



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

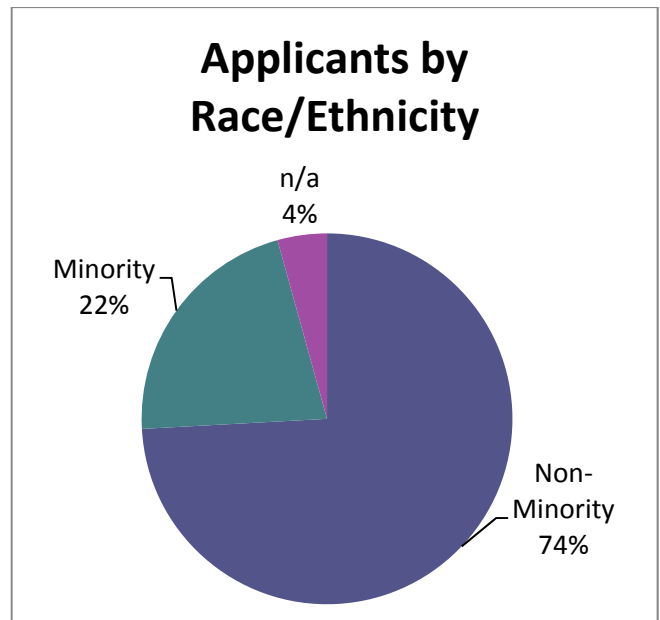
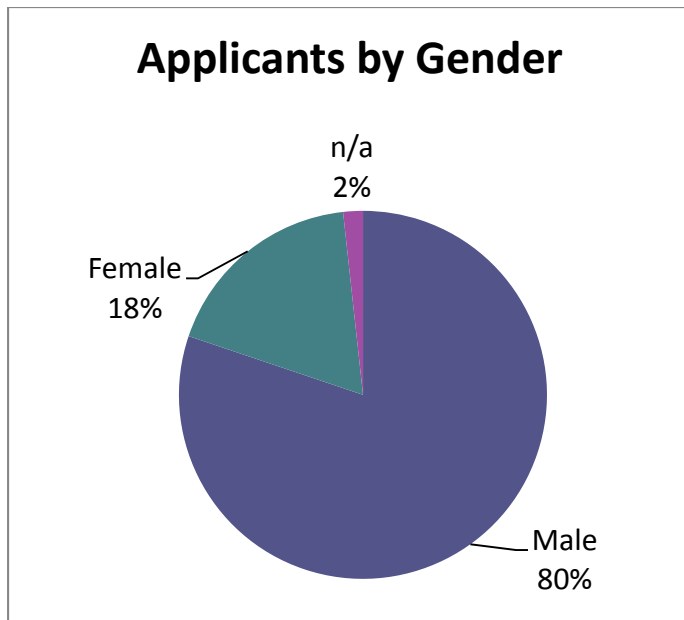
DATE: July 8, 2015

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 54 candidates (83% of the test group) with no adverse or disparate impact.

A. Background

The position was open for applications from April 16 – June 5, 2015 and Human Resources received 116 applications for the position.



Numerically, the breakdown of applicants is as follows:

Male	93	80%
Female	21	18%
No response or "n/a"	2	2%

Non-Minority	86	74%
Minority	16	22%
No response or "n/a"	5	4%

July 8, 2015

B. Application Screening

Of the 116 applicants, 100 (86%) were referred to the examination. A total of 16 applications were not referred to the examination due to the applicant not meeting the education/experience component of the position.

Disposition				# of Applicants
Did Not Meet Minimum Qualifications				
13NMQ – Does not meet min. qual. (educ./law enforcement/military)				16
Non-Minority	11 (69%)	Minority	4 (25%)	
Male	13 (81%)	Females	3 (19%)	

C. Video/Written Exam

Of the 100 applicants invited to test, 65 attended. The test was offered on Thursday, June 25, 2015 at the Hilton Garden Inn in Champaign. Demographics of the attendees are as follows:

	#	% of Invited	% of Test Group
Male	51	51%	78%
Female	13	13%	20%
No response or "n/a"	1	1%	2%

	#	% of Invited	% of Test Group
Non-Minority	52	52%	80%
Minority	11	12%	17%
No response or "n/a"	2	2%	3%

D. Passing Score

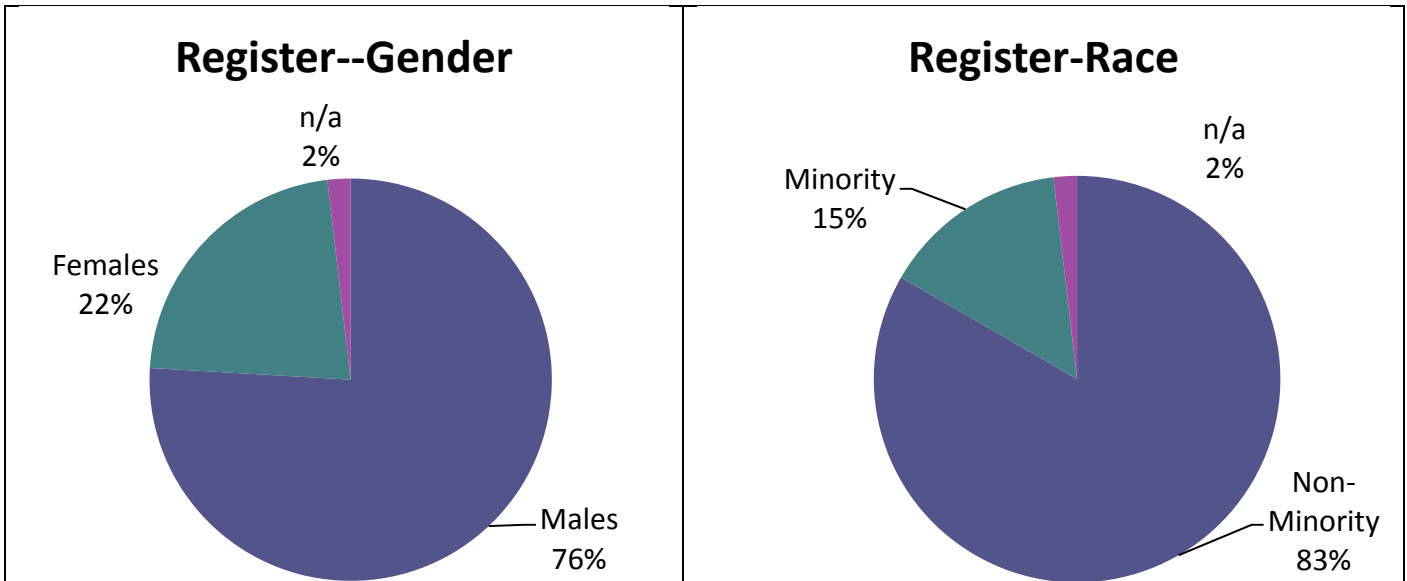
The testing vendor, Ergometrics, recommends a passing score of 65.00% for each component of the exam (human relations, written and reading), which would allow 54 applicant to be placed on the eligibility register for future consideration. At this passing score, adverse and/or disparate impact is not observed (additional data is attached).

65% Pass Rate				
	#	% of Total Tested	% of Like Group Tested	% of Register
Male	41	63% (41/65)	80% (41/51)	76% (41/54)
Female	12	18% (12/65)	92% (12/13)	22% (12/54)
No answer	1	2% (1/65)	100% (1/1)	2% (1/54)

Entry-Level Police Officer Passing Score

July 8, 2015

	#	% of Total Tested	% of Like Group Tested	% of Register
Non-Minority	45	69% (45/65)	87% (45/52)	83% (45/54)
Minority	8	12% (8/65)	73% (8/11)	15% (8/54)
No answer	1	2% (1/65)	50% (1/2)	1% (1/54)



At this passing score, a total of 11 applicants would not pass the exam, which represents a 17% failure rate.

	#	% of Total Tested	% of Like Group Tested		#	% of Total Tested	% of Like Group Tested
Male	10	15%	20%	Non-Minority	7	11%	13%
Female	1	2%	8%	Minority	3	5%	27%

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: <input type="text" value="Selection"/>			
Enter a title for your report: <input type="text" value="Police Officer (Entry-Level) June 2015"/>			
Number of Male <input type="text" value="51"/> Applicants <input type="text" value="41"/> Selected	Number of Non-Minority <input type="text" value="52"/> Applicants <input type="text" value="45"/> Selected	Number of Younger <input type="text"/> Applicants <input type="text"/> Selected	Number of Non-Disabled <input type="text"/> Applicants <input type="text"/> Selected
Number of Female <input type="text" value="13"/> Applicants <input type="text" value="12"/> Selected	Number of Minority <input type="text" value="11"/> Applicants <input type="text" value="8"/> Selected	Number of Older <input type="text"/> Applicants <input type="text"/> Selected	Number of Disabled <input type="text"/> Applicants <input type="text"/> Selected
<input checked="" type="checkbox"/> -Adverse Impact <input checked="" type="checkbox"/> -Chi-Square <input checked="" type="checkbox"/> -Standard Deviation <input checked="" type="checkbox"/> -Confidence Intervals <input checked="" type="checkbox"/> 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.	
		<input type="button" value="Compute"/>	
Display: <input checked="" type="checkbox"/> Description of Statistic <input checked="" type="checkbox"/> Interpretation of Results			

Police Officer (Entry-Level) June 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
(12/ 13) = 0.9231	(41/ 51) = 0.8039	(0.9231/ 0.8039)= 1.15	(0.8039/ 0.9231)= 0.87
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
(8/ 11) = 0.7273	(45/ 52) = 0.8654	(0.7273/ 0.8654)= 0.84	(0.8654/ 0.7273)= 1.19
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	41 42.2344	10 8.7656	51
Females	12 10.7656	1 2.2344	13
Column Total	53	11	64
Chi-Square = 1.0334			
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	45 43.746	7 8.254	52
Minorities	8 9.254	3 1.746	11
Column Total	53	10	63
Chi-Square = 1.2969			
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:

$$(r / n) - p$$

$$\text{sqrt}(p * (1-p) / n) * \text{sqrt}(1-q)$$

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	41	10	51
Females	12	1	13
Column Total	53	11	64

r = 12
n = 53
p = 13 / 64 = 0.203
q = (12 + 41) / (13 + 51) = 0.828

Standard Deviation Statistic = 1.017

These results show that the proportion of Females Selected is 1.017 standard deviations above 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	45	7	52
Minorities	8	3	11
Column Total	53	10	63

r = 8
n = 53
p = 11 / 63 = 0.175
q = (8 + 45) / (11 + 52) = 0.841

Standard Deviation Statistic = -1.139

These results show that the proportion of Minorities Selected is -1.139 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 = 12
n = 53
p = (13/(13+51))=0.203
q = ((12 + 41)/(13 + 51))=0.828
(r/n)=12/53=0.2264

The lower bound of the confidence interval is: $0.203 - (1.96 * 0.023) = 0.1582$

The upper bound of the confidence interval is: $0.203 + (1.96 * 0.023) = 0.248$

Confidence Interval = 0.1582 to 0.248

These results show that the proportion of Females Females ($r/n=0.2264$) 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.

$r = 8$

$n = 53$

$p = (11/(11+52))=0.175$

$q = ((8 + 45)/(11 + 52))=0.841$

$(r/n)=8/53=0.1509$

The lower bound of the confidence interval is: $0.175 - (1.96 * 0.021) = 0.1339$

The upper bound of the confidence interval is: $0.175 + (1.96 * 0.021) = 0.2153$

Confidence Interval = 0.1339 to 0.2153

These results show that the proportion of Minorities Minorities ($r/n=0.1509$) is contained in the confidence interval. Therefore a finding of disparate impact is not supported by this data.

Probability Distribution Report

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
2	51	(2/13)	(51/51)	0.1538	YES	0	0
3	50	(3/13)	(50/51)	0.2354	YES	0	0
4	49	(4/13)	(49/51)	0.3203	YES	0.000001	0.000001
5	48	(5/13)	(48/51)	0.4087	YES	0.000036	0.000037
6	47	(6/13)	(47/51)	0.5008	YES	0.000577	0.000614
7	46	(7/13)	(46/51)	0.597	YES	0.005421	0.006035
8	45	(8/13)	(45/51)	0.6974	YES	0.03117	0.037205
9	44	(9/13)	(44/51)	0.8024	NO	0.111323	0.148528
10	43	(10/13)	(43/51)	0.9123	NO	0.24491	0.393438
11	42	(11/13)	(42/51)	1.0275	NO	0.319125	0.712564
Selected-> 12	41	(12/13)	(41/51)	1.1482	NO	0.223388	0.935952
13	40	(13/13)	(40/51)	1.275	NO	0.064048	1

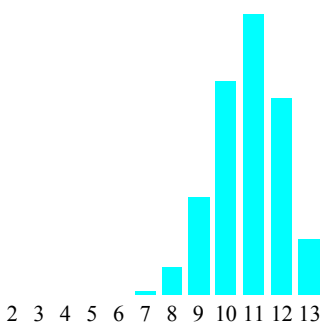
Given that 53 were Selected from a pool of 51 Males and 13 Females it was possible to have Selected from 2 to 13 Females.

Adverse Impact would be found if you Selected 8 or fewer Females.

The probability of Adverse Impact occurring even if the employment decisions were random (i.e. unbiased) is 0.0372 (the sum of the probabilities of having Selected 8 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.



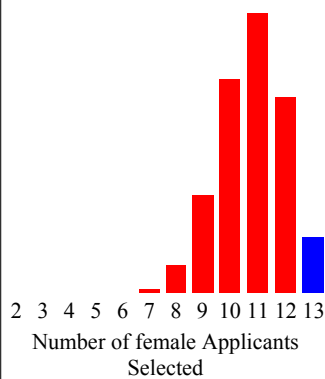
Number of female Applicants Selected

The probability distribution of having Selected from 2 to 13 Females is displayed above. The graph above is shown starting with 2 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 11 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 occurrence. 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 2 to 13 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 9 and an upper bound of 13.

The significance of having Selected 12 or fewer Females is graphically displayed below.



As noted earlier, Adverse Impact, according to the 4/5ths rule, would be found if you Selected 8 or fewer female Applicants.

You have Selected 12 female Applicants. The probability of having Selected 12 or fewer Females is equal to the cumulative probability for having Selected 12 Females Applicants. The cumulative probability of having Selected 12 female Applicants is 0.936 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 12 or fewer female Applicants is an event that occurred due to chance and not from discriminatory actions by the employer.

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
1	52	(1/11)	(52/52)	0.0909	YES	0	0
2	51	(2/11)	(51/52)	0.1854	YES	0	0
3	50	(3/11)	(50/52)	0.2836	YES	0.000002	0.000002
4	49	(4/11)	(49/52)	0.3859	YES	0.000057	0.000059
5	48	(5/11)	(48/52)	0.4924	YES	0.000979	0.001037
6	47	(6/11)	(47/52)	0.6035	YES	0.009395	0.010432
7	46	(7/11)	(46/52)	0.7194	YES	0.052567	0.062999
Selected-> 8	45	(8/11)	(45/52)	0.8404	NO	0.172719	0.235718
9	44	(9/11)	(44/52)	0.9669	NO	0.323848	0.559566
10	43	(10/11)	(43/52)	1.0994	NO	0.316652	0.876218
11	42	(11/11)	(42/52)	1.2381	NO	0.123782	1

Given that 53 were Selected from a pool of 52 Non-Minorities and 11 Minorities it was possible to have Selected from 1 to 11 Minorities.

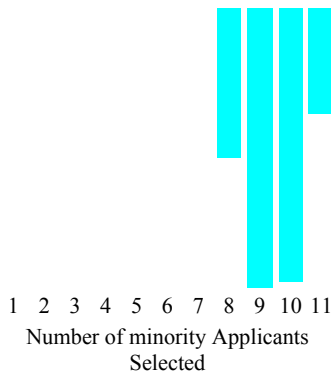
Adverse Impact would be found if you Selected 7 or fewer Minorities.

The probability of Adverse Impact occurring even if the employment decisions were random (i.e. unbiased) is 0.063 (the sum of the probabilities of having Selected 7 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.



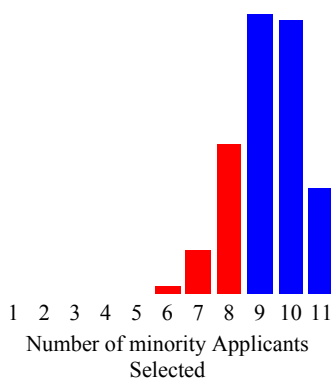


The probability distribution of having Selected from 1 to 11 Minorities is displayed above. The graph above is shown starting with 1 since the probabilities below this point are near zero. As can be seen, the most likely event (highest probability) to have occurred by chance (or decisions not affected by any form of bias) is to have Selected 9 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 occurrence. 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 1 to 11 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 7 and an upper bound of 11.

The significance of having Selected 8 or fewer Minorities is graphically displayed below.



As noted earlier, Adverse Impact, according to the 4/5ths rule, would be found if you Selected 7 or fewer minority Applicants.

You have Selected 8 minority Applicants. The probability of having Selected 8 or fewer Minorities is equal to the cumulative probability for having Selected 8 Minorities Applicants. The cumulative probability of having Selected 8 minority Applicants is 0.2357 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 8 or fewer minority Applicants is an event that occurred due to chance and not from discriminatory actions by the employer.

[View Source Code](#)