Easy Prey

Evidence for Race and Military Related Targeting In the Distribution of Pay-Day Loan Branches In Washington State

Consulting Report

Assaf Oron
Department of Statistics, University of Washington
assaf@u.washington.edu
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How was this report generated?

Seattle Post-Intelligencer investigative reporter Phuong Cat Le contacted the University of Washington statistical consulting service, in order to quantitatively examine the relations between demographic variables and the geographic distribution of 'pay-day' stores in Washington State. After some preliminary work (done mostly by Jason Thomas), Prof. Paul Sampson, director of consulting, offered an in-depth follow-up project to me as part of my Ph.D. requirements.
At that time, I had practically no idea what 'pay-days' are.
Ms. Le's articles ran on the P-I on May 24, 2005, and can be found on http://seattlepi.nwsource.com/local/225559_payday24.html and http://seattlepi.nwsource.com/local/225524_paydaymilitary24.html. This report is based on the original communications to Ms. Le, and includes some minor corrections and further discussion of methods and focus points. It was reviewed by Prof. Sampson.
March 2006: More details and corrections, following additional work done while preparing this report for a Center for Statistics and the Social Sciences seminar in November 2005.

Executive Summary

- Zip-code-level analysis of the entire state of Washington shows that 'pay-day' stores locate more frequently in African American population centers by a factor of almost 2, when compared with bank branch locations and adjusted for population size, economic and education factors. This relates to the top 1/10th (top decile) of Washington's 544 zip-codes, in terms of African American percentage. Almost two-thirds of the state's African Americans (125,000 people) live in these 55 zip-codes, where they account for 11% of the population (in most of Washington's zip-codes, they number less than 2%). The next 1/10th of zip codes, with 2% to 4.6% African Americans, still experiences disproportionately more 'pay-days' (adjusted as above), by a factor of ~1.3.
- Statistically, the effect of African-American percentage upon 'pay-day' location frequency is highly significant, with p-values ranging between 1.E-10 and 1E-7 (depending upon the specific model used). It arises mostly from 'pay-days' tendency to open more outlets in these zip-codes, but also by banks' decision to open less branches, on a per-capita basis, in African American population centers when compared with the rest of the state.
- The effect is strong, is observed across socioeconomic levels and under various model specifications, and has other attributes (discussed in the report), which pass acceptable criteria for deducing a causal link, i.e., that 'pay-day' businesses do intentionally target localities with a high percentage of African Americans.
- Most of Washington's military households are located in 28 zip-codes which are 1/20th of the state's zip-code areas. Eleven of these are also in the top decile in terms of African American population. There is significant evidence that people living in these 11 zips (164,000 people, with 24% military workforce) experience an even higher 'pay-day'/bank branch ratio (overall, roughly 3 times higher), compared with the rest of the state. The combination of statistical evidence and more direct geographic evidence seems sufficient to conclude that 'pay-days' target large military installations in Washington State as well.
- 'Pay-day' location is negatively associated high-income zip-codes and with zip-codes having a large proportion of full college degree holders. On the other hand, bank branch location is positively associated with the latter category. There is also evidence associating 'pay-days' with high-poverty zip-codes, even after adjusting for race and education.
- The analysis did not explicitly estimate geographical correlations between zip-codes and other grouping effects. However, grouping effects are indirectly accounted for in the model.
- The analysis does not have resolution below the zip-code level, and beyond the generic Census-defined racial categories. The analysis shows a clear effect only for the 'Black' racial category. However, the top 1/10th of African-American zips is also home to large populations of other nonwhite minorities, which are lumped together with more privileged groups under 'white' or 'Asian' Census categories. Hence the African American and military targeting exposed here may serve as a pointer to a wider phenomenon.

Background

Working people forced to take short-term, high-cost loans against their near future earnings in order to meet immediate basic needs, has been a recurring social phenomenon since ancient times. On some occasions, when such loans became too prevalent, they led to societal collapse; hence, laws limiting interest rates have existed since antiquity [Graves and Peterson, 2005]. The previous reincarnation of the high-cost, short-term loan phenomenon in the United States was known as 'loan sharks'; it was put to an end in the 1920's, mostly by states setting anti-usury laws. Due to a combination of judicial, political and economic changes, this loan type has been resurging in the US since the 1990's, and it is now legal in most states. Nowadays it is called **'pay-day loans'**. In some states such as North Carolina, 'pay-day' loans are outlawed, but still manage to operate 'under the table' [King et al., 2005]. In Washington State they have been re-legalized since 1995, with a loan limit of $700 and an APR cap of 390% [Graves and Peterson, 2005].

A 'pay-day' debtor writes a check post-dated to her next salary check date (usually in 1-2 weeks), and receives a smaller sum in cash from the lender – the difference being called a 'fee' (in Washington, the maximum is 15% of the loan). If the debtor cannot guarantee funds for the payment, she may face automatic deductions from her bank account, NSF fees charged as the lenders deposit her check, legal action and/or other penalties. Debtors' usual solution is to 'renew' the loan (i.e., pay a second 'fee'; this is outlawed in Washington though there are testimonies that it does occur in practice) - or pay the loan off by taking a 'pay-day' loan from a competitor. Some experts claim that these repeat borrowing practices form the backbone of the industry [Stegman and Faris, 2003]. The 'pay-day' loan business is booming: in Washington state alone, the total volume of such loans has almost doubled in just 3 years (2000 to 2003), from $570 million per year to $1.07 billion per year on nearly 3 million individual loans [WA DFI, 2005]. Nationwide it has topped $41 billion.

Since 'pay-day' loans are only recently re-legalized and have become so ubiquitous in Washington, it is of interest to study whether their proliferation is simply a 'neutral' side-effect of plain economics, or whether this type of loans is associated with certain vulnerable sectors of the population. To do this, researchers use demographic Census data and the geographic distribution of 'pay-day' outlets as a proxy measure. Recently published studies from North Carolina show a marked association between the geographic location of 'pay-day' outlets and African American population centers [Burkey and Simkins, 2004; King et al., 2005]. Graves and Peterson [2005] examined 20 states with large military bases, using a combination of geographical analysis and descriptive statistics, and conclude that there is "overwhelming and incontrovertible" evidence that 'pay-days' do target the military. They list Washington as one of the worst states in this respect.

'Pay-day' businesses have repeatedly denied any race-, military- or even poverty-related targeting (e.g., http://www.cfsa.net/genfo/igeninf.html). My goal has been to study whether the 'pay-day' loan branch distribution in Washington is associated with key demographic variables, mainly race, income, education, and the percentage of the local population employed by the military.

Descriptive Statistics

Demographic Data

The data provided to me by P-I reporter Phuong Le comes from publicly available sources: Washington State department of financial institutions ('pay-day' locations in 2003), the FDIC (bank branch locations in 2003) and the US Census of 2000 (population, race, income, etc.). Numerical summaries are available down to the Zip-Code-Tabulation-Area (ZCTA) level, i.e., of the same type used by Burkey and Simkin [2004].

According to the 2000 US Census, there were 5.89 million people in Washington State's 544 ZCTA's. Of those, 81.8% have been classified as "white", i.e. of European, West Asian or North African descent. The three largest "minorities" were 7.5% "Hispanics", i.e. mostly of Latin American descent (hereafter abbreviated Lat.Am.), 5.5% "Asians", i.e. of South and East Asian descent (hereafter, As.Am.), and 3.2% "African Americans", i.e., of sub-Saharan African descent (hereafter, Af.Am.). The census also tabulated 1.6% people of native North Americans/First Nation descent and 0.4% people of Pacific Islander descent.

Washington has vast, sparsely-populated areas, while most of its population is concentrated in large urban centers. When viewed via ZCTA's, this translates into a wide range of ZCTA population sizes – from 102 to over 64,000 (fig. 1). Nearly 78% of the state's population (4.6 million) live in 166 ZCTA's with 15,000 or more people, which can be considered fully urban/suburban; a further 15% lives in 96 ZCTA's with 5,000 to 15,000 people, which can be urban/suburban, exurban or small-town zip codes; and only 7% (417,000 people) live in the 282 remaining ZCTA's, which are mostly rural or administrative (see fig. 2).[1]

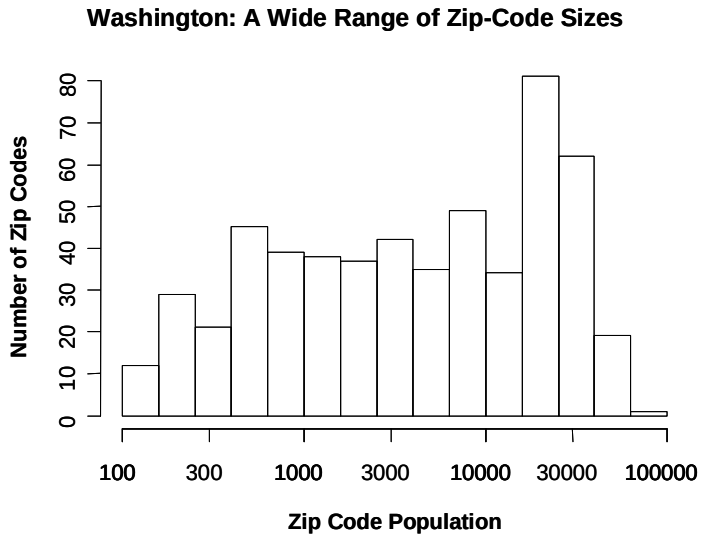

Figure 1: A histogram WA's zip-codes, by their population. The histogram is on logarithmic scale.

[1] In some exceptional cases, low-population ZCTA's are actually urban, such as zip 98134 – the region of Safeco Field, which does not have housing, but does have 4 bank branches and one 'pay-day' outlet. Judging from 98134's poverty rate of 81.8% (out of 133 residents), most of its registered population may be homeless.

The wide range of ZCTA population sizes complicates our study: first of all, 'minority' population densities vary significantly across different ZCTA sizes (fig. 2). First Nations people can be found more often in small-population ZCTA's, such as reservations. Lat.Am. is the minority most evenly distributed across population sizes (probably owing to its still predominant social roles as farm and city working-class). As.Am and Af.Am live mostly in a relatively small number of large-population ZCTA's.

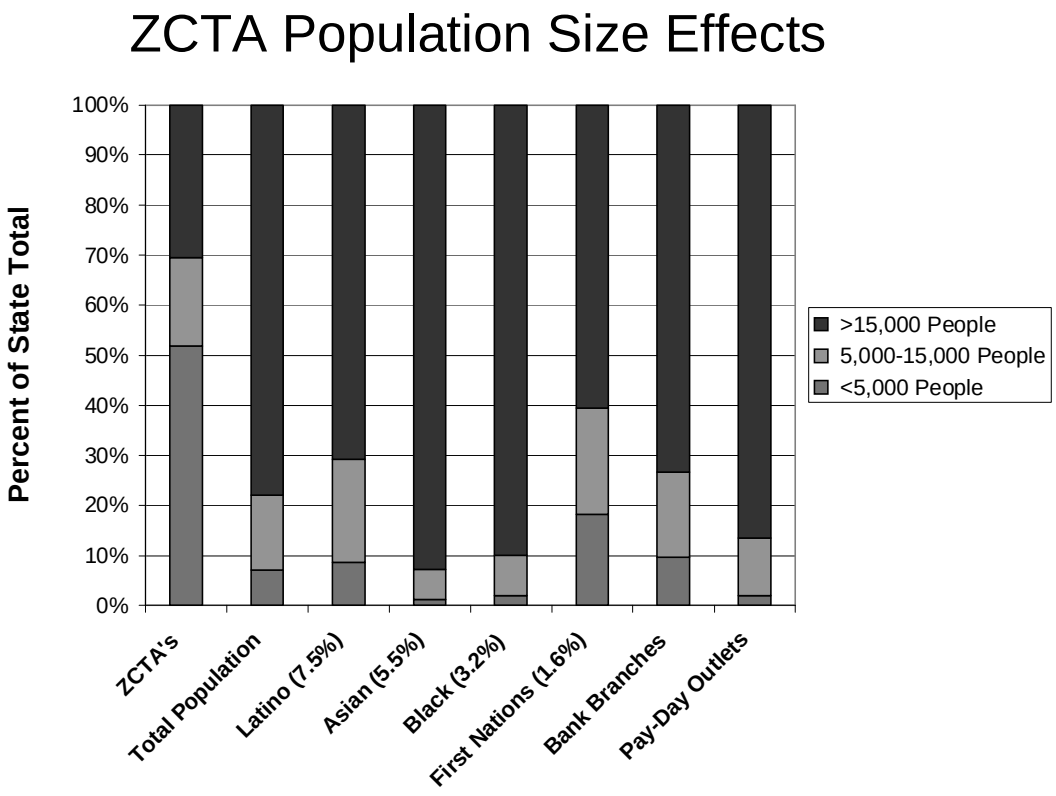

Figure 2: The distribution of ZCTA's, total population, minority populations and financial institutions, by ZCTA population size.

Looking at financial institutions, in 2003 the state's 1,797 bank branches were almost perfectly balanced (en bloc) with the population distribution across ZCTA population size categories, with a slight over-abundance in the lower-population ZCTA's (fig. 2, 2nd column from right; table 1). 'Pay-Day' outlets, on the other hand, appear to be a large-population ZCTA business: very few of them are found in ZCTA's with less than 5,000 people, and even some of those turn out to be low-population urban ZCTA's, rather than rural (cf. fig. 2, rightmost column, and table 1).

ZCTA Population:	<5,000	5,000-15,000	>15,000	Total
Pct of ZCTA's	51.8%	17.6%	30.5%	**100.0%**
Pct of Total State Population	**7.1%**	**15.0%**	**78.0%**	**100.0%**
Bank Branches	174	306	1317	**1,797**
(pct)	9.7%	17.0%	73.3%	**100.0%**
Pay-Day Outlets	11	67	498	**576**
(pct)	1.9%	11.6%	86.5%	**100.0%**

Table 1: Numbers of bank branches and 'pay-days' in WA, sliced by ZCTA population size.

African American and Asian Effects

Since both Af.Am. and 'pay-day' outlets are associated with large-population ZCTA's, one might suspect that the apparent Af.Am-'pay-day' association is only a spurious by-product of the large-population effect. One quick way to do check this suspicion is to compare the 'pay-day' distributions vs. Black and Asian distributions, since both minorities concentrate in large-population ZCTA's. We look at the 1/5th of ZCTA's with the highest percent Af.Am (upper quintile). and likewise for As.Am. (table 2).[2]

			As.Am Percent		
			Lower 4/5ths	Upper 1/5th	Total
Af. Am. (Black) Percent	Lower 4/5ths	#ZCTA's	394	37	431
		Population	2,584,009	884,050	3,468,059
		Pay-Days	197	45	242
		PD/ZCTA	0.5	1.2	0.6
		PD/100k people	**7.6**	**5.1**	**7.0**
	Upper 1/5th	#ZCTA's	38	75	113
		Population	545,144	1,879,478	2,424,622
		Pay-Days	89	245	334
		PD/ZCTA	2.3	3.3	3.0
		PD/100k people	**16.3**	**13.0**	**13.8**
	Total	**#ZCTA's**	432	112	**544**
		Population	3,129,153	2,763,528	**5,892,681**
		Pay-Days	286	290	**576**
		PD/ZCTA	0.7	2.6	**1.1**
		PD/100k people	**9.1**	**10.5**	**9.8**

[2] For each of these minorities, the upper 1/5th of ZCTA's (in terms of their proportion of the population) are home to 84% of that minority's total state population – 270,000 As.Am. and 160,000 Af.Am.

			As.Am Percent		
			Lower 4/5ths	Upper 1/5th	Total
Af.Am (Black) Percent	Lower 4/5ths	Banks	801	273	1074
		Banks/ZCTA	2.0	7.4	2.5
		Banks/100k	**31.0**	**30.9**	**31.0**
	Upper 1/5th	Banks	197	526	723
		Banks/ZCTA	5.2	7.0	6.4
		Banks/100k	**36.1**	**28.0**	**29.8**
	Total	Banks	998	799	**1797**
		Banks/ZCTA	**2.3**	**7.1**	**3.3**
		Banks/100k	**31.9**	**28.9**	**30.5**

Tables 2 and 3: Overall per-capita concentrations of 'pay-days' (top) and bank branches (bottom), sliced by upper quintile ZCTA's of each "minority's" population concentration vs. the rest of ZCTA's.

There is, as expected, a large overlap between the two racial categories' population centers (75 ZCTA's). However, looking at 'pay-days' per capita in the four "high/high, high/low, low/high, low/low" sub-groups simultaneously (table 2), they increase sharply (by a factor of >2 on a per-capita basis) for the upper quintile of Af.Am. ZCTA's, while for As.Am. the trend is both weaker and in the opposite direction.

This pattern is not replicated in the bank distribution (table 3), where there is only mild evidence for any differentiation between the four population sub-groups, in terms of per capita bank concentration ($p=0.02$, vs. $p<2E-16$ for the 'pay-day' trend). In fact, even this evidence points in a different direction: the "high Af.Am./high As.Am." group has the lowest per-capita bank branch ratio, but the second-highest per-capita 'pay-day' ratio.

African American and Poverty Effects

Another concern is that the association of 'pay-days' with Af.Am. population centers can be all explained by the effect of poverty. The dataset includes both median household income and poverty rate data. Of the two, poverty rate seems to be a more sensitive measure (reasons not to be discussed here). However, since poverty rate is determined by a federal income threshold, it somewhat artificially increases in rural areas, where both income and cost of living are lower. I therefore looked only at the 166 ZCTA's with >15000 population (which contain 78% of the population and 87% of 'pay-days'). A poverty rate of >30% is equivalent to the upper quartile of poverty in these ZCTA's.

	#Pay-Days/ZCTA		#Banks/ZCTA		PD/Bank Ratio	
	Pov<30%	Pov>30%	Pov<30%	Pov>30%	Pov<30%	Pov>30%
Af. Am. <2%	**1.5 (71 zips**	4.8 (18 zips)	7.7	10.9	**0.20**	0.44
Af. Am. 2%-5%	**2.9 (30 zips)**	5.9 (13 zips)	8.4	9.1	**0.34**	0.64
Af. Am.>5%	**3.5 (20 zips)**	5.2 (14 zips)	5.6	6.9	**0.62**	0.76

Table 4: 'Pay-Days' per ZCTA, Banks per ZCTA and their ratio, sliced by three levels of Af.Am. population concentration and two levels of poverty. The total number of ZCTA's in each category is in parentheses next to the 'Pay-Day' data.

'Pay-Days' per ZCTA increase both with increasing Af.Am. population and with increasing poverty rate. From table 4, Af.Am. percentage has a smaller effect in high-poverty areas (where the number of pay-days is large anyway), but it causes a factor 2 effect in lower-poverty areas (bolded column above). As to the number of banks, there's evidence both for an increase in high-poverty areas, and a **decrease** as the Af.Am. population increases – whether or not poverty is high. In short, the introduction of poverty rate does not make the race effect go away.

African American and Military Effects

Most of the state's military households are located in 28 ZCTA's, corresponding to the upper 1/20th of ZCTA's in terms of their relative proportion of the population. In each of these ZCTA's, they number 4% or more of the local workforce. The highest-military-percentage ZCTA's with local population over 15,000 are shown on table 5 – all of them are in or around large military installations. While bank branches in these ZCTA's seem (overall) to be on par with the corresponding statewide average, the 55 'pay-days' represent a nearly double per-capita rate, compared with the rest of the state. Graves and Peterson [2005] show a map of the area surrounding Fort Lewis and McChord AFB – Washington's largest military complex, in terms of population (fig. 3; a similar map appears on the P-I report). The most notable feature in the map is a row of a dozen or so 'pay-day' outlets in Lakewood (zip 98499), lined up along the road, right outside the base's north gate. **ZCTA 98499 (bolded in table 5) has by far the highest number of 'pay-days' in the state of Washington – 18 -** and only 14 bank branches (the statewide ratio is around 1 'pay-day' to 3 banks).[3] Judging by the per-capita figures for zip 98499 (see table), it clearly provides financial services for people living elsewhere. The Graves and Peterson map indicates that the major recipients of these services live inside the bases. Please note also that ZCTA 98499 has 13.5% Af.Am. population, and the neighboring military ZCTA 98433 (in which 'pay-days' are apparently not allowed) has 20.3%.

All the ZCTA's on table 5 have >2% Af.Am. – i.e., they are also in the upper quintile of Af.Am. population, which has been shown (tables 2,3) to be associated with high 'pay-day' per capita rates. Meanwhile, As.Am. and Lat.Am. populations are quite proportionate in these military zones, compared with their statewide average.

[3] The next two highest ZCTA's in terms of the actual number of 'pay-days', have **12** each. One of them (in Renton) has 11% Af.Am. population, and can be found on table 6. The other is zip 99207, in Spokane, which was suspected by Graves and Peterson [2005] as providing financial services to the military personnel of Fairchild AFB, 10 miles outside of town.

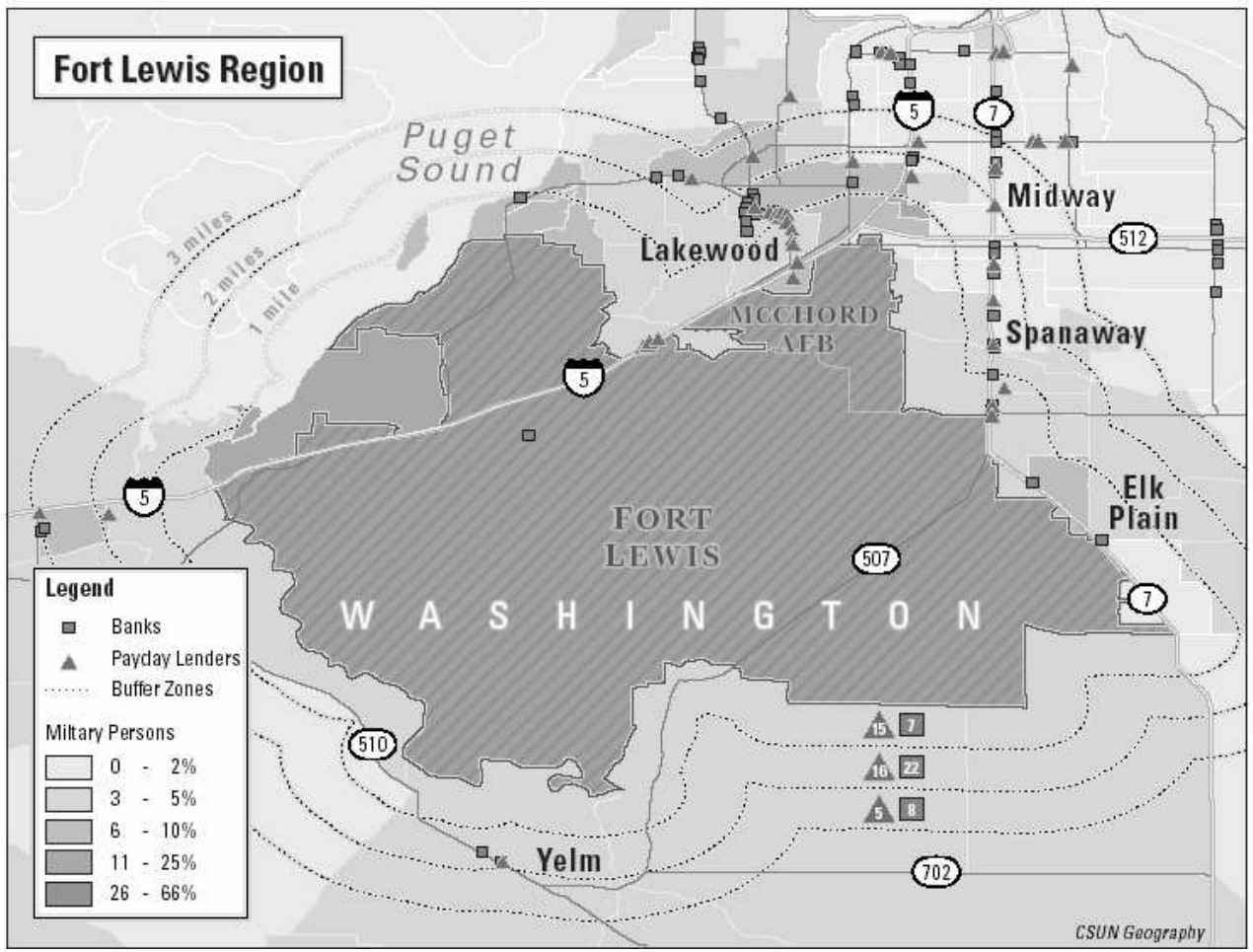

Figure 3: A map of Fort Lewis/McChord, the largest military complex in Washington State, and its surrounding, showing 'pay-day' outlets (triangles) and bank branches (squares). There were 15 'pay-days' and only 7 bank branches within 1 mile of the complex perimeter. On the main road leading from the north gate into Lakewood, there were about a dozen 'pay-days' before the first bank branch. Reprinted with permission from Graves and Peterson [2005], p. 178.

ZCTA Details			Financial Institution Data				Percentage of Pop. Or Workforce			
Zip	**Locale**	**Population**	**Pay-Days**	**Banks**	**PD/100k**	**Banks/100k**	**Military**	**Af.Am**	**As.Am**	**Lat.Am.**
98433	Fort Lewis	19,645	**0**	**2**	0.0	10.2	77.0	**20.3**	3.4	13.1
98277	Oak Harbor	36,676	**5**	**9**	13.6	24.5	31.7	**4.2**	7.2	5.7
98383	Silverdale (Trident base)	19,298	**5**	**14**	25.9	72.5	15.7	**2.9**	9.9	4.1
98201	Everett	30,320	**7**	**15**	23.1	49.5	13.5	**3.5**	3.8	6.6
98312	Bremerton	31,968	**3**	**1**	9.4	3.1	10.1	**4.8**	4.4	5.1
98311	Bremerton	23,582	**1**	**2**	4.2	8.5	9.1	**3.7**	8.4	3.6
98499	**Lakewood**	**28,959**	**18**	**14**	**62.2**	**48.3**	**7.5**	**13.5**	**10.6**	**10.5**
98498	Lakewood	28,894	**6**	**2**	20.8	6.9	6.7	**10.9**	8.2	6
98310	Bremerton	18,718	**6**	**9**	32.1	48.1	6.4	**5.2**	6	4.5
98366	Port Orchard	31,594	**4**	**14**	12.7	44.3	5.1	**2.3**	3.3	4.1
99224	Spokane (near Fairchild AFB)	16,084	**0**	**2**	0.0	12.4	5.1	**3.7**	1.8	4.7
Summary		**285,738**	**55**	**84**	**19.2**	**29.4**	**16.4**	**6.6**	**6.2**	**6.2**
Statewide Averages for >15k Pop. Zips					**10.8**	**28.7**	**1.5**	**3.7**	**6.5**	**6.8**

Table 5: All WA ZCTA's with >15,000 total population and >5% local military workforce (11 ZCTA's).

Are the 'military' and 'Af.Am.' effects one and the same? As table 6 shows, the race effect seems to go on even in the absence of large military installations. In the 14 ZCTA's with >15,000 residents, >10% Af.Am., and <5% military workforce, there are ~1.6 as many 'pay-day's per capita as in the statewide average. Please note also, that these ZCTA's have 18% fewer per-capita bank branches – a marked deviation from the general balance in per-capita bank branches across demographics, observed previously (tables 1, 3, 5).

Overall in table 6's 14 ZCTA's there are slightly more As.Am. than Af.Am.; however, compared with the two groups' proportions in large-population zips (last row of the table), these ZCTA's are (relatively speaking) more pronouncedly "African American" than "Asian American": the zips in table 6 are home to 1/3 of Washington's blacks, but only 1/5

of its Asians. The numbers do indicate, though, that certain Asian ethnic groups may share the 'pay-day' experience of Af.Am.; this will be discussed later in more detail.

ZCTA Details			Financial Institution Data				Percentage of Pop. Or Workforce			
Zip	**Locale**	**Population**	**Pay-Days**	**Banks**	**PD/100k**	**Banks/100k**	**Military**	**Af.Am**	**As.Am**	**Lat.Am.**
98178	South Seattle/ Tukwila/ Renton	21,860	1	1	4.6	4.6	0.3	26.3	23.7	4.3
98118	S. Seattle (Rainier, Columbia City)	40,791	3	8	7.4	19.6	0.1	26	34.1	7.2
98122	Seattle (Capitol Hill)	28,790	4	3	13.9	10.4	0.0	25	7.8	6.9
98144	Seattle (First Hill, Beacon, Rainier)	24,913	2	5	8.0	20.1	0.4	21.7	30.4	8.8
98405	Tacoma	22,355	0	9	0.0	40.3	0.5	21.7	7.1	6
98409	South Tacoma	21,988	7	9	31.8	40.9	2.3	15.1	6.4	9.5
98108	South Seattle (Boeing Field)	21,223	2	5	9.4	23.6	0.1	14.8	43	12.2
98404	Tacoma	30,679	7	3	22.8	9.8	0.8	13	13.2	13
98444	South Tacoma	31,712	7	8	22.1	25.2	4.7	12.6	9.7	7.4
98106	White Center, West Seattle	23,317	3	3	12.9	12.9	0.1	12.1	22.9	11.1
98055	**Renton**	**26,953**	**12**	**9**	**44.5**	**33.4**	**0.1**	**11.3**	**15.6**	**6.6**
98467	Tacoma, University Place	15,165	2	2	13.2	13.2	4.3	11.2	9.8	4.7
98188	Sea-Tac, Tukwila	22,583	7	14	31.0	62.0	0.1	11	11.8	11.7
98408	Tacoma	29,095	6	6	20.6	20.6	0.9	10.1	7.7	7.1
Summary		**361,424**	**63**	**85**	**17.4**	**23.5**	**1.0**	**16.9**	**17.7**	**8.4**
Statewide Averages for >15k Population Zips					**10.8**	**28.7**	**1.5**	**3.7**	**6.5**	**6.8**

Table 6: All WA ZCTA's with >15,000 total population, >10% Af.Am. population and military workforce below 5% (14 ZCTA's).

Quantitative (Model-Based) Analysis and Inference

Methodological Comments and Considerations

To examine the 'pay-day' distribution in a more sophisticated manner, one that simultaneously adjusts for the effects of several explanatory variables, regression models were run. As requested by Ms. Le, I ran models similar to those of Burkey and Simkin [2004] and King et al. [2005]. These models quantify the association between the number of 'pay-days' (or banks), and various factors.[4] They provide direct answers to the question "what affects the number of 'pay-days' or banks in a given locale?". In terms of the public relevance of these associations, though, we should try and fully account for the association between banks and 'pay-days'. This is because one could argue that only a differential pattern between 'pay-days' and banks constitutes a net 'pay-day' related effect.

My preferred solution was to examine the **'pay-day'/bank branch location frequency ratio.**[5] Though at first glance this measure may seem strange, it does compare the 'pay-day' distribution to the most ubiquitous, everyday financial institution, whose services 'pay-days' claim to complement, in a direct manner.[6] It simultaneously examines 'pay-days' and 'banks' as a function of the same demographic factors, and forces a linear relationship between their numbers (which is logical, since both are customer service outlets). One must be careful in interpreting the model, though. We should keep in mind that bank locations and 'pay-day' locations are generally chosen by different people. Therefore, the ratio may reflect difference in their priorities and preferences, or – how different a 'pay-day' is from a 'legit' financial institution in that respect. Conversely, we **can** also interpret the ratio as the excess (or deficit) **'pay-day load'** experienced by people living in certain zip-codes, compared with the state's population baseline. Since the abundance or lack of businesses in one's home area does affect her economic behavior, I think this is a valid interpretation.

Another key advantage of the ratio model is that it also indirectly neutralizes many unobservable, unknown or unspecified factors. Presumably, such factors would affect any financial business, whether bank or 'pay-day', and hence the bank:'pay-day' ratio would remain unaffected by them.

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[4] The 'formal' name for this model is Poisson regression with negative binomial dispersion. The models were weighted for ZCTA population. I also ran Poisson models with linear dispersion factors, yielding similar results. All statistical modeling was performed in the public-domain R language (www.r-project.org). Some minor calculations were performed in Microsoft Excel.

[5] Nominally, not the ratio was modeled but rather the number of 'pay-days' per ZCTA, given a ZCTA's total number of 'pay-days' and banks in each zip. If both are Poisson distributed, then the number of one of them (given their sum) is a binomial random variable; a test on this binomial outcome is equivalent to a test on the ratio of Poisson rates [see e.g. Lehmann, 1986, Ch. 5; if the two are negative-binomial, the sum-conditional outcome is hypergeometric, which can be approximated by a binomial as a 'worst case' in terms of dispersion].
The binomial model included a linear correction for over-dispersion. Like the Poisson models, it was also weighted for ZCTA population. The binomial approach has another 'side effect': it removes 202 'diluting' low-population ZCTA's with no banks or 'pay-days' from the model data, leaving us with 342 zips that have all of Washington's banks and 'pay-days' and 94% of the population.

[6] Graves and Peterson [2005] also used this measure among others, viewing it as a form of 'location quotient'.

In any case, no claim is made here that a particular model is absolutely superior to all others. There are several plausible options to model this problem. All options I've tried have produced similar results. Finally, teasing apart the Af.Am. and military effects posed additional challenges. The solution chose is explained in the appendix.

Model Results

Table 7 summarizes the effect of various factors upon the 'pay-day' and bank distributions separately. Only factors which were found to be significant, or directly related to the question of interest, are shown.

Pay-day outlets increase with increasing ZCTA population, increasing number of banks at the same ZCTA, a high percentage (relative to Washington state) of Af.Am., and an increase in the ZCTA poverty rate. They decrease for very high income ZCTA's, and as the proportion of full college degree holders increases. All these associations are highly significant. Comparison of high-military ZCTA's to ZCTA's with low-military ones was performed for ZCTA's in the 9^{th} and 10^{th} deciles in terms of Af.Am. population. The 10^{th} decile comparison (highest proportion of Af.Am.) does show a significant additional 'military' effect on top of the race effect, by a factor of ~1.25.

Banks increase with an increase in the number of 'pay-days', ZCTA population, the poverty rate and the proportion of academics, but they decrease for the top decile of Af.Am. population. There is some evidence that they further decrease for this decile, if the ZCTA has a high percentage of military personnel, but this evidence is inconclusive.

If…	Pay-Days increase by	95% CI	Banks increase by	95% CI
Banks increase by 1	**+6%**	(5%,8%)	N/A	N/A
Pay-Days increase by 1	N/A	N/A	**+9%**	(6%,12%)
ZCTA Pop. Doubles	**+106%**	(81%,135%)	**+54%**	(40%,70%)
Median Income is >60k	**-47%**	(-62%,-27%)	**+5%**	(-18%,33%)
College Grads increase by 5%	**-5%**	(-8%,-1%)	**+7%**	(4%,10%)
Poverty rate increases by 5%	**+9%**	(5%,13%)	**+7%**	(2%,11%)
Af.Am are 2%-4.6% (9th decile)	**+30%**	(7%,57%)	**-7%**	(-23%,12%)
Af.Am are >=4.6% (10th decile)	**+62%**	(33%,97%)	**-32%**	(-44%,-17%)
Military >=4% (vs. 9^{th} Af.Am. Decile Baseline)	**+10% (+50% vs. state baseline)**	(-9%,32%)	**+10% (+10% vs. state baseline)**	(-10%,35%)
Military >=4% (vs. 10^{th} Af.Am. Decile Baseline)	**+25% (+130% vs. state baseline)**	(4%,49%)	**-19% (-50% vs. state baseline)**	(-35%,1%)

Table 7: Model results for the effect of various factors upon the number of 'pay-days' **(left)** and of bank branches **(right)** in any given ZCTA. The effect of 'high military' was only tested for the upper two deciles of Af.Am. populations, running a separate model - for reasons explained in the appendix. The table is color-coded with green (light shade in BW) for significant increase, orange (dark shade in BW) for decrease. Non-significant or marginally significant effects have a white background.

Comparing the sides of table 7, we see two factors with strongly opposing associations: the highest decile ZCTA's of Af.Am population, and percentage of college-degree holders (note: they are also opposing each other in direction). High-income ZCTA's and the 9th decile of Af.Am. do not appear to be associated with the number of bank branches, and for the rest of the factors the effect's direction is similar for 'pay-days' and bank branches.

If…	Pay-Day/Bank Frequency Ratio increases by	95% CI	P-value
ZCTA Pop. Doubles	**+48%**	(30%,69%)	**7.6E-09**
Median Income is >60k	**-44%**	(-61%,-21%)	**0.001**
College Grads increase by 5%	**-7%**	(-10%,-3%)	**1.6E-04**
Poverty rate increases by 5%	**+4%**	(0%,9%)	**0.06**
Af.Am are 2%-4.6% (9th decile)	**+28%**	(6%,54%)	**0.01**
Af.Am are >=4.6% (10th decile)	**+88%**	(54%,129%)	**7.4E-10**
Military >=4% (vs. 9th Af.Am. Decile Baseline)	**+5% (+30% vs. state baseline)**	(-27%,50%)	**0.79**
Military >=4% (vs. 10th Af.Am. Decile Baseline)	**+81% (+210% vs. state baseline)**	(21%,169%)	**0.003**

Table 8: Model results for the effect of various factors upon the 'pay-day'/bank branch ratio. The effect of 'high military' was only tested for the upper two deciles of Af.Am. populations, running a separate model - for reasons explained in the appendix. The table is color-coded like table 8.

Table 8 shows the results of the 'pay-day'/bank location frequency ratio model, which was run on the 342 ZCTA's having at least one 'pay-day' or bank branch (these ZCTA's are home to 5.52 million people, or 94% of Washington's population). The general trends are similar to those on the 'pay-day' column of table 7.

The top decile Af.Am. zip codes experiences an 'overload' of 'pay-days' vs. banks (compared with the general population baseline), by a factor of ~1.9, with a p-value of less than 1 in a billion (1E-9). This is after adjusting for population size, poverty rate and extreme richness, and college degree holders. **If one decile seems like a small number of ZCTA's, please note that in the top-Af.Am.-decile ZCTA's live 66% of the state's Af.Am. population (125,000).** They average nearly 11% of these ZCTA's 1.16 million people. For the 9th decile, the 'overload' factor is ~1.3.

After adjusting for Af.Am, the other large "minorities", namely As.Am., Lat.Am. and First Nations, show no significant association. When the geographically-correlated Af.Am. and As.Am. are modeled together, Af.Am. effect remains significant while As.Am. is not.

The military effect seems to be concentrated in the upper decile of Af.Am. ZCTA's: people living in the 11 ZCTA's which are both in the upper Af.Am. decile and the upper 5% of military zips, see about *3 times* as many 'pay-days' per bank, as does the rest of the state.

As expected from table 7's separate-model numbers, the 'pay-day'/bank location frequency ratio increases with increasing population, and decreases with increasing percentage of full degree holders (by 7% for each 5% increase), and for ZCTA's with >$60k median income (by a factor of nearly 2). After adjusting for race and military employment (Fort Lewis ZCTA 98433 is also Washington's highest-poverty-rate zip), poverty rate appears only marginally significant with respect to the 'pay-day'/bank ratio. However, in a separate model run only on >15k people ZCTA's, the poverty effect doubled its strength and became quite significant with a p-value of 0.009. This indicates that poverty still plays a role (all other effects changed very little in the >15k model; more details available upon request).

Some Limitations and Disclaimers

The models used here assume that except for relationships defined explicitly in the model, ZCTA's are independent of each other, regardless of their geographic proximity or socio-economic-administrative relationship. This is of course a gross oversimplification. It is not clear what kind of a spatial dependence model would be appropriate for this problem; possibly it would be one that took into account the nearest (and perhaps next-nearest) neighboring ZCTA's, with some distance-based weighting. Such a model would be very complicated to formulate and run, and is beyond the extent of the current project. Another unaccounted grouping factor in the data is that we are modeling many hundreds of business location decisions as if they were independent trials, while in fact at least within a given company decisions are obviously correlated.

Fortunately, we can address this concern: first of all, people usually do their personal finance close to home, in their home ZCTA [Graves and Peterson, 2005]. If not, they might just as well be doing it near their workplace rather than hop over to neighboring ZCTA's (for an example, see the appendix). But modeling this would require a much higher-resolution dataset containing information about people's commuting habits, which we don't currently have. Moreover, the inclusion of 'over-dispersion' factors in our models (see footnotes in the methodology section) does indirectly account for spatial correlations. Assuming over-dispersion means that the data are not homogeneous but are divided into sub-groups or 'clusters', geographic or otherwise. This assumption usually makes our significance estimates more conservative (and hence more reliable). It also indirectly accounts for other grouping effects.

At bottom line, given the adjustment for over-dispersion, the Af.Am. effect is so overwhelmingly significant, that it is unlikely to go away with the explicit introduction of spatial correlations, company groupings, or any other 'twisting and turning' of the model.

ZCTA-based analysis raises a concern in the opposite direction as well: it does not capture street- and neighborhood-level information, such as shown by Graves and Peterson [2005]. This concern cannot be dismissed; however, a ZCTA has become a standard geographic/demographic unit for analyses of this type. Again, higher-resolution data will probably not wipe out the Af.Am. and military effects, but may rather reveal more detail about target populations of the 'pay-day' business. In many ways, though, ZCTA is

approximately an optimal scale for this analysis: people usually do their banking close to home, but given America's motorized culture, many times it is not within walking distance but rather, within the same zip-code. All in all, the limited resolution of ZCTA-level analysis amounts to erring on the side of caution – it artificially dilutes apparent effects, rather than artificially enhance them.

This leads us to a 'last but not least' limitation. The demographic groups addressed in this study (a.k.a. "minorities") have been defined somewhat arbitrarily. For a case in point, "Asians" include Filipinos - who in Washington may be mostly working-class and might live mostly next to blacks - side by side with (East) Indians, most of whom may be concentrated in the wealthy Eastside hi-tech suburbs. This level of resolution is not captured by the analysis. Hence, blacks may not be the only minority experiencing a disproportionately large 'pay-day load'. They may be joined by some Asian, "Hispanic" or even "White" groups, but the latter groups are masked by their inclusion in larger racial categories.[1] As a case in point, the top Af.Am. decile of ZCTA's (home to 2/3 of the Washington's blacks) is also home to nearly 12% Asian Americans, which amount to 42% of the state's Asian population.[7]

[7] If you wish to look for target groups within the "white" or "Hispanic" categories, I suggest starting from zips like 98501 in Olympia (11 'pay-days', 15 banks) and 98661 in Vancouver (11 'pay-days', 8 banks).

Public-Interest Summary and Questions

Further Discussion of the Inference

The general question whether 'pay-day' lending is a legitimate type of business, cannot be answered by this report and is up to the public and its representatives to answer. The basic public-interest question placed at our doorstep was: given that 'pay-days' are a newly re-legalized and booming business, is their distribution driven by 'purely economic' factors, or do other factors come into play? This question, of course, has implications regarding the fairness of 'pay-day' business practices and regarding possible side effects of their re-legalization.

Since 'pay-days' claim to offer a financial service that is complementary to that of banks' (but not a complete substitute to banks), and since we have no direct way of measuring local patterns of demand for financial services, looking at the 'pay-day' to bank location frequency ratio provides a 'financially adjusted' measure of the 'pay-day' distribution.

A 'null hypothesis' of sorts would be that 'pay-days', serving the "heart of the working middle-class" (a direct quote from www.cfsa.net, a 'pay-day' industry site), would differ from banks in their location strategy only due to 'neutral' factors as population size (as a proxy for "customer traffic), and may also legitimately stay away from very rich neighborhoods where their services are not needed. These effects were indeed found to be significant.

However, even while adjusting for these 'neutral' factors, the analysis indicates that 'pay-days' are more strongly associated than banks with poor areas in general. Furthermore, (black) race and education are strongly associated with 'pay-days', whether the latter are modeled directly or compared with banks. Additionally, military zips have some of the largest 'pay-day' concentrations in the state. The significance of the military effect is not very robust under a regression framework due to the small sample involved. However, regression evidence is supported by the geographical evidence presented by Graves and Peterson [2005] with regards to Fort Lewis/McChord (fig. 3). The latter, in my view, constitutes overwhelming evidence. One could think up a specific statistical test to estimate the probability of 'randomly' seeing the largest concentration of 'pay-days' in the state right next to the largest military complex in the state (in a locality that, other than serving soldiers, is not a major business center) - but frankly, you do not need a statistician for this.

Back to the African American effect: the number of zip-codes involved is larger, and the effect is quite robust to modifications of the model, with p-values consistently in the 1E-10 to 1E-7 range. Even though the interpretation of p-values is a subject of debate among statisticians, mathematically speaking such low p-values do indicate a very strong and consistent association. Given that the dataset is low-resolution and only medium-sized – several hundred zip-codes, roughly 2,400 'pay-days' and banks combined – this kind of association makes the question of a causal relationship (direct or indirect) relevant.

Since we are dealing with social phenomena, this would of course not be a causal relationship such as encountered in nature (e.g., "gravity causes water to flow down"), but more like "a high percentage of blacks affects 'pay-day' business decisions where to open up shop, in a different manner from bank branch location decisions", or equivalently and in plain language, "**pay-days target black localities**". So can we conclude this or not?

The Issue of Causality or Targeting

A known challenge for observational statistical studies is "when can we deduce causality?" In social statistics, abuse of bulk statistical trends to make spurious causal conclusions about individual behavior is known as "the ecological fallacy". The wish to avoid this fallacy has dominated research. Fortunately for us, the issue in question does not involve an attempt to study the consumption behavior of a population of millions (of whom blacks still form only a minority, even in Washington's 'black localities'), but rather, the branch-location strategy of a much smaller set of people, namely bank and 'pay-day' executives. This is certainly a more tractable and less "ecological" task. Moreover, the low resolution in which this dataset was provided (ZCTA) works in our favor, since if anything, it errs on the side of caution by sometimes lumping together diverse neighborhoods, while still remaining close to the optimal resolution as far as service-outlet location strategy is concerned.

To sum it up, caution is always important. However, **being overly cautious can be detrimental and even deadly.** During the 1950's R.A. Fisher, arguably the greatest statistician in history, helped the tobacco industry hold back regulation and public pressure for years in face of mounting evidence, arguing that observational studies (associating smoking with lung cancer in men) do not constitute evidence for causality. We now know that the tobacco industry had deliberately misled the public, and its delaying tactics coupled with the overly cautious approach of statisticians and regulators, has caused unnecessary death and misery to many thousands, and cost the public many billions of dollars.

The debate ended with the 1964 Surgeon General report concluding that there is a causal relationship, even if the exact scientific mechanism had not yet been found directly. In that report, important guidelines were set to determine when observational studies constitute sufficient evidence for causality [USDH, 1964]; these guidelines are still the basis for such discussion. Here they are, translated to our 'non-medical' case:

- Strength of association – meaning that the effect is strong, if not absolutely, then at least compared with the available resolution (i.e., in our case, highly significant, having small p-values); **Satisfied on both counts.**
- Consistency of association – meaning the association is observed repeatedly in different populations and settings. In our dataset, different subsets I've taken and different model formulations have all shown a strong African-American race effect; moreover, such an effect is reported by others from other states. **Satisfied.**
- Temporality – meaning that blacks were there before 'pay-days' decided where to locate their stores. Trivially **satisfied.**

- Dose-Response – meaning that the more blacks there are in the neighborhood, the more likely 'pay-days' will locate there. Since there are significant differences between the top Af.Am. decile, second-highest decile and remaining 80% of zip-codes, this criterion (though nowadays not considered a necessary one) is also **satisfied.**

- Laboratory Evidence – meaning that there exists separate, carefully controlled causal evidence closely related to the problem in question. For many social questions such evidence is unattainable. However, for black:white race biases there exists ample evidence from blindfold experiments, in which subjects changed their behavior according to the perceived race of the person with whom they interacted.[8] At bottom line, even though (again) for the social sciences this criterion cannot be considered to be gating, it does appear to be **satisfied** in this particular case.

- Plausibility – meaning that the idea that 'pay-days' will prefer to locate in black neighborhoods is logical. **This is a crucial criterion in our case**; if there is not some plausible explanation for the association, one could still argue that 'other factors missing from the model' are really causing the observed effect. Here the historical context plays an important role. 'Pay-Day' type loans were outlawed across the US for two generations, precisely because of the damage they inflicted upon vulnerable social strata. This is (or rather, should be) common knowledge. Blacks have always been vulnerable and disadvantaged in America, and have yet as a group to fully recover from centuries of slavery and institutional racism, large pockets of which still exist. This is also common knowledge. Hence the notion that 'pay-days', once re-legalized, will prefer to cluster near black neighborhoods, is certainly plausible. **Satisfied.**

Therefore I conclude that from my analysis emerges a clear pattern of **'pay-days' deliberately targeting African-American population centers in Washington State**. As mentioned earlier, these localities also have disproportionately large numbers of other nonwhite ethnic groups, and other vulnerable social groups, which may also be perceived as 'pay-day' targets. However, on the Census-defined racial category level, only blacks emerge as a clear-cut target. They are, so to speak, the "spotted owls" of social statistics.

If we perform a similar examination of the military effect, the evidence is somewhat lacking with regards to strength and consistency (due to technical limitations related to the small sample of military zips). However, given that a causal relationship with black population centers has been established above, given the descriptive statistics of table 5, and last but not least, given the direct geographic evidence near the state's largest military complex (fig. 3), we can conclude, at a minimum, that **the 'pay-day' industry targets large military bases in Washington.** Needless to say, one can safely state that 'pay-days', as far as can be judged by their geographic distribution, certainly do not just aim to serve Washington's "heart of the working middle-class".

[8] Moreover, the 'pay-day' phenomenon in its entirety can be considered almost a laboratory case: a new type of business was released into an existing pattern of population and business. Does it 'zoom in' on certain localities, or does it follow the existing patterns?

My Personal Perspective

First a disclaimer: I knew next to nothing about 'pay-day' loans before being offered to perform this project, and certainly had no opinion about them. However, I do have a world view (as can be easily found out), and once I knew what 'pay-days' are and what rates they charge,[9] they could not qualify as one of my favorite types of business. I would never, however, compromise my professional integrity as a statistician. I've performed the best analysis I know to perform in order to answer the questions of interest, working within a rigorous academic program. This analysis was reviewed by, and presented to, top experts in the field. All methods used are transparent, documented and publicly available, and I am ready to answer more questions regarding them, at assaf@u.washington.edu.

Regarding the issue itself: it is tempting to see the 'pay-day' industry as the sole villain here. Their brazen advocacy claims of 'helping middle-class America' (which as this and other analyses show, do not hold water) certainly do not help their case in this respect. But narrow self-interest and misleading advertisement are part of the nature of business in general. The 'pay-day' boom is just another symptom for a problem that we as a society, and our representatives, are responsible for: the problem of neglecting our duty to protect the weak among us.[10]

Basic food, shelter, clothing and basic medical care are **not a free market**. People do not "freely choose" not to eat today, or to get injured, or to be evicted. In our age, one needs a steady flow of cash (or credit) in order to obtain these basic needs while preserving one's dignity. Therefore, if someone's access to the "mainstream" sources of cash is blocked – for whatever reason – no ordinary rules of "demand and supply" exist.[11] Cash-strapped people will pay any price for it, whether or not the deal is fair or sustainable.

Moreover: 'pay-days' were already illegal for this reason. Washington allowed them back in a decade ago without much thought, as part of a nationwide 'domino effect'. Imagine that marijuana would have been legalized, or the alcohol age dropped to 18. Surely the decision would have been accompanied by mandatory, large-scale follow-up studies to test the effect of such a decision. The decision to allow 'pay-days' back in the market without any follow-up was terribly negligent; even worse, the legislature is still amenable to 'pay-day' industry pressure, and periodically expands their mandate – still, without any follow-up. This study reveals that in effect, **in its 'pay-day' decisions our legislature has declared open season on the weak.** We have forgotten that anyone may find oneself at

[9] A back-of-the-envelope calculation, using the current allowed rates and the average loan size of $375 reported by DFI, shows that in order to break even, a 'pay-day' branch of an existing company needs to bring in only **~3** new loans per day. The average for Washington State in 2004 was **22.7** new loans, per branch, per day. I leave you to calculate pay-day's profit margin on your own. No wonder entrepreneurs are still crowding in to join this business. As of early 2006, there were already over 700 'pay-days' in Washington.

[10] **March 2006 note: these words were written 3 months before Hurricane Katrina.**

[11] It may be that blacks' special vulnerability to 'pay-days' has to do with their extremely high rate of prisoners (7 times that of whites) and other people in trouble with law enforcement, which in turn prevents them from obtaining fairer credit solutions.

bottom, and that when the bottom falls out – sooner or later the whole of society may follow.

People needing short-term cash to fulfill their emergency needs is a complex problem. But 'pay-days' with their unsustainably high rates are not a solution; they only exacerbate the problem. Looking more deeply, the problem has to do with the fact that workers receive payments regularly, after they do the work – hence, in effect, lending their work to their employers – while costs may be incurred real-time or even in advance (such as rent). In my view, therefore, employers should be asked to be part of the solution, just like they are expected to help their workers shoulder the burden of health insurance. Legislation requiring medium and large employers to provide advances on account of work already performed (subject to limitations, of course), and establishing some central fund to enable similar assistance to workers in small firms and the self-employed, would be a welcome change from a legislature that has so far let its vulnerable constituents down on this issue.

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Appendix: Modeling the 'Military' Effect

Since nearly all large-population military ZCTA's have a high percentage of Af.Am., the 'military' effect has no general-population baseline to compare with directly – a necessary feature if this effect is to be assessed independently of any other. I finally settled for testing this effect by comparing the 'raw' Af.Am. effect with a 'composite' effect of a factor that split high Af.Am. ZCTA's into high-military and low-military levels.[12] This factor replaces the 'straight' Af.Am. effect factor, and hence was run on a different model (not a different model type). This is why I put double lines separating the 'military' effects from the rest.

Zip 98433 (first row on table 5) posed an additional problem – a distortion of data patterns. This ZCTA is apparently confined to Fort Lewis, and its workforce is 77% military –the most heavily military zip in the state. It only has 2 banks and no 'pay-day' outlet – probably because the military controls the type and number of businesses allowed on base. Including this zip's data 'as is' in the model, places a large-population, high-military, zero 'pay-day'/bank ratio ZCTA in one of the smallest groups in the model (only 11 ZCTA's) – when in fact, the soldiers living there have a dozen 'pay-days' lined up outside their doorstep. My solution was quite simple. It is clear that this 98433's excess financial needs are served mostly by the neighboring zip 98499. Hence, I 'reallocated' the 18 'pay-days' and 16 banks in these two ZCTA's, roughly in proportion to their respective populations (6 and 6 in 98433, 12 and 10 in 98499). Since both ZCTA's belong to the same group of 11, the 'price' paid for this 'reallocation' is not high. A 'half-and-half' allocation yielded essentially the same model results. I also tested whether the two ZCTA's cause any anomaly in the data after 're-allocation' (compared with other 'high-military' ZCTA's), and they appear not to.[13] This is not true of the 'as is' data: without 're-allocation', the 'military' effect's p-value is 0.09, while after 're-allocation' it is 0.008.[14]

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[12] Both variables, being highly skewed, were discretized into levels (rather than modeled as continuous variables, like population or poverty rate).

[13] This is done by adding a 'dummy factor' for the two zip-codes, and seeing whether it is significant.

[14] Zips 98439 (McChord) and 98312 (Bremerton NS) had similar properties, but had zero banks as well, so they were automatically dropped from the 'pay-day'/bank ratio model (limiting their distortion). Zip 99011 (Fairchild AFB) has a single bank and 61% military, but its population is only 4,700, again limiting its effect.