SECTION VI.
Disparity Analysis for ODOT Contracts

Section V reported low levels of utilization on ODOT contracts for some MBE/WBE groups. In addition, overall MBE/WBE participation in ODOT engineering-related contracts was substantially lower than in ODOT construction contracts.

However, utilization results for construction and engineering projects may not be directly comparable due to differences in the location, types and sizes of these contracts. When evaluating differences in utilization among racial/ethnic/gender groups or differences between sets of contracts, it is important to account for the relative availability of minority- and women-owned firms for the specific prime contracts and subcontracts under scrutiny.

To know whether groups of MBE/WBE firms are "underutilized," one must compare utilization with a benchmark that reflects what would be expected given the relative availability of firms for a particular set of contracting opportunities. This analysis is referred to as a disparity analysis. A disparity analysis helps to identify whether disparities exist for certain types of contracts and subcontracts for specific race/ethnicity/gender groups.

- The disparity analysis provided in Section VI accounts for differences in types, sizes, locations and timing of prime contracts and subcontracts to establish availability benchmarks for specific MBE/WBE groups and sets of contracts.

- BBC compares actual participation of an MBE/WBE group in certain contracts (expressed as a percentage of total dollars) to the percentage of work that might be expected to go to that group given availability for that specific work (i.e., availability benchmark).

- BBC creates an index that easily communicates how close actual utilization comes to the availability benchmark, or whether it exceeds the benchmark. By creating this index of relative disparity (or lack of disparity) for each MBE/WBE group and set of contracts, one can directly compare results among groups and between sets of contracts.

Section VI presents BBC's disparity analysis in six parts:

A. Overview of disparity analysis methodology;

B. Overall disparity results for ODOT contracts;

C. Disparity results for construction contracts;

D. Disparity results for engineering contracts;

E. Analysis of statistical significance of disparities; and

F. Summary of disparity results.

A. Overview of Disparity Analysis Methodology

BBC compared actual utilization of minority- and women-owned firms by race/ethnicity/gender (as a percentage of contract dollars) to the share of contract dollars that might be expected to go to minority- and women-owned firms based on BBC's availability analysis for a particular set of contracts. In the following discussion, "expected share of contract dollars" is also referred to as the "availability benchmark" for an MBE/WBE group for the specific set of contracts. For each MBE/WBE group, BBC calculated a unique availability benchmark for each set of ODOT contracts.

Figure VI-1.
Calculation of disparity indices

The disparity index provides a straightforward way of assessing how closely actual utilization of an MBE//WBE group matches what might be expected given the relative availability of that MBE/WBE group for the work involved in a specific set of contracts. An index of "100" indicates an exact match between actual and expected utilization for that group (also referred to as "parity"). In BBC's disparity analysis, a disparity index is calculated for each MBE/WBE group for each set of contracts examined. One can directly compare an index for one group to another group, and between sets of contracts.

BBC calculates the disparity index for a particular group through the following formula:

$$\frac{\text{\% actual utilization}}{\text{\% availability}} \times 100$$

For example, if actual utilization of WBEs in a set of ODOT contracts was 2% and the availability benchmark was 10% for those contracts, the index would be 2%÷10%, which is then multiplied by 100 to derive an index of 20. In this example, WBEs would have received 20 cents for every dollar expected to go to WBEs based on the availability benchmark.

Both actual utilization and the availability benchmark for a set of contracts are expressed as a percentage of the dollars involved in those contracts. As such, the actual outcome and the benchmark are expressed in terms that are directly comparable (e.g., 5% actual utilization compared with a benchmark of 4%). To help compare results between groups or across sets of contracts, BBC calculates a disparity index, as described in Figure VI-1.

Example of a disparity analysis table. Disparity results presented in this report are based on the more than 50 detailed disparity tables found in Appendix K (each table reports disparity study results for a different set of contracts). Therefore, it is useful to first review the calculation and presentation of results in these tables.

Figure VI-2 presents an example of a disparity table from Appendix K (it is labeled Figure K-3 in Appendix K). This disparity table pertains to FHWA-funded construction and engineering contracts that ODOT awarded for July 2004–June 2009. It includes dollars for prime contractors and subcontractors. The parameters for the set of contracts being examined are noted in the heading of each table. Appendix K contains similar tables for different sets of contracts, including results that separate prime contracts and subcontracts. Each set of contract elements is for a specific:

- Funding source (all funding sources, FHWA-funded or state-funded);
- Type of work (combined contracts, construction-related and engineering-related);
- Time period (the first half of the study period, which is July 2004–December 2006; the second half of the study period; which is January 2007–June 2009 and the entire study period); and
- Contract role (combined prime/sub, only prime contracts and only subcontracts).

BBC also completed disparity analyses for "small contracts" alone. The study team defined small contracts as $5 million or less for construction and $500,000 or less for engineering.[1] Analyses that focus on small contracts are noted as such.

Utilization. Each of the disparity tables includes the same columns and rows:

- Column (a) notes the number of prime contracts and subcontracts in the set of contracting data under examination (in Figure VI-2, 6,306 total contracts and subcontracts).
- Column (b) identifies the dollars examined in the set of contract elements. Because "prime contract dollars" refers to the dollars retained by the prime contractor after deducting subcontract dollars, the combined prime/subcontract analyses equals the total contract amounts. Dollars are reported in thousands. This disparity table examines contract dollars totaling approximately $2.9 billion.
- Column (c) provides utilization dollars by group after pro-rating any money going to firms identified as MBEs for which specific race/ethnicity information was not available. In the ODOT disparity analysis, there were no contract elements for which race/ethnicity of an MBE firm could not be determined.
- Column (d) portrays relative utilization on a percentage basis. Each percentage in column (d) is calculated by dividing dollars going to that group in column (c) by the total dollars in the set of contracts or subcontracts as shown in row (1) of column (c).

Figure VI-2 includes separate rows for each firm type:

- "All firms" in row (1) pertains to combined majority-, minority- and women-owned firms.
- Row (2) pertains to "WBEs," or white women-owned firms, whether or not they are certified as WBEs or DBEs.
- Row (3) pertains to "MBEs," or all minority-owned firms, regardless of certification.

Data for individual minority groups are shown in subsequent rows. Combined, those utilization dollars add up to the total for MBEs (in some cases, numbers may not perfectly add due to rounding).

[1] Values for larger and smaller contracts were determined from BBC's analysis of the size distribution of ODOT contracts.

The bottom half of Figure VI-2 reports utilization for firms that were certified as DBEs. BBC included a row for white male-owned DBEs, though no such DBE-certified firms appeared to have received ODOT contracts or subcontracts examined in this study. DBE utilization data reported in the bottom half of Figure VI-2 were prepared independently from ODOT's DBE participation reports and thus do not match DBE utilization presented in those reports (for a discussion of differences, see Section V).

Figure VI-3.
Definition of "substantial disparity"

Some courts deem a disparity index below 80 as "substantial" and accepted as evidence of adverse impact. See e.g., *Rothe Development Corp v. U.S. Dept of Defense*, 545 F.3d 1023, 1041; *Eng'g Contractors Ass'n of South Florida, Inc. v. Metropolitan Dade County*, 122 F.3d at 914, 923 (11th Circuit 1997); *Concrete Works of Colo., Inc. v. City and County of Denver*, 36 F.3d 1513, 1524 (10th Cir. 1994). See Appendix A for additional discussion.

Relative availability. BBC developed an estimate of relative availability of firms for each racial/ethnic/gender group following the procedures described in Section IV. Availability results, represented as a percentage, provide a benchmark against which to compare relative utilization for a specific group for a particular set of contracts. BBC separately calculated relative availability for each group and set of contracts/subcontracts.

Column (e) of Figure VI-2 reports relative availability for each group for ODOT's FHWA-funded construction and engineering contracts. Based on the types of work involved in the prime contracts and subcontracts included in the Figure VI-2 analysis, plus the sizes of the contract elements when they were awarded, BBC estimated that 12.7 percent of FHWA-funded contract dollars from July 2004 through June 2009 would be expected to go to minority- and women-owned firms after considering each firm's:

- Specialization;
- Interest and qualifications in prime versus subcontract work;
- Geographic reach;
- Bid capacity to perform the work; and
- Whether the firm was in business in the year ODOT awarded the contract.

This result can be found in row (2) of column (e) in Figure VI-2.

Differences between utilization and availability. The first step in analyzing whether there was a disparity between the relative utilization of a particular group and its relative availability is to subtract percentage utilization from percentage availability. For example, as reported in row (2), column (f) of Figure VI-2, MBE/WBE utilization was 6 percentage points above MBE/WBE availability.

It is sometimes difficult to interpret absolute differences between relative utilization and relative availability, especially when utilization and availability are relatively small. Therefore, BBC also calculated a "disparity index," which divides percentage utilization by percentage availability and multiplies the result by 100. An index of "100" means that there is "parity" between relative utilization and availability for a particular group. An index below 100, particularly below 80, may indicate a substantial disparity, as discussed in Figure VI-3 above.

Column (g) provides the disparity index for each group. For example, the disparity index of 33 for African American-owned firms shown in row (5) of column (g) means that utilization of African American-owned businesses in FHWA-funded contracts was much lower than what would be expected given the relative availability of African American-owned firms to perform that work. The disparity index of 147 for all MBE/WBEs shown in row (2) of column (g) indicates no underutilization of all minority- and women-owned firms considered together.[2]

Results when disparity indices are very large or when availability is zero. BBC applied the following rules when the disparity indices calculated were exceedingly large or could not be calculated because no firms were identified as available for the contracts under examination:

- When BBC's calculations showed a disparity index exceeding 200, BBC reported an index of "200+."
- When there was no utilization and 0 percent availability for a particular group for a set of contracts, BBC reported "parity" between utilization and availability (indicated by a disparity index of "100").
- When BBC identified utilization for a group but 0 percent availability (which could occur for many reasons, including the fact that one or more utilized firms were out of business by the time of BBC's availability survey), BBC reported a disparity index of "200+."

The DBE utilization statistics at the bottom of Figure VI-2 are provided as reference. BBC did not conduct disparity analyses for certified DBEs alone for the reasons described in Section IV.

B. Overall Disparity Results for ODOT Contracts

BBC summarizes results of the disparity analyses for each MBE/WBE group for:

1. FHWA-funded contracts;
2. State-funded contracts; and
3. All contracts.

1. FHWA-funded contracts. Figure VI-4 summarizes the results of the disparity analysis in Figure VI-2 using disparity indices by race/ethnic/gender group from column (g). The line down the center of the graph shows an index of 100, which indicates "parity" between relative utilization and relative availability for a particular group. Indices under 100 indicate a disparity between utilization and availability. The graph ends at a disparity index of 200 even though, in some cases, disparity indices exceed 200. For reference, a line is also drawn at an index of 80. Some courts use 80 as a threshold for what may indicate a substantial disparity, as discussed in Figure VI-3.

[2] Note that all percentages in the disparity tables were rounded to the nearest tenth of 1 percent after making all calculations. Percentages correctly add and subtract, even though the rounding may make actual sums appear to differ by one tenth of 1 percent. In addition, the disparity index is derived from the detailed data for percentage utilization and availability before any rounding.

Figure VI-2.
MBE/WBE utilization, availability and disparity analysis for prime contracts/subcontracts on FHWA-funded construction and engineering contracts, July 2004—June 2009

Firm Type	(a) Number of contracts (subcontracts)	(b) Total dollars (thousands)	(c) Total dollars after Unknown MBE allocation (thousands)*	(d) Actual utilization (column c / column c, row1) %	(e) Utilization benchmark (availability) %	(f) Difference (column d - column e) %	(g) Disparity index (d / e) x 100
(1) All firms	6,306	$2,851,094	$2,851,094				
(2) MBE/WBE	2,768	$533,072	$533,072	18.7	12.7	6.0	147.1
(3) WBE	1,806	$360,430	$360,430	12.6	7.0	5.6	180.5
(4) MBE	962	$172,641	$172,641	6.1	5.7	0.3	106.0
(5) African American-owned	49	$3,440	$3,440	0.1	0.4	-0.2	33.0
(6) Asian-Pacific American-owned	4	$423	$423	0.0	0.2	-0.2	7.6
(7) Subcontinent Asian American-owned	9	$648	$648	0.0	0.1	-0.1	18.3
(8) Hispanic American-owned	114	$28,845	$28,845	1.0	0.9	0.1	111.7
(9) Native American-owned	786	$139,285	$139,285	4.9	4.1	0.8	118.6
(10) Unknown MBE	0	$0					
(11) DBE-certified	2,038	$227,091	$227,091	8.0			
(12) Woman-owned DBE	1,262	$112,385	$112,385	3.9			
(13) Minority-owned DBE	776	$114,705	$114,705	4.0			
(14) African American-owned DBE	41	$3,140	$3,140	0.1			
(15) Asian-Pacific American-owned DBE	0	$0	$0	0.0			
(16) Subcontinent Asian American-owned DBE	3	$319	$319	0.0			
(17) Hispanic American-owned DBE	95	$28,126	$28,126	1.0			
(18) Native American-owned DBE	637	$83,120	$83,120	2.9			
(19) Unknown DBE-MBE	0	$0	$0	0.0			
(20) White male-owned DBE	0	$0					
(21) Unknown DBE	0	$0					

Notes: Spreadsheet rounds numbers to nearest thousand dollars or tenth of one percent. WBE is white women-owned firms.

* Unknown MBE, Unknown DBE-MBE, and Unknown DBE dollars were allocated to MBE subgroups proportional to the known total dollars of those groups. For example, if total dollars of African American-owned firms (column b, row 5) accounted for 25 percent of total MBE dollars (column b, row 4), then 25 percent of column b, row 11 would be added to column b, row 5 and the sum would be shown in column c, row 5.

Source: BBC Research & Consulting Disparity Analysis.

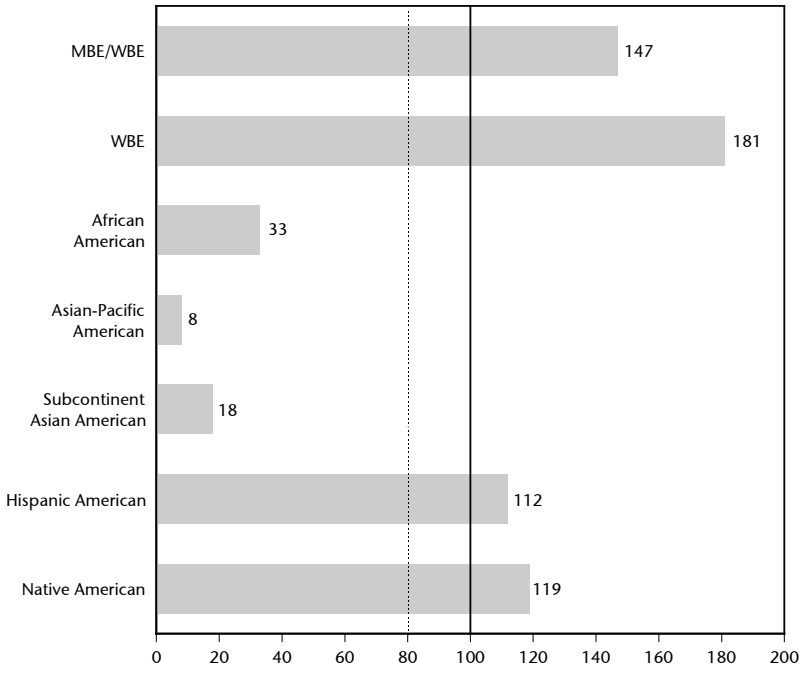
ODOT operated a DBE contract goals program for FHWA-funded construction contracts, which represent most of the contracts dollars examined in Figure VI-4. Therefore, any disparities identified in Figure VI-4 occurred even with the DBE contract goals program in place.

Overall, there was no disparity in the overall utilization of MBE/WBEs in ODOT's FHWA-funded contracts. However, when examined further, disparities do exist for individual groups. For example, the disparity index of 33 shown for African American-owned firms means that they received about 33 cents out of every FHWA-funded contract dollar that would be expected based on the availability benchmark for African American-owned firms for this work. Substantial disparities were also present for Asian-Pacific Americans and Subcontinent Asian Americans on FHWA-funded contracts during the study period. There were no disparities for WBEs, Hispanic American- and Native American-owned firms.

Figure VI-4.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on FHWA-funded construction and engineering contracts, July 2004–June 2009

Note:
Number of contracts/subcontracts analyzed is 6,306.
For more detail, see Figure K-3 in Appendix K.

Source:
BBC Research & Consulting.



2. State-funded contracts. BBC examined $453 million of state-funded contracts from July 2004 through June 2009 that were similar in work type to the FHWA-funded contracts included in the study. ODOT did not apply any form of contract goals to state-funded contracts. Figure VI-5 compares disparity results for state-funded contracts (lighter bars in Figure VI-5) with the results for FHWA-funded contracts (darker bars in Figure VI-5).

Overall MBE/WBE utilization was equal (18.7%) for FHWA- and state-funded contracts. Similar to the disparity analysis for FHWA-funded contracts, MBE/WBE utilization on state-funded contracts exceeded what would be expected based on availability for the particular types, locations and sizes of state-funded prime contracts and subcontracts (disparity index of 118).

Groups showing substantial disparities for FHWA-funded contracts also showed substantial disparities for state-funded contracts. Disparities were particularly severe for:

- African American-owned firms (disparity index of 1),

- Asian-Pacific American-owned firms (disparity index of 0 as there was no utilization for this group based on the contract data BBC examined);
- Subcontinent Asian American-owned firms (disparity index of 7); and
- Although utilization was in line with availability for Hispanic American-owned firms on FHWA-funded contracts, there was a very large disparity for this group on state-funded contracts (disparity index of 16).

Utilization of WBEs on state-funded contracts was close to what would be expected based on the availability of white women-owned firms for this work. Utilization of Native American-owned firms was considerably higher than what would be expected based on availability.

Figure VI-5.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on FHWA- and state-funded construction and engineering contracts, July 2004–June 2009

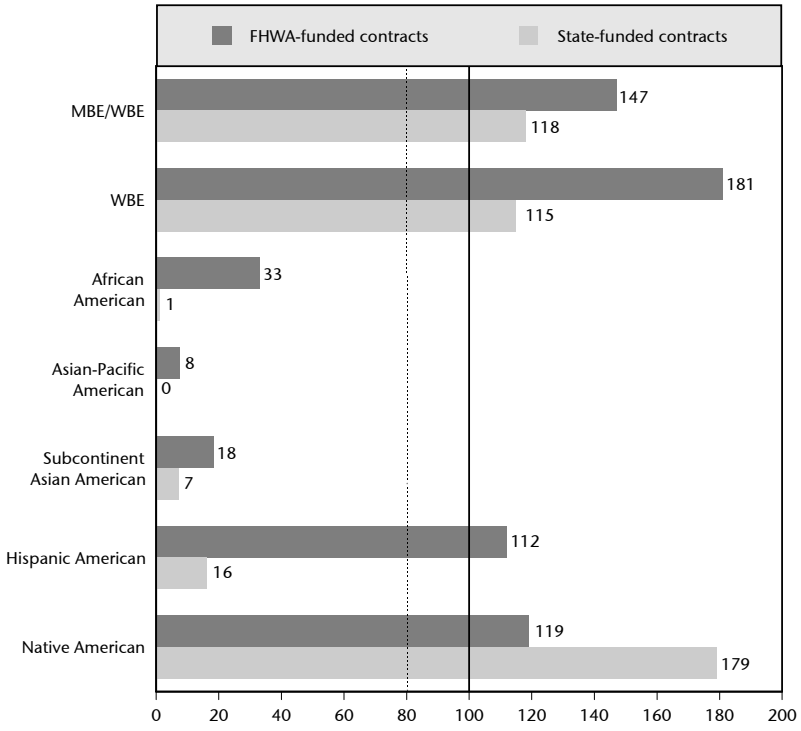
Note:

Number of contracts/subcontracts analyzed is 6,306 for FHWA-funded and 1,685 for state-funded contracts.

For more detail, see Figures K-3 and K-4 in Appendix K.

Source:

BBC Research & Consulting.



3. All contracts. Figure VI-6 shows combined results for FHWA- and state-funded contracts for July 2004 through June 2009. Overall, MBE/WBE utilization exceeded the availability benchmark. However, there were substantial disparities for African American-, Asian-Pacific American- and Subcontinent American-owned firms.

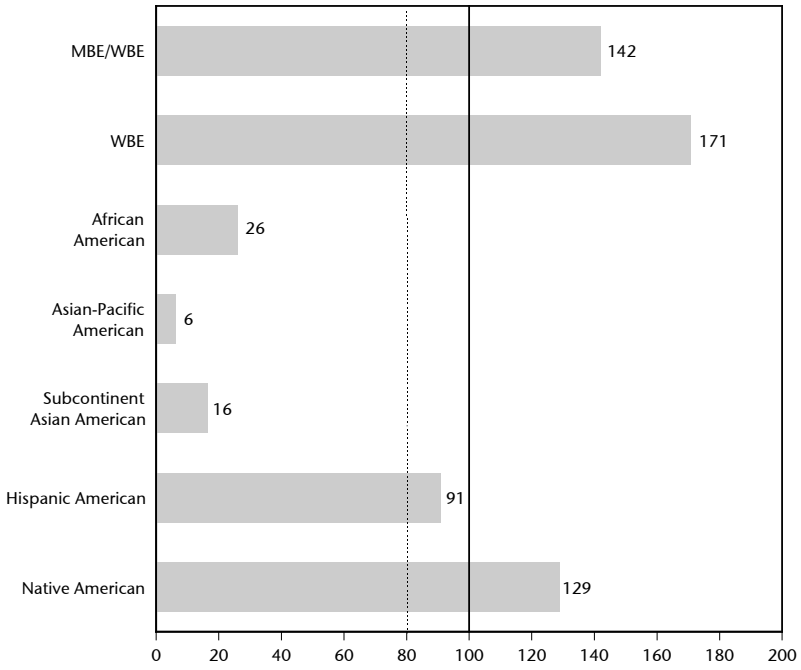
Because there was no disparity for Hispanic American-owned firms for FHWA-funded contracts and because FHWA contract dollars accounted for such a large proportion of total contract dollars, results in Figure VI-6 show that overall utilization was close to what would be expected based on availability of Hispanic American-owned firms. However, Figure VI-5 demonstrates very large disparities for Hispanic American-owned firms when the DBE contract goals program is not in place (i.e., for state-funded contracts).

There were also no disparities in the overall utilization of WBEs and Native American-owned firms.

Figure VI-6.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on FHWA- and state-funded transportation contracts, July 2004–June 2009

Note:
Number of contracts/subcontracts analyzed is 7,991.
For more detail, see Figure K-2 in Appendix K.

Source:
BBC Research & Consulting.



Separate analyses for construction contracts and engineering contracts presented below begin to explore possible reasons behind any disparities identified for ODOT contracts considered together. BBC also conducted sophisticated statistical analyses to examine the likelihood that disparities may have occurred by random chance in the procurement process, which are presented at the end of this section.

Section VII examines other possible factors behind these disparities, using information including disparity analyses contained in Appendix K. Tables in Appendix K provide utilization, availability and disparity analyses for different types of ODOT contracts (construction and engineering), contract roles (prime contracts and subcontracts), locations within the state (five regions corresponding to ODOT divisions), sizes of ODOT contracts and time periods.

C. Disparity Results for Construction Contracts

The figures below present results for ODOT construction contracts, combining prime contract and subcontract dollars. BBC summarizes results of the disparity analyses for each MBE/WBE group for:

1. FHWA-funded construction contracts;

2. State-funded construction contracts; and

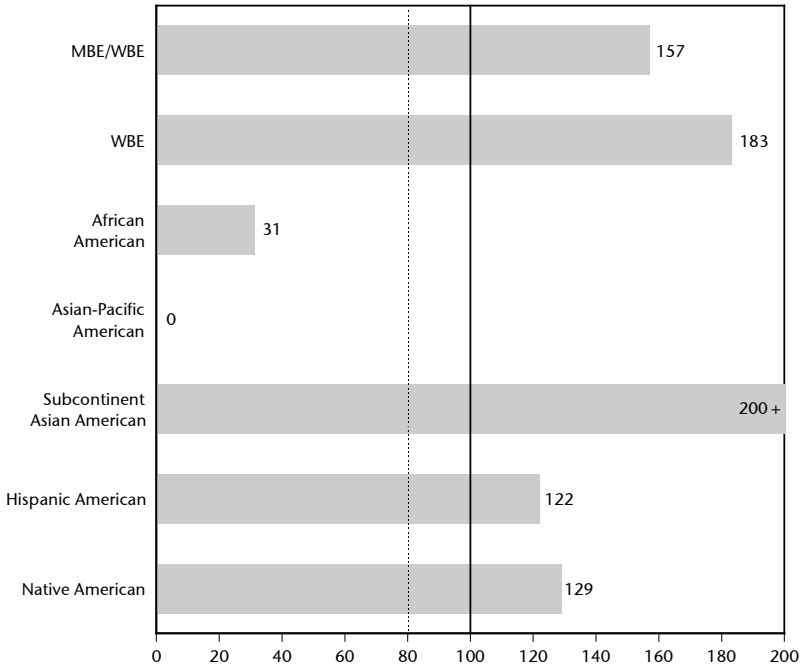
3. All construction contracts.

1. FHWA-funded construction contracts. Figure VI-7 presents results of the disparity analysis for FHWA-funded construction contracts for July 2004–June 2009. Even with the DBE contract goals program that applied to these contracts, there were substantial disparities for African American and Asian-Pacific American-owned firms — African American firms had a disparity index of 31 and Asian-Pacific American firms had an index of 0. Utilization exceeded what would be expected based on availability for each other MBE/WBE group.

Figure VI-7.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on FHWA-funded construction contracts, July 2004–June 2009

Note:
Number of contracts/subcontracts analyzed is 5,741.
For more detail, see Figure K-6 in Appendix K.

Source:
BBC Research & Consulting.



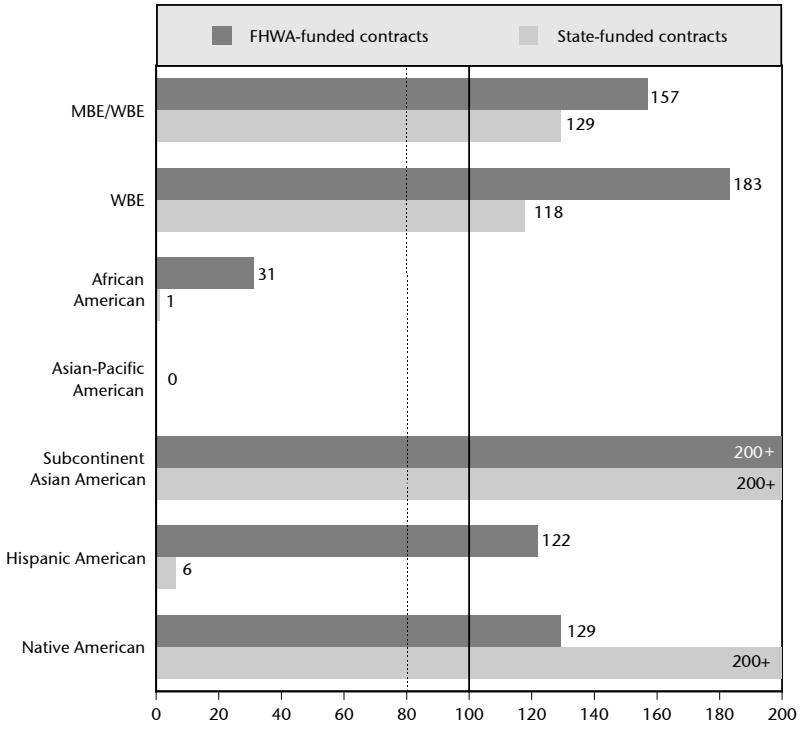
2. State-funded construction contracts. Figure VI-8 compares disparity indices for FHWA-funded construction contracts (top bar) with state-funded construction contracts (bottom bar). Figure VI-8 shows disparities for African Americans and Asian-Pacific Americans on both state- and FHWA-funded contracts. With the DBE goals program in place (FHWA-funded construction contracts), there was no disparity for Hispanic American-owned firms. Without the DBE goals program (state-funded construction contracts), there was a very large disparity for Hispanic American-owned firms.

For both FHWA- and state-funded construction contracts, there were no disparities for WBEs, Subcontinent Asian American-owned firms or Native American-owned firms.

Figure VI-8.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on FHWA- and state-funded construction contracts, July 2004–June 2009

Note:
Number of contracts/subcontracts analyzed is 5,741 for FHWA-funded and 1,552 for state-funded contracts.
For more detail, see Figures K-6 and K-7 in Appendix K.

Source:
BBC Research & Consulting.



3. All construction contracts. Figure VI-9 shows combined results for FHWA- and state-funded construction contracts for July 2004 through June 2009. There were no overall disparities for MBE/WBEs. Because there were large disparities for both FHWA- and for state-funded contracts, analysis of combined construction contracts shows large disparities for African American- and Asian-Pacific American-owned firms. Utilization of WBEs, Subcontinent Asian American-owned firms and Native American-owned businesses exceeded respective availability benchmarks for these groups.

Utilization of Hispanic American-owned firms on state-funded contracts was far below what would be expected based on availability, and utilization exceeded availability for FHWA-funded contracts (DBE goals program was applied). Combined results for FHWA- and state-funded contracts for Hispanic American-owned firms indicates utilization of Hispanic American-owned firms to be below but close to what would be anticipated based on availability. As indicated in Figure K-6 in Appendix K, DBE-certified businesses accounted for nearly all of the utilization of Hispanic American-owned firms on ODOT construction projects, further indicating the influence of the DBE contract goals program on overall utilization of Hispanic American-owned companies.[3]

[3] In contrast, relatively little of the utilization of WBEs on ODOT construction contracts was with DBE-certified firms (see Figure K-6). More than one-half of the utilization of Native American-owned firms on ODOT construction contracts was with DBE-certified firms.

Figure VI-9.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on FHWA- and state-funded construction contracts, July 2004–June 2009

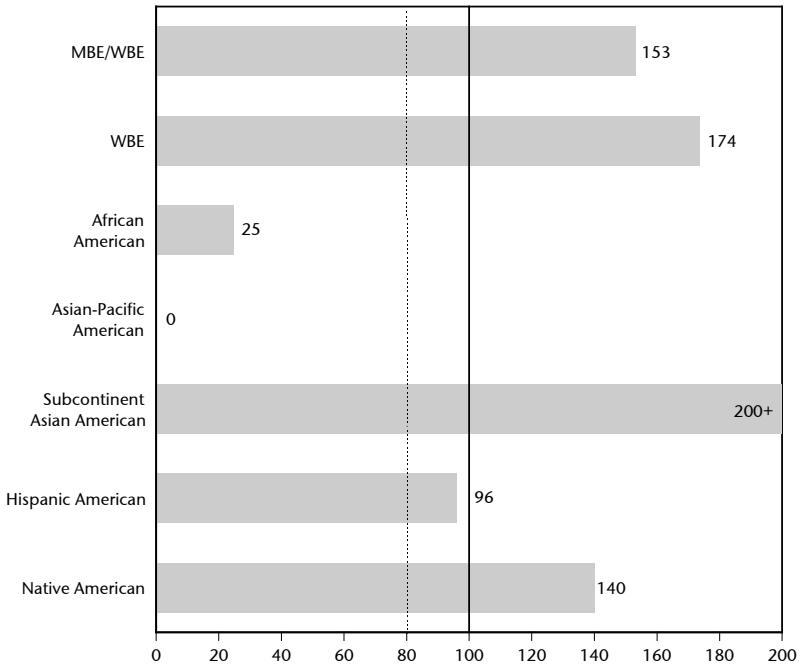
Note:

Number of contracts/subcontracts analyzed is 7,293.

For more detail, see Figure K-5 in Appendix K.

Source:

BBC Research & Consulting.



D. Disparity Results for Engineering Contracts

BBC also performed disparity analyses for ODOT engineering-related contracts for July 2004 through June 2009. As with the other analyses presented in Section VI, the figures below provide results for prime contract and subcontract dollars combined. ODOT did not employ contract goals for either FHWA- or state-funded engineering-related contracts during the study period. Only after July 2009 did ODOT begin setting DBE contract goals for certain FHWA-funded engineering contracts.

BBC summarizes results of the disparity analyses for each MBE/WBE group for:

1. FHWA-funded engineering contracts;

2. State-funded engineering contracts; and

3. All engineering contracts.

1. FHWA-funded engineering contracts. Figure VI-10 presents results of the disparity analysis for FHWA-funded engineering contracts. Each group of MBE/WBEs was substantially underutilized on these contracts. Each group except for WBEs received less than one-half of the contract dollars that would be expected based on availability for FHWA-funded engineering-related work.

Figure VI-10.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on FHWA-funded engineering contracts, July 2004–June 2009

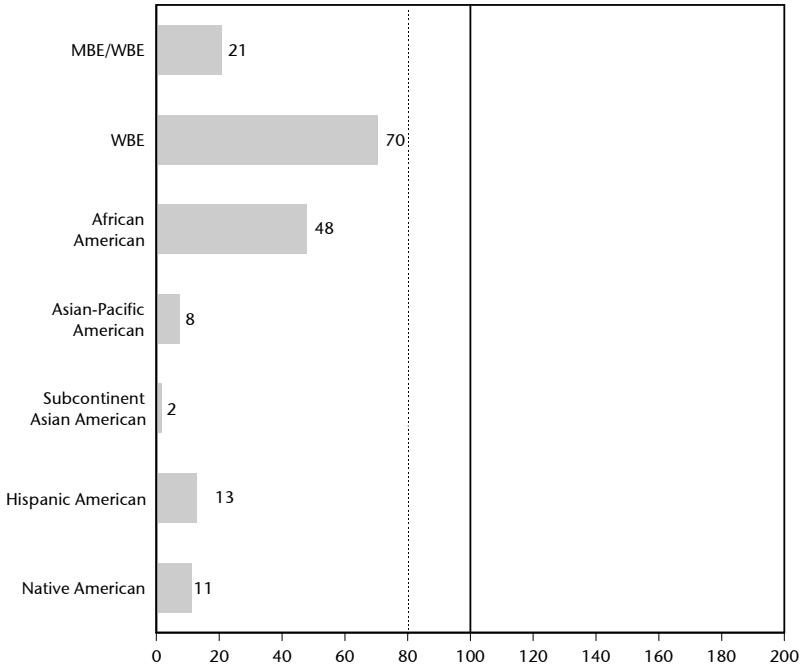
Note:

Number of contracts/subcontracts analyzed is 565.

For more detail, see Figure K-9 in Appendix K.

Source:

BBC Research & Consulting.



2. State-funded engineering contracts. As with ODOT construction contracts, relatively little of the engineering-related contracts and subcontracts examined (by count and by dollars) were state-funded. Figure VI-11 presents disparity indices for state-funded engineering contracts. Overall utilization of MBE/WBEs on state-funded engineering contracts was about one-quarter of what would be expected based on MBE/WBE availability, and the study team identified disparities for each MBE/WBE group except for Hispanic American-owned firms.

Figure VI-11.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on state-funded engineering contracts, July 2004–June 2009

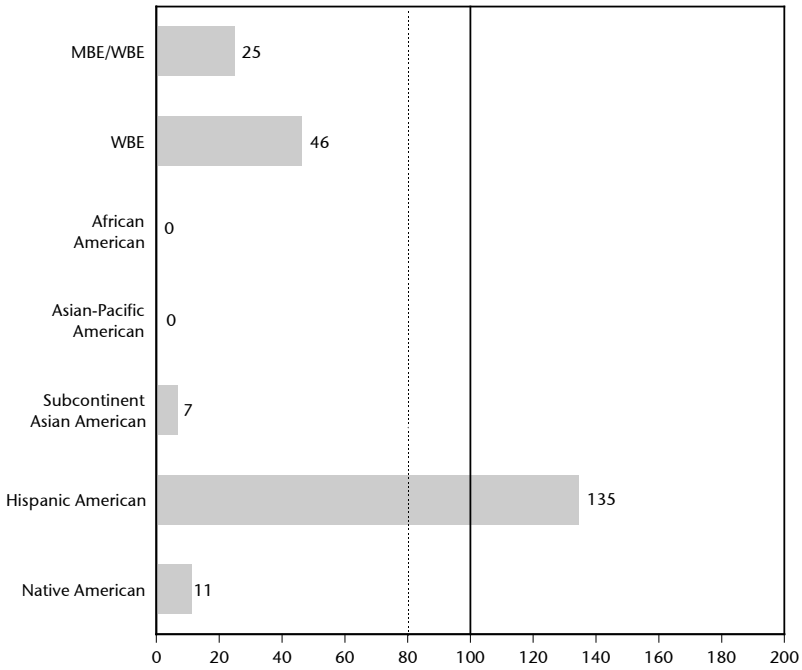
Note:

Number of contracts/subcontracts analyzed is 133.

For more detail, see Figure K-10 in Appendix K.

Source:

BBC Research & Consulting.



3. All engineering contracts. Figure VI-12 shows combined results for FHWA- and state-funded engineering-related contracts for July 2004 through June 2009. Overall, utilization of MBE/WBEs was substantially less than what would be expected based on availability for these contracts (disparity index of 22). Utilization was substantially below availability for each MBE/WBE group.

Figure VI-12.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on FHWA- and state-funded engineering contracts, July 2004–June 2009

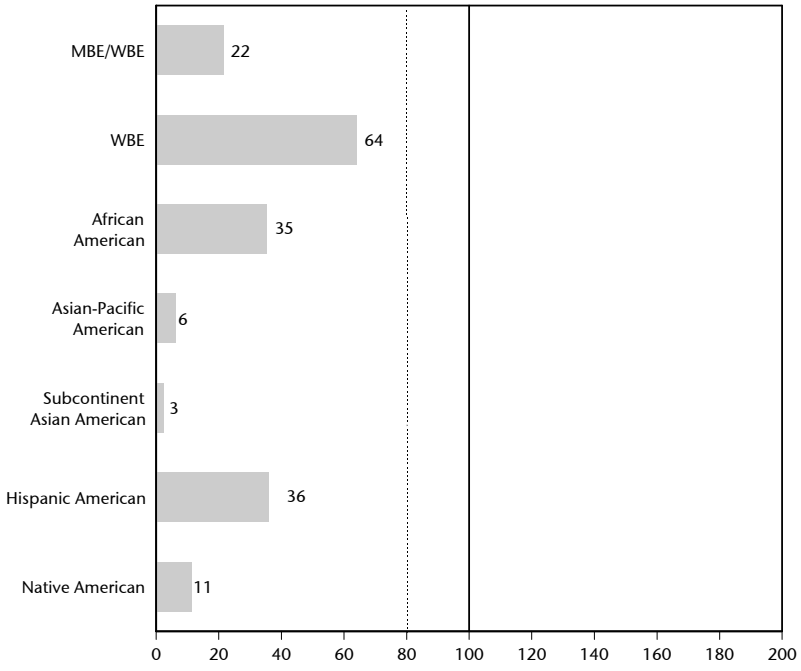
Note:

Number of contracts/subcontracts analyzed is 698.

For more detail, see Figure K-8 in Appendix K.

Source:

BBC Research & Consulting.



E. Analysis of Statistical Significance of Disparities

Statistical significance of any disparities relates to the degree to which a researcher can reject "random chance" as a cause. Random chance in data sampling is the factor that researchers consider most in determining statistical significance of results. However, BBC attempted to contact every firm in Oklahoma that Dun & Bradstreet identified as doing business within relevant subindustries (as described in Section IV), mitigating many of the concerns associated with random chance in data sampling as it relates to BBC's availability analysis. Further discussion of these issues is presented in Figure VI-13.

The utilization analysis also approaches a "population" of contracts. Therefore, any disparity found when comparing overall utilization with availability would be "statistically significant." BBC used a more sophisticated analytical tool to examine statistical significance of disparity results.

The discussion below explains:

1. Methodology of statistical significance testing; and

2. Results of the statistical significance analysis.

Figure VI-13.
Confidence intervals for availability measures

BBC conducted telephone interviews with more than 2,000 business establishments —a number of completed interviews that is generally considered large enough to be treated as a "population," not a sample. BBC's analysis of the confidence interval around the estimate of MBE/WBE representation among all firms available for ODOT transportation work, 28.2 percent, is accurate within about +/-2 percentage point at the 95 percent confidence level (BBC applied the finite population correction factor when determining confidence intervals). At this level of accuracy in the availability analysis, a disparity index of 92 would technically be "statistically significant." (By comparison, many survey results for proportions reported in the popular press are +/- 5 percentage points.)

1. Methodology of statistical significance testing. There were many opportunities in the sets of prime contracts and subcontracts that BBC analyzed for minority- and women-owned firms to be awarded work. Some contract elements involved large dollar amounts and others only involved a few thousand dollars.

Monte Carlo analysis is a useful tool to use for statistical significance testing, because there were many individual chances at winning work with ODOT between July 2004 and June 2009, each with a different payoff.

The Monte Carlo technique works as follows:

- The analysis starts by examining an individual contract element (a prime contract or subcontract).

- BBC's availability database provides information on individual firms "available" for that contract element based on type of work, prime versus subcontract role, size of the prime contract or subcontract, and location of the work. Each available firm was assumed to have an equal chance of receiving that contract element.

- The Monte Carlo simulation randomly chooses a firm from the pool of available firms to "receive" that contract element. For example, the odds of a woman-owned firm receiving that contract element are equal to the number of women-owned firms available for that work divided by the total number of firms available for that contract element.

- The Monte Carlo simulation repeats the above process for all other contract elements in the set. The output of a single Monte Carlo simulation for all contracts in the set represents simulated utilization of minority- and women-owned firms, by group, for that set of contract elements.

- The Monte Carlo simulation is then repeated 1 million times for each set of contracts. The combined output from all 1 million simulations represents simulated utilization of minority- and women-owned firms, by group, if contracts were awarded randomly based on the relative availability of Oklahoma firms working in relevant subindustries.

2. Results. Figure VI-14 shows results of BBC's Monte Carlo simulations. Output of a Monte Carlo simulation is the number of runs out of 1 million that produce a result that is equal or below observed utilization in the actual data for each MBE/WBE group.

BBC only tested statistical significance for the disparities that the study team observed that fell below the threshold of 80. Some courts use 80 as a threshold for a value that may indicate a substantial disparity.

BBC first examined whether any of the disparities identified for all ODOT construction and engineering-related contracts could be easily replicated by chance in the procurement process. There was a very low probability that chance explained disparities for African American- and Asian-Pacific American-owned firms, as shown in the top portion of Figure VI-14. None of the 1 million simulation runs replicated the disparity found for African American-owned firms for combined FHWA- and state-funded contracts, and only 165 simulation runs did so for Asian-Pacific-owned firms.

Figure VI-14.
Statistical significance of disparities in MBE/WBE utilization for ODOT construction and engineering contracts

MBE/WBE Group	Disparity index	Number of simulation runs out of 1 million that replicated observed utilization	Probability of observed disparity occurring due to "chance"
FHWA-and state-funded contracts			
MBE/WBE	142	N/A	N/A %
WBE	171	N/A	N/A
African American	26	0	<0.1
Asian-Pacific American	6	174	<0.1
Subcontinent Asian American	16	57,188	5.7
Hispanic American	90	350,306	35.0
Native American	129	N/A	N/A
State-funded contracts			
MBE/WBE	118	N/A	N/A %
WBE	115	N/A	N/A
African American	1	0	<0.1
Asian-Pacific American	0	50,753	5.1
Subcontinent Asian American	7	335,757	33.6
Hispanic American	16	1	<0.1
Native American	179	N/A	N/A
Engineering contracts			
MBE/WBE	22	0	<0.1 %
WBE	64	28,256	2.8
African American	35	36,598	3.7
Asian-Pacific American	6	206	<0.1
Subcontinent Asian American	2	5,623	0.6
Hispanic American	36	46,300	4.6
Native American	11	0	<0.1

Note: "N/A" means "not applicable" because utilization exceeded availability.
Utilization and availability includes non-DBE-certified firms.

Source: BBC Research & Consulting.

The Monte Carlo simulation also showed a relatively low probability that chance can explain the disparities found for Subcontinent Asian American-owned firms when examining all contracts (5.7 percent of the simulation runs produced the disparity through chance in contract/subcontract awards). There was also a very low probability that chance can explain the disparity for Hispanic American-owned firms participating in state-funded ODOT contracts, as shown in the middle portion of Figure VI-14.

BBC also performed simulations of engineering-related contracts to determine whether disparities found for MBE/WBEs overall could be replicated by chance in contract/subcontract awards. None of the 1 million simulation runs replicated the disparity. For each of the MBE/WBE groups analyzed

for engineering contracts, the simulation showed low probabilities of chance replicating the disparities. These results are shown in the bottom portion of Figure VI-14.[4]

F. Summary

The disparity analysis indicates that, without the DBE goals program, there are disparities for African American-, Asian-Pacific American-, and Hispanic American-owned firms on ODOT construction contracts. There were disparities for each MBE/WBE group on ODOT engineering-related contracts. No DBE contract goals applied to engineering-related contracts during the study period.

This information alone may not be sufficient for ODOT to make decisions as to future implementation of the Federal DBE Program. Using additional disparity analyses and other research, Section VII of the report explores why any disparities may be occurring.

[4] Because of the limited number of engineering-related contracts and subcontracts, the Monte Carlo simulation focused on utilization of MBE/WBEs overall rather than individual MBE/WBE group.