all of the input{Distribution} probabilities.

Number Females Selected	Number Males Selected	Rate of Females Applicants Selected	Rate of Males Applicants Selected	Adverse Impact Ratio of Females	Adverse Impact against Females ?	Probability	Cumulative Probability
0	115	(0/22)	(115/123)	0	YES	0	0
2	113	(2/22)	(113/123)	0.099	YES	0	0
4	111	(4/22)	(111/123)	0.2015	YES	0	0
6	109	(6/22)	(109/123)	0.3078	YES	0	0
8	107	(8/22)	(107/123)	0.418	YES	0.000003	0.000003
10	105	(10/22)	(105/123)	0.5325	YES	0.000219	0.000222
12	103	(12/22)	(103/123)	0.6514	YES	0.006286	0.006508
14	101	(14/22)	(101/123)	0.775	YES	0.070686	0.077194
16	99	(16/22)	(99/123)	0.9036	NO	0.301783	0.378977
18	97	(18/22)	(97/123)	1.0375	NO	0.441614	0.820591
20	95	(20/22)	(95/123)	1.177	NO	0.171776	0.992367
22	93	(22/22)	(93/123)	1.3226	NO	0.007633	1

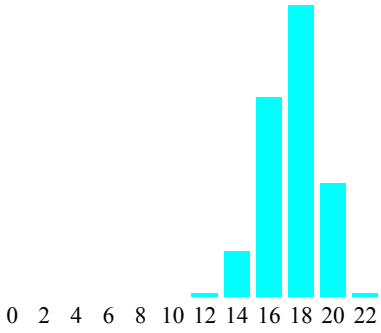
Given that 115 were Selected from a pool of 123 Males and 22 Females it was possible to have Selected from 0 to 22 Females.

Adverse Impact would be found if you Selected approximately 14 or fewer Females.
The word "approximately" was used since the results are shown in increments of 2.

The probability of Adverse Impact occurring even if the employment decisions were random (i.e. unbiased) is 0.0772 (the sum of the probabilities of having Selected 14 or fewer Females).

Since the probability of Adverse Impact occurring even if the selection was random (i.e. unbiased) is less than 10%, an observed Adverse Impact may be significant since there is a low probability that Adverse Impact would have occurred by chance.

Probability Distribution of the variable: Number of Females Selected.

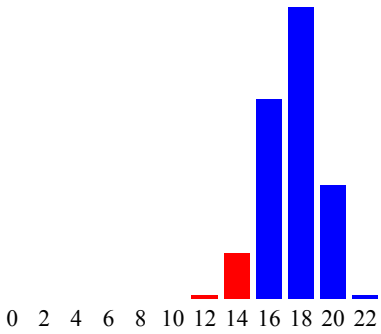


The probability distribution of having Selected from 0 to 22 Females is displayed above. As can be seen, the most likely event (highest probability) to have occurred by chance (or decisions not affected by any form of bias) is to have Selected 18 female Applicants. This represents the mean of the probability distribution. Approximately half of the probability distribution is above this point and approximately half is below this point. The total area contained in the probability distribution is equal to 1. Thus, probabilities for each number of female Applicants Selected are a fraction of the total probability distribution. The larger areas of the distribution represent higher probabilities of occurance. Adding the individual probabilities up to a certain point enable you to compute the probability of having Selected that many or fewer female Applicants. Adding the individual probabilities from a certain point and higher enable you to compute the probability of having Selected that many or more female Applicants.

The characteristics of the probability distribution--its mean and standard deviation--are a function of the number of female and male Applicants and the number of Applicants to be Selected. Though it is possible to have Selected from 0 to 22 female Applicants, the individual probabilities of having Selected each number of female Applicants can be computed and accumulated. As noted before, these individual probabilities are a function of the number of female and male Applicants and the number of Applicants to be Selected.

Using the distribution above, a 90 percent confidence interval on the variable 'Number of Females Selected' would have a lower bound of 14 and an upper bound of 20.

The significance of having Selected 15 or fewer Females is graphically displayed below.



As noted earlier, Adverse Impact, according to the 4/5ths rule, would be found if you Selected approximately 14 *or fewer* female Applicants.
The word "approximately " was used since the results were computed in increments of 2.

You have Selected 15 female Applicants. The probability of having Selected 15 *or fewer* Females is equal to the cumulative probability for having Selected 15 Females Applicants. The cumulative probability of having Selected 15 female Applicants is 0.0772 and is graphically displayed, in red, above.

Since the probability is less than 10%, we must reject the hypothesis that the decisions occurred due to chance. Therefore, we must conclude that the result 15 female Applicants were Selected does not support (based on statistics) a finding of Adverse Impact.

Please note:
Due to the large number selected, the results will be shown in increments of 2 which may have an effect on the probability distributions. *All* computed probabilities will be multiplied by the increment of 2. The use of the increment was necessary to reduce the processing load on our web server which has to compute all of the input{Distribution} probabilities.

Number Minorities Selected	Number Non-Minorities Selected	Rate of Minorities Applicants Selected	Rate of Non-Minorities Applicants Selected	Adverse Impact Ratio of Minorities	Adverse Impact against Minorities ?	Probability	Cumulative Probability
4	110	(4/34)	(110/110)	0.1176	YES	0	0
6	108	(6/34)	(108/110)	0.1797	YES	0	0
8	106	(8/34)	(106/110)	0.2442	YES	0	0
10	104	(10/34)	(104/110)	0.3111	YES	0	0
12	102	(12/34)	(102/110)	0.3806	YES	0	0
14	100	(14/34)	(100/110)	0.4529	YES	0	0
16	98	(16/34)	(98/110)	0.5282	YES	0.000002	0.000002
18	96	(18/34)	(96/110)	0.6066	YES	0.000098	0.0001
20	94	(20/34)	(94/110)	0.6884	YES	0.002362	0.002463
22	92	(22/34)	(92/110)	0.7737	YES	0.026588	0.029051
Selected-> 24	90	(24/34)	(90/110)	0.8627	NO	0.140078	0.169129
26	88	(26/34)	(88/110)	0.9559	NO	0.336271	0.505399
28	86	(28/34)	(86/110)	1.0534	NO	0.345476	0.850875
30	84	(30/34)	(84/110)	1.1555	NO	0.133975	0.98485
32	82	(32/34)	(82/110)	1.2626	NO	0.014946	0.999797
34	80	(34/34)	(80/110)	1.375	NO	0.000203	1

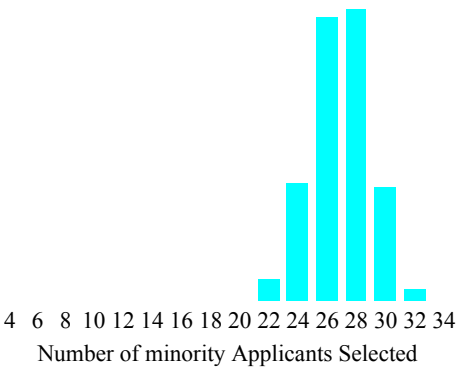
Given that 114 were Selected from a pool of 110 Non-Minorities and 34 Minorities it was possible to have Selected from 4 to 34 Minorities.

Adverse Impact would be found if you Selected approximately 22 or fewer Minorities.
The word "approximately" was used since the results are shown in increments of 2.

The probability of Adverse Impact occurring even if the employment decisions were random (i.e. unbiased) is 0.0291 (the sum of the probabilities of having Selected 22 or fewer Minorities).

Since the probability of Adverse Impact occurring even if the selection was random (i.e. unbiased) is less than 10%, an observed Adverse Impact may be significant since there is a low probability that Adverse Impact would have occurred by chance.

Probability Distribution of the variable: Number of Minorities Selected.

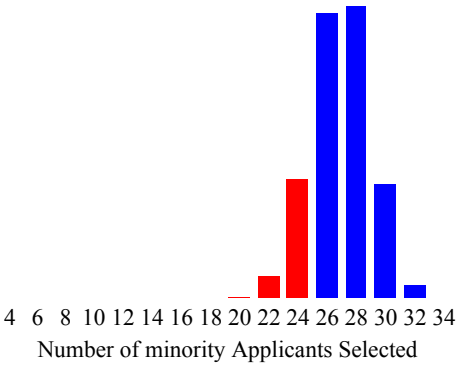


The probability distribution of having Selected from 4 to 34 Minorities is displayed above. The graph above is shown starting with 4 since the probabilities below this point are near zero. As can be seen, the most likely event (highest probability) to have occurred by chance (or decisions not affected by any form of bias) is to have Selected 28 minority Applicants. This represents the mean of the probability distribution. Approximately half of the probability distribution is above this point and approximately half is below this point. The total area contained in the probability distribution is equal to 1. Thus, probabilities for each number of minority Applicants Selected are a fraction of the total probability distribution. The larger areas of the distribution represent higher probabilities of occurance. Adding the individual probabilities up to a certain point enable you to compute the probability of having Selected that many or fewer minority Applicants. Adding the individual probabilities from a certain point and higher enable you to compute the probability of having Selected that many or more minority Applicants.

The characteristics of the probability distribution--its mean and standard deviation--are a function of the number of minority and non-minority Applicants and the number of Applicants to be Selected. Though it is possible to have Selected from 4 to 34 minority Applicants, the individual probabilities of having Selected each number of minority Applicants can be computed and accumulated. As noted before, these individual probabilities are a function of the number of minority and non-minority Applicants and the number of Applicants to be Selected.

Using the distribution above, a 90 percent confidence interval on the variable 'Number of Minorities Selected' would have a lower bound of 24 and an upper bound of 30.

The significance of having Selected 24 or fewer Minorities is graphically displayed below.



As noted earlier, Adverse Impact, according to the 4/5ths rule, would be found if you Selected approximately 22 *or fewer* minority Applicants. The word "approximately " was used since the results were computed in increments of 2.

You have Selected 24 minority Applicants. The probability of having Selected 24 *or fewer* Minorities is equal to the cumulative probability for having Selected 24 Minorities Applicants. The cumulative probability of having Selected 24 minority Applicants is 0.1691 and is graphically displayed, in red, above.

Since the probability is greater than 10%, we are unable to reject the hypothesis that the decisions occurred due to chance. Therefore, we must conclude that it is entirely possible that having Selected 24 or fewer minority Applicants is an event that occurred due to chance and not from discriminatory actions by the employer.

View Source Code

Send questions or comments to webmaster@hr-guide.com. Thank you.