

## ERRATA

To: Recipients of MG-388-RC, Estimating Terrorism Risk, 2005

From: RAND Corporation Publications Department

Date: December 2005

Re: Corrected pages (pp. 23–24, Table 4.1, Population, Population Density, Density-Weighted Population, and Grant Allocations for Urban Areas Receiving UASI Funding in Fiscal Year 2004); Corrected page (p. 34, Figure 4.1, City Shares of Total Risk Estimated Using Four Indicators of Risk, Sorted by Aggregated Estimate, with a Vertical Line Indicating Equal Risk Across Cities); Corrected page (p. 43, Figure 5.2, Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1a); Corrected page (p. 45, Figure 5.3, Maximum Risk Underestimation as True Risk Deviates from Estimates: Model 1a); Corrected page (p. 46, Figure 5.4, Mean Risk Underestimation as True Risk Deviates from Estimates: Model 2; and Figure 5.5, Maximum Risk Underestimation as True Risk Deviates from Estimates: Model 2); Corrected pages (pp. 57–60, Figure A.1, Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1b; Figure A.2, Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1c; Figure A.3, Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1d; Figure A.4, Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1e; Figure A.5, Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1f; Figure A.6, Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1g); Corrected pages (pp. 61–62, Table A.1, Shares of 2003 DHS UASI and City Risk Shares Estimated Using Population, Density-Weighted Population, and Aggregated Estimator Methods)

An error resulted in erroneous data in some tables and figures. The following adjustments have been made for precision. All conclusions and calculations that they were based upon remained unchanged.

All figures in the Population Density (per Square Mile) and Density-Weighted Population columns in Table 4.1 have changed.

The figures for St. Louis, MO-IL; San Antonio; San Diego; San Francisco; San Jose; and Seattle-Bellevue-Everett in the FY2004 UASI Grant Allocation column in Table 4.1 have changed.

The placement of symbols for Population and Density-Weighted Population have changed in Figure 4.1 for the following cities: San Francisco (Population and Density-Weighted Population); Seattle-Bellevue-Everett (Population and Density-Weighted Population); San Diego (Density-Weighted Population); St. Louis, MO-IL (Density-Weighted Population); San Antonio (Density-Weighted Population); and San Jose (Density-Weighted Population).

The caption for Figure 5.2 has been changed to read: Factor (k) by which true risk may differ from RMS estimates of risk combining all threat outlooks and all consequences.

The caption for Figure 5.3 has been changed to read: Factor (k) by which true risk may differ from RMS estimates of risk combining all threat outlooks and all consequences.

The caption for Figure 5.4 has been changed to read: Factor (k) by which true risk may differ from risk estimated using density-weighted population.

The caption for Figure 5.5 has been changed to read: Factor (k) by which true risk may differ from risk estimated using density-weighted population.

The caption for Figure A.1 has been changed to read: Factor (k) by which true risk may differ from RMS estimates of risk combining the RMS Standard threat outlook and all consequences.

The caption for Figure A.2 has been changed to read: Factor (k) by which true risk may differ from RMS estimates of risk combining the RMS Enhanced threat outlook and all consequences.

The caption for Figure A.3 has been changed to read: Factor (k) by which true risk may differ from RMS estimates of risk combining the RMS Reduced threat outlook and all consequences.

The caption for Figure A.4 has been changed to read: Factor (k) by which true risk may differ from RMS estimates of risk combining all threat outlooks and fatalities as consequences.

The caption for Figure A.5 has been changed to read: Factor (k) by which true risk may differ from RMS estimates of risk combining all threat outlooks and injuries as consequences.

The caption for Figure A.6 has been changed to read: Factor (k) by which true risk may differ from RMS estimates of risk combining all threat outlooks and property losses as consequences.

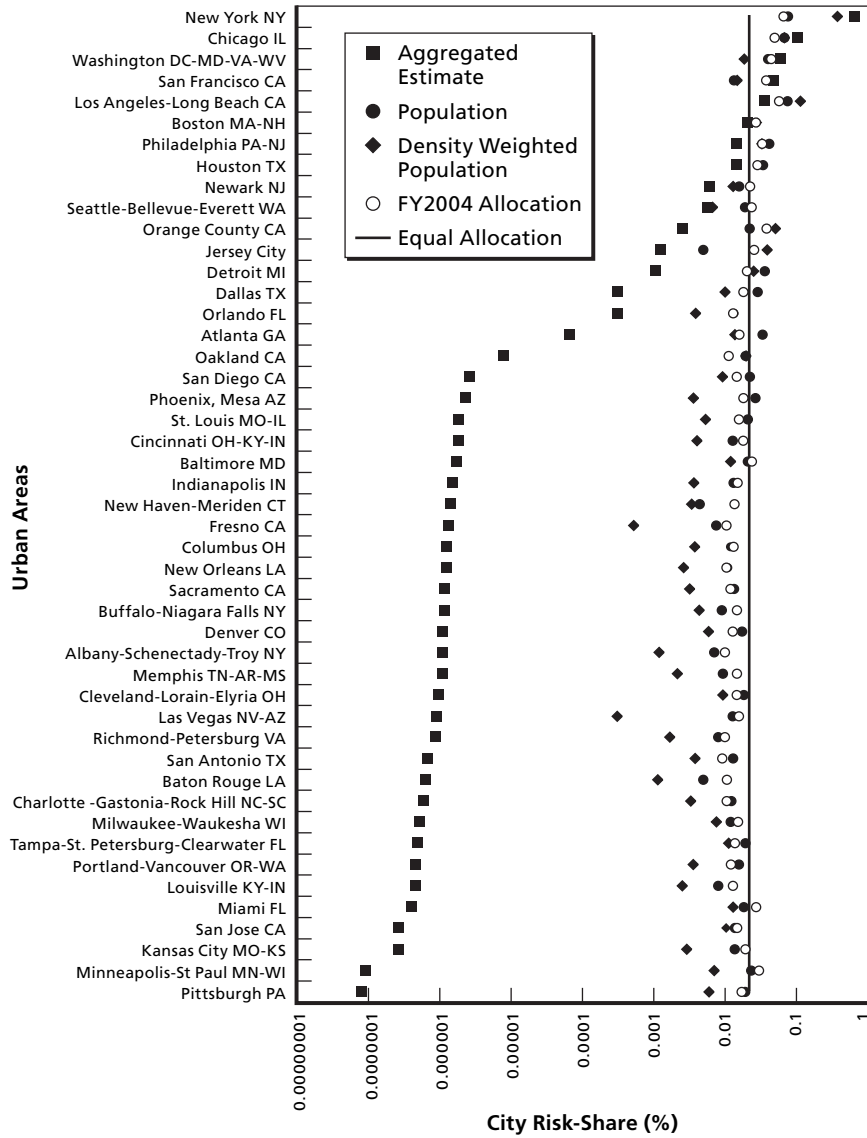
The figure for Orange County, CA, in the DHS Allocation column in Table A.1 has changed.

We regret the inconvenience.

**Table 4.1**  
**Population, Population Density, Density-Weighted Population, and Grant**  
**Allocations for Urban Areas Receiving UASI Funding in Fiscal Year 2004**

Urban Areas	Population <sup>a</sup>	Population Density <sup>a</sup> (per Square Mile)	Density-Weighted Population <sup>b</sup>	FY2004 UASI Grant Allocation <sup>c</sup> (\$ million)
Albany-Schenectady-Troy	875,583	272	237,926,588	7
Atlanta	4,112,198	672	2,761,386,037	11
Baltimore	2,552,994	979	2,498,144,264	16
Baton Rouge	602,894	380	229,154,762	7
Boston, MA-NH	3,406,829	1,685	5,740,709,241	19
Buffalo-Niagara Falls	1,170,111	747	873,657,856	10
Charlotte-Gastonia-Rock Hill, NC-SC	1,499,293	444	665,682,378	7
Chicago	8,272,768	1,634	13,519,096,414	34
Cincinnati, OH-KY-IN	1,646,395	493	811,141,960	13
Cleveland-Lorain-Elyria	2,250,871	832	1,871,707,337	10
Columbus, OH	1,540,157	490	755,141,752	9
Dallas	3,519,176	569	2,002,093,120	12
Denver	2,109,282	561	1,183,064,989	9
Detroit	4,441,551	1,140	5,062,484,593	14
Fresno	922,516	114	105,084,482	7
Houston	4,177,646	706	2,948,039,040	20
Indianapolis	1,607,486	456	733,470,541	10
Jersey City	608,975	13,044	7,943,237,618	17
Kansas City, MO-KS	1,776,062	329	583,476,273	13
Las Vegas, NV-AZ	1,563,282	40	62,076,079	11
Los Angeles-Long Beach <sup>d</sup>	9,519,338	2,344	22,314,867,674	40
Louisville, KY-IN	1,025,598	495	507,651,616	9
Memphis, TN-AR-MS	1,135,614	378	428,953,952	10
Miami, FL	2,253,362	1,158	2,609,185,020	19
Milwaukee-Waukesha, WI	1,500,741	1,028	1,542,728,464	10
Minneapolis-St. Paul, MN-WI <sup>e</sup>	2,968,806	490	1,453,687,745	20
New Haven-Meriden, CT	542,149	1,261	683,670,545	10
New Orleans	1,337,726	394	526,405,217	7

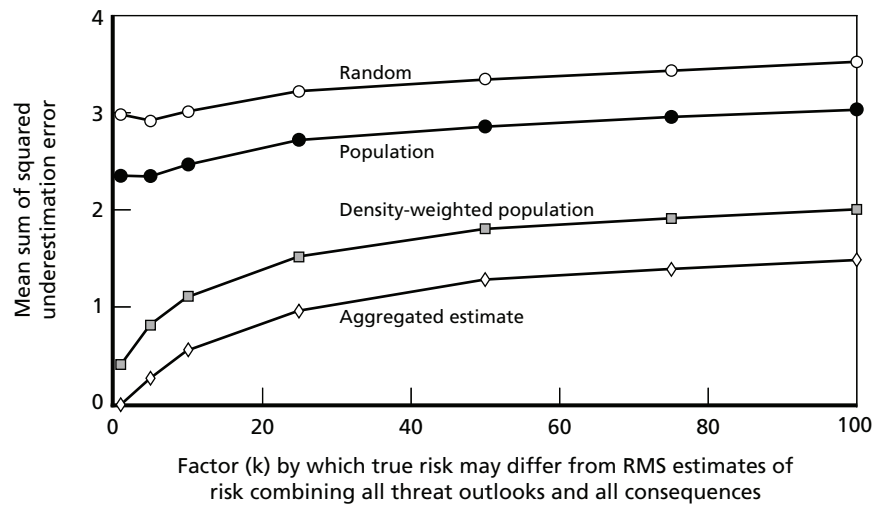
**Figure 4.1**  
**City Shares of Total Risk Estimated Using Four Indicators of Risk, Sorted by**  
**Aggregated Estimate, with a Vertical Line Indicating Equal Risk Across Cities**



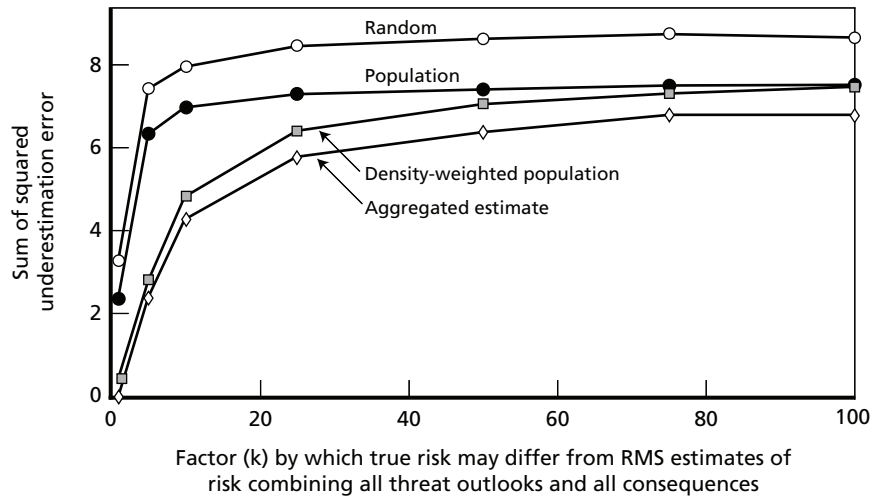
loss across terrorism risk outlooks. As such, these models use all or a superset of the RMS model estimates of risk as the basis for simulating true risk (three types of consequences in each of three terrorism risk outlooks). Since the aggregated estimator was developed to minimize underestimation error using the RMS model, it might be expected to outperform the other estimators. Nevertheless, we include measurements of the performance of the aggregated estimator in the first series of models, because it provides information on how well an optimized risk-share estimator could perform, which aids in the interpretation of the performance of the other risk-share estimators.

Figure 5.2 presents the mean underestimation error performance for the three risk-share estimators and the random estimator when true risk is assumed to vary around all nine RMS estimates of city terrorism risk (Model 1a). As expected, the random estimator is associated with the greatest underestimation error and the aggregated estimator is associated with the lowest underestimation error.

**Figure 5.2**  
**Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1a**



**Figure 5.3**  
**Maximum Risk Underestimation as True Risk Deviates from Estimates:**  
**Model 1a**

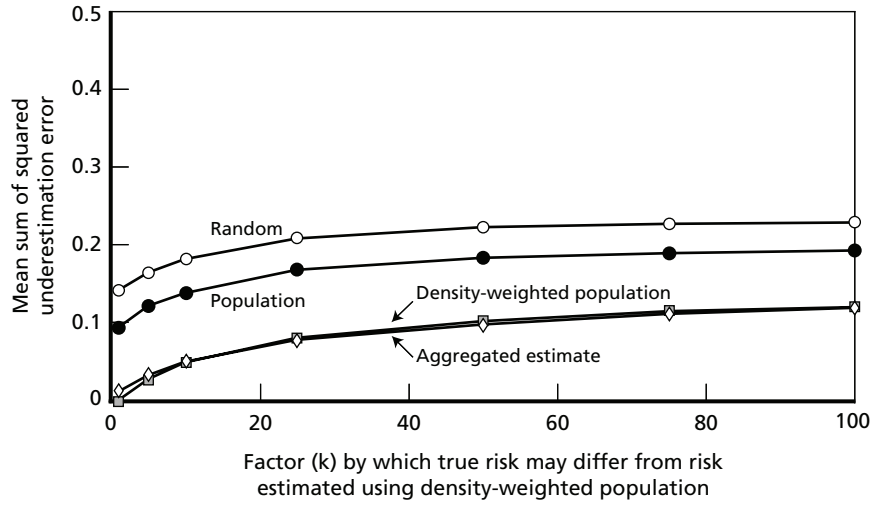


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In Model 2, simulated true risk is based on density-weighted population, rather than RMS estimates of risk. As seen in Figure 5.4, this change has the effect of making the density-weighted population estimator the optimal choice, at least when true risk is assumed to differ from density-weighted populations by no more than a factor of five. Interestingly, however, the aggregated estimator exhibits a comparable mean underestimation error to the density-weighted population estimator for higher levels of  $k$ . As in the first series of models, the population estimator produces underestimation errors closer to the random estimator than to either the density-weighted population estimator or the aggregated estimator.

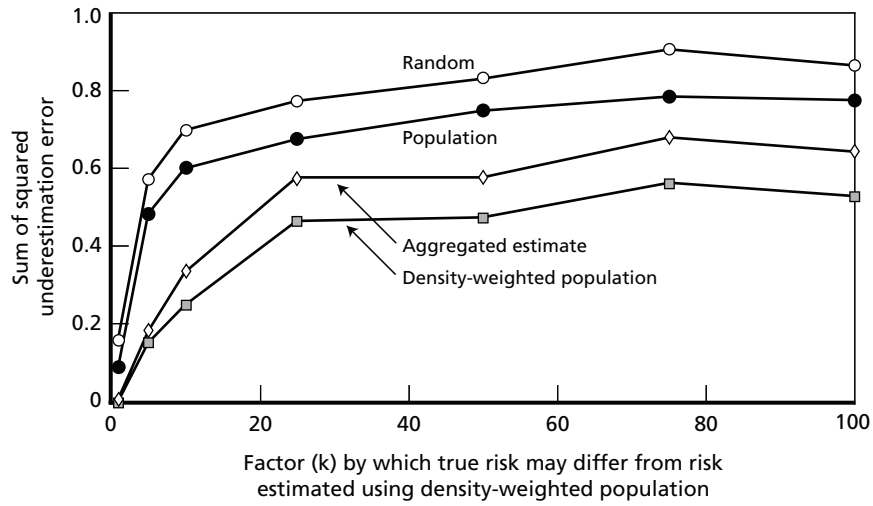
Figure 5.5 presents the worst-case performances for Model 2. Here the aggregated estimator clearly exhibits higher underestimation error than the density-weighted population estimator, but otherwise the relative performance of the estimators is similar to what has been observed in all earlier models.

**Figure 5.4**  
**Mean Risk Underestimation as True Risk Deviates from Estimates: Model 2**



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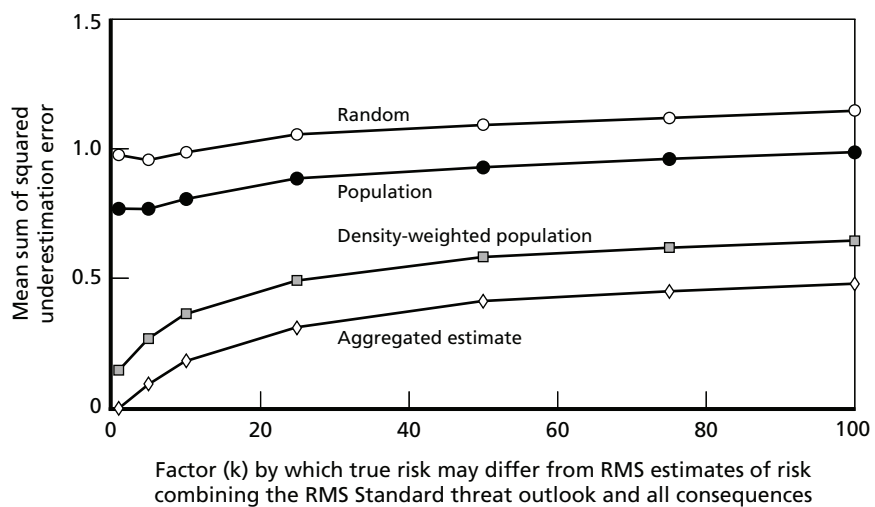
**Figure 5.5**  
**Maximum Risk Underestimation as True Risk Deviates from Estimates: Model 2**



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## Supporting Figures and Table

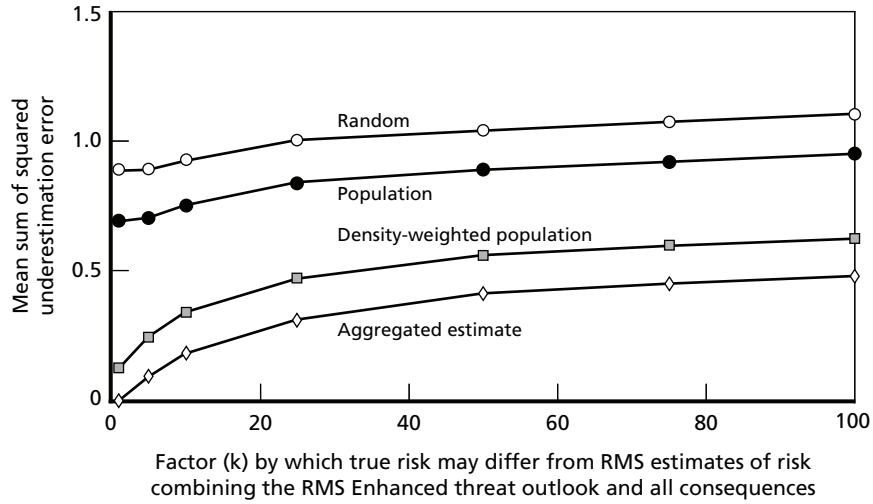
**Figure A.1**  
**Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1b**



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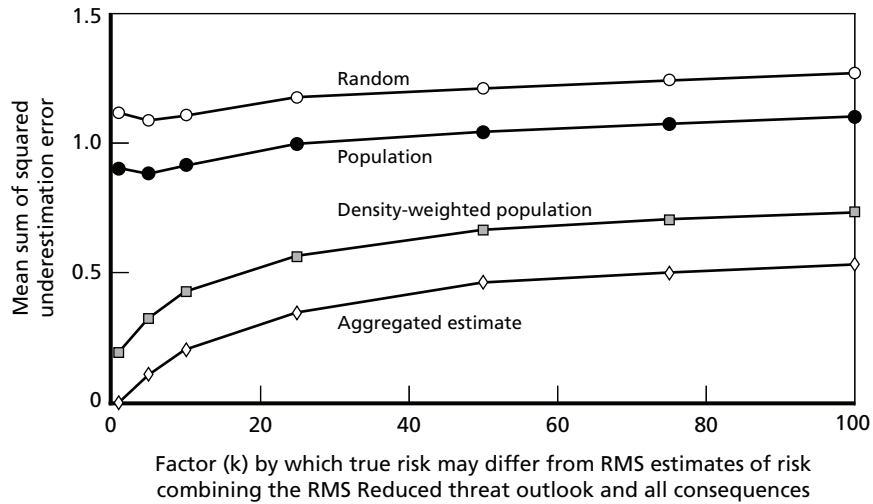


**Figure A.2**  
**Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1c**



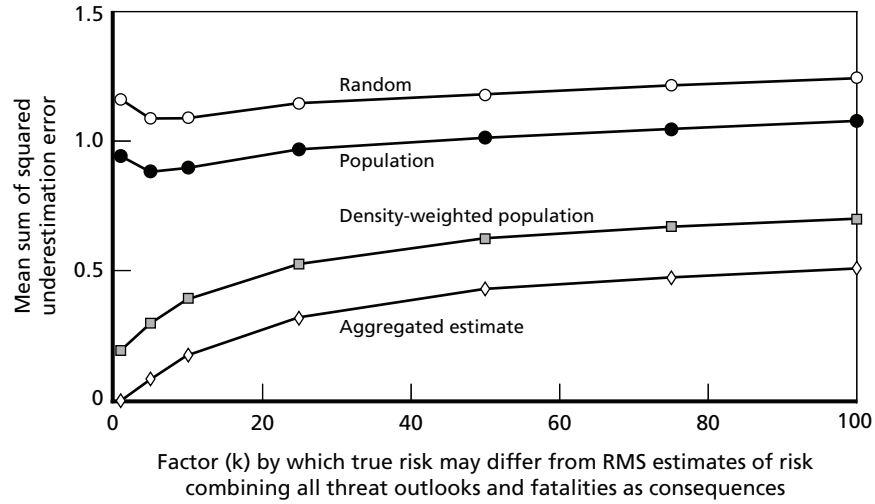
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**Figure A.3**  
**Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1d**



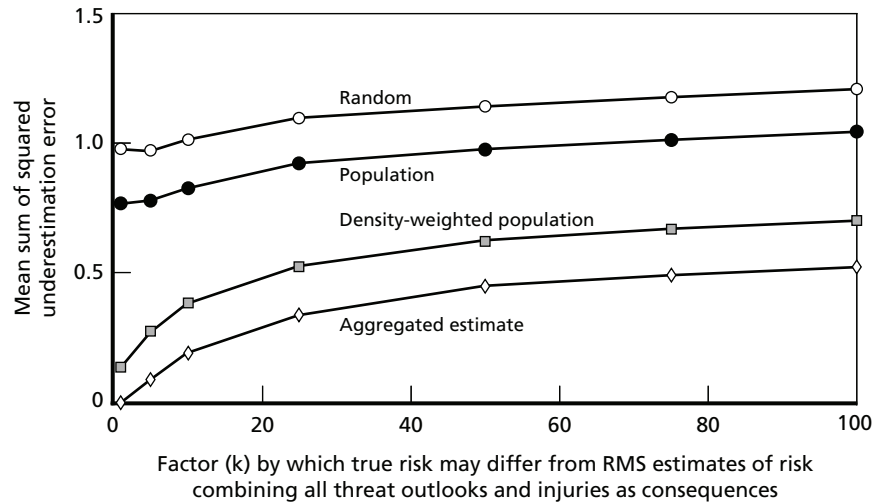
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**Figure A.4**  
**Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1e**



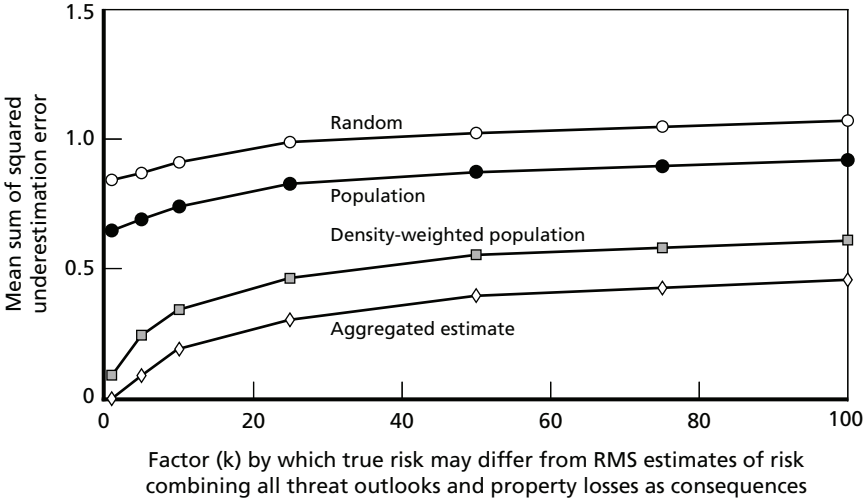
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**Figure A.5**  
**Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1f**



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**Figure A.6**  
**Mean Risk Underestimation as True Risk Deviates from Estimates: Model 1g**



**Table A.1**  
**Shares of 2003 DHS UASI and City Risk Shares Estimated Using Population, Density-Weighted Population, and Aggregated Estimator Methods**

Metro Area	DHS Allocation	Risk-Share Estimator		
		Population	Dens.-Wt. Pop.	Aggregated
Albany-Schenectady-Troy, NY	0.0102	0.0071	0.0012	1.08E-06
Atlanta, GA	0.0159	0.0335	0.0138	6.55E-05
Baltimore, MD	0.0236	0.0208	0.0124	1.69E-06
Baton Rouge, LA	0.0107	0.0049	0.0011	6.15E-07
Boston, MA-NH	0.0283	0.0278	0.0286	2.22E-02
Buffalo-Niagara Falls	0.0150	0.0095	0.0044	1.15E-06
Charlotte-Gastonia-Rock Hill, NC-SC	0.0110	0.0122	0.0033	5.71E-07
Chicago, IL	0.0506	0.0675	0.0673	1.10E-01
Cincinnati, OH-KY-IN	0.0189	0.0134	0.0040	1.82E-06
Cleveland-Lorain-Elyria, OH	0.0155	0.0184	0.0093	9.44E-07
Columbus, OH	0.0129	0.0126	0.0038	1.25E-06
Dallas, TX	0.0181	0.0287	0.0010	3.12E-04
Denver, CO	0.0128	0.0172	0.0059	1.10E-06
Detroit, MI	0.0204	0.0362	0.0252	1.04E-03
Fresno, CA	0.0105	0.0075	0.0005	1.33E-06
Houston, TX	0.0296	0.0341	0.0147	1.52E-02
Indianapolis, IN	0.0151	0.0131	0.0037	1.52E-06
Jersey City, NJ	0.0254	0.0050	0.0396	1.23E-03
Kansas City, MO-KS	0.0197	0.0145	0.0029	2.53E-07
Las Vegas, NV-AZ	0.0156	0.0128	0.0003	8.95E-07
Los Angeles-Long Beach	0.0599	0.0777	0.1111	3.73E-02
Louisville, KY-IN	0.0133	0.0084	0.0025	4.52E-07
Memphis, TN-AR-MS	0.0149	0.0093	0.0021	1.08E-06
Miami, FL	0.0284	0.0184	0.0130	3.95E-07
Milwaukee-Waukesha, WI	0.0151	0.0122	0.0077	5.23E-07

Table A.1—continued

Metro Area	Risk-Share Estimator			
	DHS Allocation	Population	Dens.-Wt. Pop.	Aggregated
Minneapolis-St. Paul, MN-WI	0.0298	0.0242	0.0072	8.98E-08
New Haven-Meriden, CT	0.0143	0.0044	0.0034	1.39E-06
New Orleans, LA	0.0106	0.0109	0.0026	1.19E-06
New York, NY	0.0696	0.0760	0.3785	6.72E-01
Newark, NJ	0.0223	0.0166	0.0130	6.36E-03
Oakland, CA	0.0116	0.0195	0.0196	7.79E-06
Orange County, CA	0.0472	0.0232	0.0511	2.66E-03
Orlando, FL	0.0130	0.0134	0.0039	3.06E-04
Philadelphia, PA-NJ	0.0342	0.0416	0.0336	1.53E-02
Phoenix-Mesa, AZ	0.0181	0.0265	0.0036	2.27E-06
Pittsburgh, PA	0.0178	0.0192	0.0060	7.87E-08
Portland-Vancouver, OR- WA	0.0121	0.0156	0.0036	4.55E-07
Richmond-Petersburg, VA	0.0097	0.0081	0.0017	8.61E-07
Sacramento, CA	0.0119	0.0133	0.0032	1.18E-06
St. Louis, MO-IL	0.0160	0.0212	0.0053	1.84E-06
San Antonio, TX	0.0094	0.0130	0.0038	6.77E-07
San Diego, CA	0.0155	0.0230	0.0094	2.52E-06
San Francisco, CA	0.0392	0.0141	0.0147	4.78E-02
San Jose, CA	0.0148	0.0137	0.0109	2.67E-07
Seattle-Bellevue-Everett	0.0245	0.0197	0.0066	5.93E-03
Tampa-St. Petersburg- Clearwater, FL	0.0137	0.0195	0.0112	4.62E-07
Washington, DC-MD-VA- WV	0.0434	0.0402	0.0185	6.23E-02