



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: March 23, 2016

A. Summary

City of Urbana Human Resources staff recommends a passing score of 68.00% for the video exam and 70.0% for the written and reading portions of the FrontLine National Testing System for Entry-Level Police Officers. This would result in an eligibility register of 86 candidates (72% of the test group) with no adverse or disparate impact.

B. Background

The position was open for applications from October 16, 2015 – Jan. 16, 2016; Human Resources received 181 applications for the position. Of those, 149 were invited to test and 32 were not. Of the 32, 18 were disqualified due to not meeting the minimum requirements of the position and 14 were disqualified for not providing required documentation.

C. Video/Written Exam

A total of 119 applicants tested either in-person on Saturday, Jan. 30, 2016 at the Alice Campbell Alumni Center in Urbana or through a National Testing Network testing center. Demographics of the testing candidates are as follows:

	#	%
Male	96	80.7%
Female	17	14.3%
No response or "n/a"	6	5.0%

	#	% of Test Group
Non-Minority	89	74.8%
Minority	20	16.8%
No response or "n/a"	10	8.4

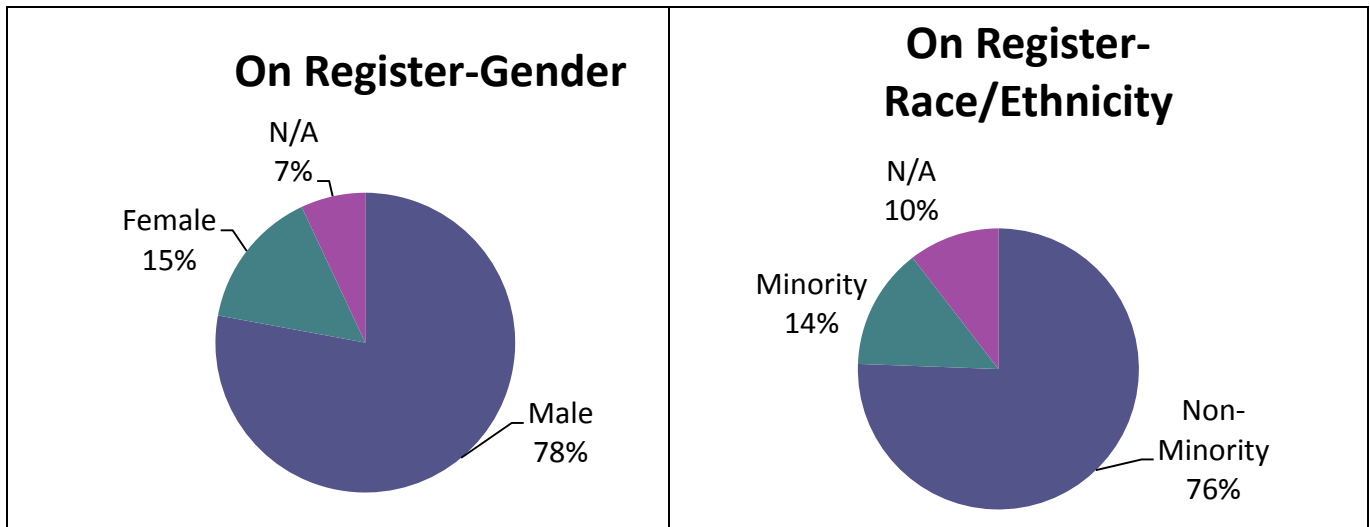
D. Passing Score

At the recommended passing score, adverse and/or disparate impact is not observed (additional data is attached).

Entry-Level Police Officer Passing Score

March 23, 2016

Proposed Pass Rate				
	#	% of Total Tested	% of Like Group Tested	% of Register
Male	67	56.3% (67/119)	69.8% (67/96)	77.9% (67/86)
Female	13	10.9% (13/119)	76.4% (13/17)	15.1% (13/86)
N/A	6	5.0% (6/119)	100% (6/6)	7.0% (6/86)
	#	% of Total Tested	% of Like Group Tested	% of Register
Non-Minority	65	54.6% (65/119)	73.0% (65/89)	75.6% (65/86)
Minority	12	10.0% (12/119)	60.0% (12/20)	14.0% (12/86)
N/A	9	7.6% (9/119)	90.0% (9/10)	1.0% (9/86)



At this passing score, a total of 33 applicants would not pass the exam, which represents a 28% failure rate.

	#	% of Total Tested	% of Like Group Tested		#	% of Total Tested	% of Like Group Tested
Male	29	24.4% (29/119)	30.2% (29/96)	Non-Minority	24	20.2% (24/119)	27.0% (24/89)
Female	4	3.3% (4/119)	23.5% (4/17)	Minority	8	6.7% (8/119)	40% (8/20)

E. Attachments

- Disparate Impact Report



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:

Enter a title for your report:

Sex

Number of Male
 Applicants
 Selected

Race

Number of Non-Minority
 Applicants
 Selected

Age

Number of Younger
 Applicants
 Selected

Disability

Number of Non-Disabled
 Applicants
 Selected

Number of Female
 Applicants
 Selected

Number of Minority
 Applicants
 Selected

Number of Older
 Applicants
 Selected

Number of Disabled
 Applicants
 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	

Entry-Level Police Officer (Feb. 2016)

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 Female Applicants Selected	Rate of Male Applicants Selected	Adverse Impact Ratio for Female	Adverse Impact Ratio for Male
(13/17) = 0.7647	(67/96) = 0.6979	(0.7647/0.6979)=1.1	(0.6979/0.7647)=0.91
Adverse impact as defined by the 4/5ths rule was not found in the above data.			

Rate of Minority Applicants Selected	Rate of NonMinority Applicants Selected	Adverse Impact Ratio for Minority	Adverse Impact Ratio for NonMinority
(12/20) = 0.6	(65/89) = 0.7303	(0.6/0.7303)=0.82	(0.7303/0.6)=1.22
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
Male	67 67.9646	29 28.0354	96
Female	13 12.0354	4 4.9646	17
Column Total	80	33	113
Chi-Square = 0.3116			
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
NonMinority	65 62.8716	24 26.1284	89
Minority	12 14.1284	8 5.8716	20
Column Total	77	32	109
Chi-Square = 1.3376			
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:

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

*Analysis of proportion of Female Selected*where:

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

	Selected	Not Selected	Row Totals
Male	67	29	96
Female	13	4	17
Column Total	80	33	113

$$r = 13$$

$$n = 80$$

$$p = 17 / 113 = 0.15$$

$$q = (13 + 67) / (17 + 96) = 0.708$$

Standard Deviation Statistic = 0.558

These results show that the proportion of Female Selected is 0.558 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 Minority Selected*where:

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

	Selected	Not Selected	Row Totals
NonMinority	65	24	89
Minority	12	8	20
Column Total	77	32	109

$$r = 12$$

$$n = 77$$

$$p = 20 / 109 = 0.183$$

$$q = (12 + 65) / (20 + 89) = 0.706$$

Standard Deviation Statistic = -1.157

These results show that the proportion of Minority Selected is -1.157 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 = $p - 1.96 * \text{Std Dev}$

Upper Bound = $p + 1.96 * \text{Std Dev}$

*Analysis of proportion of Female Applicants Selected*where:

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

r = 13

n = 80

p = $(17 / (17 + 96)) = 0.15$

q = $((13 + 67) / (17 + 96)) = 0.708$

(r/n) = $13 / 80 = 0.1625$

The lower bound of the confidence interval is: $0.15 - (1.96 * 0.022) = 0.1081$

The upper bound of the confidence interval is: $0.15 + (1.96 * 0.022) = 0.1928$

Confidence Interval = 0.1081 to 0.1928

These results show that the proportion of Female Female (r/n=0.1625) is contained in the confidence interval.

Therefore a finding of disparate impact is not supported by this data.

*Analysis of proportion of Minority Applicants Selected*where:

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

r = 12

n = 77

p = $(20 / (20 + 89)) = 0.183$

q = $((12 + 65) / (20 + 89)) = 0.706$

(r/n) = $12 / 77 = 0.1558$

The lower bound of the confidence interval is: $0.183 - (1.96 * 0.024) = 0.1366$

The upper bound of the confidence interval is: $0.183 + (1.96 * 0.024) = 0.2303$

Confidence Interval = 0.1366 to 0.2303

These results show that the proportion of Minority Minority (r/n=0.1558) is contained in the confidence interval.

Therefore a finding of disparate impact is not supported by this data.

Probability Distribution Report

Number Female Selected	Number Male Selected	Rate of Female Applicants Selected	Rate of Male Applicants Selected	Adverse Impact Ratio of Female	Adverse Impact against Female ?	Probability	Cumulative Probability
0	80	(0/17)	(80/96)	0	YES	0	0
1	79	(1/17)	(79/96)	0.0715	YES	0	0
2	78	(2/17)	(78/96)	0.1448	YES	0	0
3	77	(3/17)	(77/96)	0.22	YES	0.000001	0.000001
4	76	(4/17)	(76/96)	0.2972	YES	0.000014	0.000015
5	75	(5/17)	(75/96)	0.3765	YES	0.000135	0.00015
6	74	(6/17)	(74/96)	0.4579	YES	0.000919	0.00107
7	73	(7/17)	(73/96)	0.5415	YES	0.004648	0.005718
8	72	(8/17)	(72/96)	0.6275	YES	0.017674	0.023392
9	71	(9/17)	(71/96)	0.7158	YES	0.050901	0.074293
10	70	(10/17)	(70/96)	0.8067	NO	0.111198	0.185491
11	69	(11/17)	(69/96)	0.9003	NO	0.183458	0.368949
12	68	(12/17)	(68/96)	0.9965	NO	0.226047	0.594996
Selected->13	67	(13/17)	(67/96)	1.0957	NO	0.203862	0.798858
14	66	(14/17)	(66/96)	1.1979	NO	0.130083	0.928941
15	65	(15/17)	(65/96)	1.3032	NO	0.05539	0.984332
16	64	(16/17)	(64/96)	1.4118	NO	0.014064	0.998396
17	63	(17/17)	(63/96)	1.5238	NO	0.001604	1

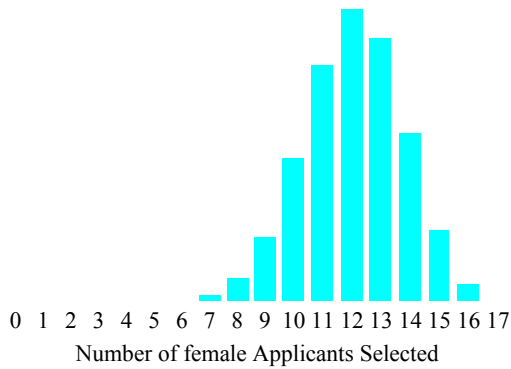
Given that 80 were Selected from a pool of 96 Male and 17 Female it was possible to have Selected from 0 to 17 females.

Adverse Impact would be found if you Selected 9 or fewer Female.

The probability of Adverse Impact occurring even if the employment decisions were random (i.e. unbiased) is 0.0743 (the sum of the probabilities of having Selected 9 or fewer Female).

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 Female Selected.

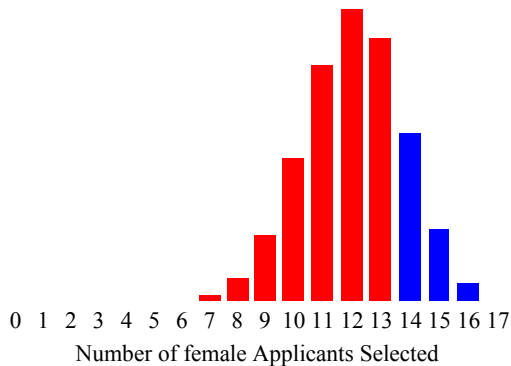


The probability distribution of having Selected from 0 to 17 females is displayed above. As can be seen, the most likely event (highest probability) to have occurred by chance (or decisions not affected by any form of bias) is to have Selected 12 female Applicants. This represents the mean of the probability 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 females Applicants. Adding the individual probabilities from a certain point and higher enable you to compute the probability of having Selected that many or more females 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 17 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 Female Selected' would have a lower bound of 9 and an upper bound of 15.

The significance of having Selected 13 or fewer Female is graphically displayed below.



As noted earlier, Adverse Impact, according to the 4/5ths rule, would be found if you Selected 9 or fewer female Applicants.

You have Selected 13 female Applicants. The probability of having Selected 13 or fewer Female is equal to the cumulative probability for having Selected 13 Female Applicants. The cumulative probability of having Selected 13 female Applicants is 0.7989 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 13 or fewer female Applicants is an event that occurred due to chance and not from discriminatory actions by the employer.

Probability Distribution Report

Number Minority Selected	Number NonMinority Selected	Rate of Minority Applicants Selected	Rate of NonMinority Applicants Selected	Adverse Impact Ratio of Minority	Adverse Impact against Minority ?	Probability	Cumulative Probability
0	77	(0/20)	(77/89)	0	YES	0	0
1	76	(1/20)	(76/89)	0.0586	YES	0	0
2	75	(2/20)	(75/89)	0.1187	YES	0	0
3	74	(3/20)	(74/89)	0.1804	YES	0	0
4	73	(4/20)	(73/89)	0.2438	YES	0	0
5	72	(5/20)	(72/89)	0.309	YES	0.000003	0.000003
6	71	(6/20)	(71/89)	0.3761	YES	0.000031	0.000034
7	70	(7/20)	(70/89)	0.445	YES	0.000232	0.000267
8	69	(8/20)	(69/89)	0.5159	YES	0.001322	0.001588
9	68	(9/20)	(68/89)	0.589	YES	0.00579	0.007378
10	67	(10/20)	(67/89)	0.6642	YES	0.019685	0.027063
11	66	(11/20)	(66/89)	0.7417	YES	0.052131	0.079194
Selected->12	65	(12/20)	(65/89)	0.8215	NO	0.10752	0.186713
13	64	(13/20)	(64/89)	0.9039	NO	0.172031	0.358745
14	63	(14/20)	(63/89)	0.9889	NO	0.211731	0.570475
15	62	(15/20)	(62/89)	1.0766	NO	0.197615	0.768091
16	61	(16/20)	(61/89)	1.1672	NO	0.136743	0.904834
17	60	(17/20)	(60/89)	1.2608	NO	0.067678	0.972512
18	59	(18/20)	(59/89)	1.3576	NO	0.022559	0.995071
19	58	(19/20)	(58/89)	1.4578	NO	0.00452	0.99959
20	57	(20/20)	(57/89)	1.5614	NO	0.00041	1

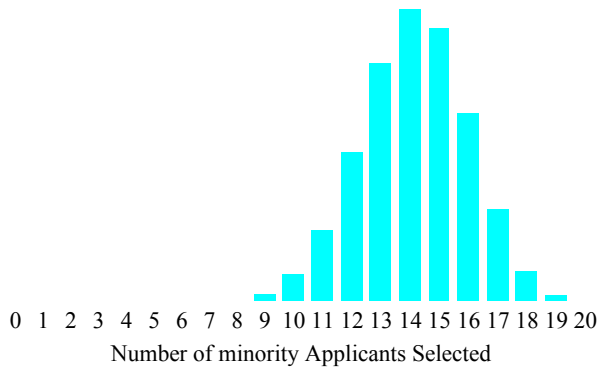
Given that 77 were Selected from a pool of 89 NonMinority and 20 Minority it was possible to have Selected from 0 to 20 minorities.

Adverse Impact would be found if you Selected 11 or fewer Minority.

The probability of Adverse Impact occurring even if the employment decisions were random (i.e. unbiased) is 0.0792 (the sum of the probabilities of having Selected 11 or fewer Minority).

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 Minority Selected.

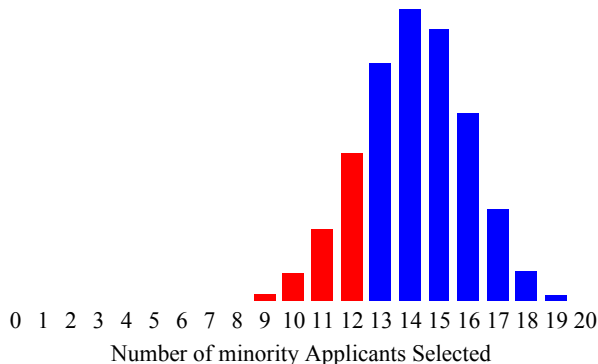


The probability distribution of having Selected from 0 to 20 minorities is displayed above. As can be seen, the most likely event (highest probability) to have occurred by chance (or decisions not affected by any form of bias) is to have Selected 14 minority Applicants. This represents the mean of the 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 minorities Applicants. Adding the individual probabilities from a certain point and higher enable you to compute the probability of having Selected that many or more minorities 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 0 to 20 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 Minority Selected' would have a lower bound of 11 and an upper bound of 17.

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



As noted earlier, Adverse Impact, according to the 4/5ths rule, would be found if you Selected 11 or fewer minority Applicants.

You have Selected 12 minority Applicants. The probability of having Selected 12 or fewer Minority is equal to the cumulative probability for having Selected 12 Minority Applicants. The cumulative probability of having Selected 12 minority Applicants is 0.1867 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 minority Applicants is an event that occurred due to chance and not from discriminatory actions by the employer.