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Availability, price, and promotions for cigarettes and non-cigarette tobacco products: An observational comparison of United States Air Force Bases with nearby tobacco retailers, 2016

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Abstract

Introduction—Active duty military personnel have higher cigarette and smokeless tobacco use rates than civilian populations. Although United States Airmen (called Airmen regardless of gender or rank) are required to be tobacco-free during initial training, many resume use once this period ends, perhaps as a result of easy access to cheap tobacco products.

Methods—Between July and September 2016, we collected tobacco product, price, and promotion information by visiting on- (n=28) and off- (n=80) base tobacco retailers near the eight Technical Training bases where approximately 99% of Airmen attend training. We conducted mixed linear effects models to examine on- versus off-base differences.

Results—Cigarette packs were 11–12% cheaper at on-base retailers compared to off-base retailers. Newport Menthol and Marlboro Red cigarette packs were \$0.87 and \$0.80 lower on-base

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CONTRIBUTORSHIP

SD Golden, AE Myers, M Little, and KM Ribisl contributed to study concept and design. AY Kong and S Vandegrift contributed to data acquisition. AY Kong conducted data analysis and undertook statistical analysis, and all authors contributed to interpretation of the data. AY Kong and SD Golden drafted the manuscript, and all authors critically revised the manuscript for important intellectual content.

COMPETING INTERESTS

The views expressed are those of the authors and do not reflect the official views or policy of Department of Defense or its Components. AE Myers and KM Ribisl have a royalty interest in a store mapping and audit system owned by the University of North Carolina at Chapel Hill and the store audit system was used in this study. KM Ribisl serves as an expert consultant in litigation against tobacco companies. The other authors have no competing interests declared.

($p<0.001$) while the cheapest pack available was \$0.54 lower on-base ($p<0.01$). Copenhagen smokeless tobacco was also significantly cheaper on-base ($B=-0.65$, $p<0.01$). Interior price promotions were more common on-base.

Conclusions—Retail stores located on Air Force bases sell cigarettes and smokeless tobacco products at prices well below those in nearby off-base retailers: the vast majority of these retailers feature interior price promotions for these products. Federal policies regulating prices of on-base tobacco sales, if implemented more effectively, have the potential to protect the health of Airmen by helping them remain tobacco-free after technical training.

Keywords

Priority/special populations; Public policy; Price; Non-cigarette tobacco products; Advertising and Promotion

INTRODUCTION

The United States (US) Department of Defense (DoD) employs more than 3.2 million people, making it the largest employer in the world, ahead of both Walmart and McDonalds. [1] Unfortunately, characteristics of this population, including demographics (e.g., young, predominantly male), psychosocial risk factors (e.g., risk-taking behaviors, high prevalence of alcohol abuse), and the stress of military deployment[2–4], place them at a higher risk for tobacco use. The most recent DoD Health Related Behaviors Survey (2011) estimated the 30-day prevalence of cigarette smoking to be substantially higher among active duty military personnel (24%) compared to civilian populations (18%), a disparity which also is evident in smokeless tobacco use (12.8% military vs. 2.3% civilian).[5] The US military is vast reaching with personnel stationed worldwide. Military personnel who use tobacco have worse physical and mental health and are at greater risk of early discharge compared to their non-smoking colleagues.[6,7] Furthermore, the DoD spends more than \$1.6 billion each year on health costs and lost productivity due to tobacco-related health issues.[8]

Within the Air Force specifically, more than one quarter of Airmen (called Airmen regardless of gender or rank) report regular tobacco use prior to military service, and about 15% report initiating tobacco use after enlistment.[9] This is despite a requirement that all Airmen remain tobacco free during 8 ½ weeks of Basic Military Training and the first four weeks of Technical Training, and is at odds with report of 63% of Airmen stating complete confidence that they will remain tobacco free for one year following the period of forced abstinence.[10]

Past studies have found that low prices[11–13] are associated with increased tobacco consumption and relapse behaviors[14,15] while exposure to tobacco retail marketing[16–18] has been associated with tobacco consumption and purchase behaviors.[19] Concerted efforts by the tobacco industry to make tobacco accessible for military personnel have been met by federal regulations designed for military sales systems.[20] Until very recently, military stores were required by DoD policy to set tobacco product prices within 5% of the lowest competitive local price while commissaries were required to place a 5% surcharge on all such purchases.[21] Commissaries, operated by the Defense Commissary Agency

(DeCA), are stores located on military bases that sell groceries and household goods to military personnel, their families and retirees at cost plus a surcharge. A loophole existed whereby the “lowest competitive local price” was not legally required to include local or state excise or sales taxes. As a result, many of the tobacco products sold on-base were offered at substantially cheaper prices than those available off-base.[22–24] In an effort to address this price gap, a March 2017 DoD tobacco policy memorandum stipulated that all military-priced tobacco products must now “match the prevailing local price in the community, including the effect of all applicable taxes that local consumers pay when purchasing tobacco”.[22,23] This policy went into effect after the data collection for the current study. Although tobacco advertising on the exterior of on-base retailers is prohibited, [25] other marketing strategies, such as interior advertised price promotions, are not.

Primarily through the use of phone-based data collection, previous national studies of all military service branches have documented lower prices for both premium and discount cigarette brands on military bases relative to nearby off-base community stores (typically defined as mass merchandisers, such as Walmart). Between 2011 and 2013, despite rising on-base prices for Marlboro Red and concurrent falling off-base prices, Marlboro Red prices were still significantly cheaper on military bases than in the community.[26,27] Between 2013 and early 2014, 18.2% of military retailers were selling Marlboro Red at prices below 5% of the lowest competitive local price.[26,27] Another study found that Newport menthol cigarettes cost an average of 23% less on a military base than in local community Walmarts. [28] Finally, a recent national study compared military retailer Marlboro Red cigarette prices to internal community prices used by military retailers to set exchange prices.[29] Researchers found that on average, the price of Marlboro Red cigarettes at military retailers was 6.2% lower than the average community price. [29]

Marlboro and Newport are premium cigarette brands, so studies solely focused on these brands are not able to capture possible price differences in discount brands. If, however, military trends match those evident in the broader U.S. marketplace [30], an increasing percentage of Airmen may be choosing discount brands in response to increasing cigarette prices. Furthermore, although Airmen who use tobacco most frequently smoke cigarettes, they also regularly use other tobacco products such as cigarillos (8.7%) and smokeless tobacco (8.5%) at high rates, with 6% of Airmen reporting e-cigarette use.[10] Dual- and poly- use of multiple tobacco products – especially combinations of cigarettes and smokeless tobacco (13.8%)[31,32] – is also common among Airmen. To our knowledge, no other studies have examined whether smokeless tobacco products or e-cigarettes are cheaper on bases.

The current study is the first to assess disparities in the pricing, availability, and marketing of *multiple* tobacco products on- and off-base through in-person tobacco retailer assessments at multiple tobacco retailer store types. Prior to the enactment of the new DoD policy that includes all applicable taxes in community price comparisons, we conducted store audits at on- and off-base tobacco retailers to compare the availability and pricing of three types of cigarettes (Marlboro Red, Newport menthol and the cheapest pack in the store), Copenhagen smokeless, and Vuse e-cigarettes. To examine other potential retail factors that might further contribute to smoking initiation and relapse for Airmen, we also conducted exploratory

assessments of distance from bases to the ten closest off-base retailers, and on- vs. off-base differences in both exterior marketing and interior tobacco price promotions.

METHODS

Selection of Technical Training Bases and Tobacco Retail Outlets

We collected tobacco product, price, and promotion information by visiting on- and off- base tobacco retailers near seven Air Force Technical Training bases and one army installation where nearly all (99%) of Airmen attend technical training. Five bases (Camp Bullis, Ft. Sam Houston, Goodfellow Air Force Base [AFB], Lackland AFB, and Sheppard AFB) were in Texas, two (Presidio of Monterey and Vandenberg AFB) were in California, and one was in Mississippi (Keesler AFB). Base maps and Air Force-based civilian staff were used to identify every on-base tobacco retail outlet. In advance of data collection, state business and tobacco retailer licensing websites were used to identify a list of probable nearby off-base community tobacco retailers. The retailers included in the study were then identified using ground truthing. During each site visit, the data collector identified the 10 closest off-base community retailers nearest each of the base gates by driving the local roads surrounding the base and using the list of likely tobacco retailers. For each store, the data collector confirmed the sales of tobacco.

Data collection was completed between July and September 2016 using a preprogrammed electronic survey on an Android web-enabled mobile device. For on-base outlets, we secured advance permission and arranged for a military escort to accompany the data collector. The data collector completed store audits at all 80 off-base retailers, and at 26 of the 28 on-base retailers (92.9%), for a total sample of 108 retailers. Audits were not possible at two retailers on Vandenberg AFB due to temporary closure during a nearby forest fire. As needed, clerk assistance was requested when assessing product availability and price information. This protocol was approved by the 59th Medical Wing Institutional Review Board.

Tobacco Retail Environment Measures

A modified version of the Standardized Tobacco Assessment for Retail Settings (STARS)²⁸ was used to characterize tobacco product availability, price, and marketing characteristics using standard store assessment protocols.[33,34] The STARS tool was adapted by the research team to reflect the on-base military environment (e.g., store types) and products most frequently consumed by Airmen according to surveillance data. We conducted exploratory data collection on the availability of packs and cartons of cigarettes (i.e. any, Marlboro Red, Newport Menthol), cigarillos (i.e. any, single, flavored), cigars (i.e. any, flavored), smokeless tobacco (i.e. any, flavored, Copenhagen), and electronic cigarettes (i.e. any, flavored, Vuse). We categorized mentholated tobacco products as flavored. The data collector distinguished between large cigars and cigarillos by evaluating product size and using previous brand recognition knowledge. The data collector also indicated whether the retailer displayed special price promotions (e.g., ‘50 cents off’), multi-buy price promotions (e.g., ‘buy five cigars, get three free’), and exterior advertising for cigarettes, menthol cigarettes, cigarillos, cigars, smokeless tobacco, and e-cigarettes.

Price—To compare the prices an Airman would pay for tobacco products at on- vs. off-base retailers, we recorded the advertised price (in dollars and cents) of packs and cartons of three types of cigarettes (cheapest pack, Marlboro Red, Newport Menthol) as well as the advertised price of a tin of Copenhagen smokeless tobacco and single Vuse disposable e-cigarette.

For off-base sales, the data collector also indicated whether sales tax was included in the price. If not included, we added a state and local sales tax amount to the advertised price, identified by consulting government websites. No taxes were added to prices for products sold on-base, as these outlets were exempt from state and local sales taxes at the time of the data collection. However, commissaries (located on bases) charged a 5% surcharge on all products purchased, and this was accounted for in our data.

Analysis

Proximity to Retailers Analysis—Using 2016 Census Bureau TIGER/Line® military installation shapefiles, we used ArcGIS 10.2 (Environmental Systems Research Institute, Redlands, California) to calculate the centroid, or center, of each military installation area. [35] We then calculated the average distance from the centroid of each military base to the ten nearest tobacco retailers using street networks.[36]

Product Availability, Exterior Marketing, and Price Promotions—We report the availability of each tobacco product, exterior marketing presence, and advertised interior price promotions for both on- and off- base stores. Due to the small and unbalanced sample of tobacco retailers (28 on-base and 80 off-base), we did not have the power to assess for statistically meaningful differences between product availability and promotions on- and off-base.

Multilevel Models of Tobacco Product Prices for On- vs. Off- Air Force Base Retailers—For each tobacco product price variable, we analyzed a linear regression model of price as function of on- vs. off- base retailer. We expected that prices within each base area would be more similar to each other than they would be if chosen randomly, due to shared area costs of living and other local market characteristics. Null models employing a base area random intercept indicated moderate clustering of retailer prices within the eight areas (ICCs ranged from 0.22–0.45 for different product prices). We therefore used mixed linear effects models to adjust for nesting of retailers within base areas, and further added a state fixed effect to control for any unmeasured time in varying characteristics of states. In sensitivity tests, we explored a base area fixed effects model, and our results were essentially unchanged, so we report the results from the more efficient estimator. All analyses were conducted using SAS 9.2 (SAS Institute, Cary, NC).

RESULTS

Base Characteristics

Table 1 describes characteristics of each Technical Training Base.

The number of on-base retailers ranged from one to six, while the annual number of non-prior service enlisted Airmen graduating from Technical Training on a given base ranged from 275 at Vandenberg AFB to 9,392 at Sheppard AFB. For all but two bases, the nearest tobacco retailer was located within two miles of the center of the base; the notable exceptions were Vandenberg (8.5 miles) and Camp Bullis (7.2 miles) which is expected, as these bases have the largest land areas and thus, the base centroid is likely not as representative of the population distribution within each base. The average distance to the nearest ten tobacco retailers varied significantly as well, from only one mile for Presidio of Monterey to more than 10 miles for two other bases.

Product Availability

Both packs and cartons of cigarettes were available in all on-base stores, but only 60.0% of off-base retailers sold cartons of Marlboro Red and 57.3% sold Newport Menthol (Table 2). Cigarillos and e-cigarettes were sold in the vast majority of stores, with little variation in availability on- or off- base. Cigars and smokeless tobacco, however, were more prevalent on- base than off-base. Cigars were sold in 66.7% of on-base stores compared to just 25% of off-base retailers. Smokeless tobacco was available in about 15% more stores on-base compared to off-base. Flavored large cigars were rarely (3.8%) sold in any store we audited and were not available on-base.

Interior Price Promotions and Exterior Advertising

Table 3 indicates that interior price promotions (any type) were more common in on-base retailers for cigarettes (85.7%) and smokeless tobacco (64.3%) compared to off-base stores.

However, price promotions for cigarillos were much less common on-base (25.0%) compared to off-base (40.0%). For all stores, most tobacco products were promoted through special prices on one or more products, with the exception of cigarillos, which were more commonly promoted through multi-buy deals (not shown in table). Finally, consistent with DoD Instruction 1130.17[25] no on-base retailers had any exterior tobacco marketing while all off-base retailers had exterior tobacco marketing for at least one type of tobacco product.

Product Prices

As indicated in Table 4, the average unadjusted price paid for all tobacco product types was cheaper in on-base stores compared to off-base stores. For most products, these price differences were statistically significant after adjusting for base area nesting and controlling for possible state confounding. Newport Menthol and Marlboro Red cigarette packs were \$0.87 and \$0.80 lower on-base; cartons of these products were cheaper on-base as well (data not shown). The cheapest pack available on-base was \$0.54 lower than the cheapest pack off-base, but differences for cheapest cartons were not significant. Additionally, Copenhagen smokeless tobacco was also significantly cheaper on-base ($B=-0.65$, $p<0.01$). We observed no significant price difference by retailer location for Vuse disposable e-cigarettes, which were sold at a flat \$11.00 at all on-base stores and averaged at \$11.47 (SD=1.4) at off-base stores.

DISCUSSION

Our results confirm previous studies of premium cigarette price disparities on military bases, and we are the first to provide baseline data of significantly cheaper prices for a variety of other tobacco products not previously assessed in other studies. Overall, the price of packs of cigarettes was about 11–12% cheaper at on-base retailers compared to off-base retailers. The on-base savings for Marlboro Red and Newport Menthol packs were between \$0.80–\$0.87, or about \$292–318 annually for a pack a day smoker. Previous studies comparing prices on AFB to Walmart have documented savings ranging from \$0.94–\$1.87[26,27] for Marlboro Red and \$1.45[28] for Newport Menthol cigarettes. Furthermore, consistent with a previous study[27], even the cheapest packs sold in military installments were more than \$0.50 cheaper than those sold off-base, amounting to an annual savings of \$183 for a pack a day smoker. Additional research is needed to determine whether the lower price differences we document, especially for premium brands, reflects the wider range of store types included in our community sample or lower differentials on Technical Training Bases compared to other bases and/or military branches. Finally, cigarette cartons were also available for purchase in all on-base stores, compared to only 61% of off-base community retailers. Pricing exerts a strong influence on tobacco consumption,[11] and switching to discount brands[30] and buying cigarettes in bulk through cartons[37,38] are two strategies often employed by smokers to keep cigarettes affordable. Selling low price products even more cheaply on base could thus contribute to tobacco relapse and initiation among Airmen.

Airmen have high cigarette and smokeless use rates, and this is precisely the combination of products most common among dual users.[31] Our study is the first to assess price disparities in other tobacco product types, and after adjusting for area and potential state confounders, we found that Copenhagen smokeless tobacco was \$0.65 cheaper in on-base retailers compared to nearby off-base community stores. Relatively affordable access to both of these products may present a double health hazard to Airmen. On the other hand, e-cigarettes were priced similarly on- and off-base: e-cigarettes rarely have an excise tax at the state- or local- level[39], and thus, this similarity in price is expected, and there may be no price advantage to purchase these products on-base. However, continued monitoring of potential e-cigarette price differences and advertising may be critical to preventing a rise in dual use of combustible and electronic products.

By conducting in-person assessments of the retailer environment, we were also able to assess the presence of interior price promotions that may lower the price of tobacco products. We find that on-base retailers are advertising the low cost of products through extensive use of interior price promotions. Promotions were particularly prevalent for cigarettes and smokeless tobacco, the products for which on- vs off-base availability and price differentials were highest. Although cigars were more commonly sold on base, no on-base stores advertised price promotions for them. While the prevalence of cigar use is low among military personnel (4.8%), there is a culture of using cigars at celebratory events which may account for their higher availability in on-base stores but absence of price promotions.[10]

Stopping smoking entirely is challenging, and most people require multiple attempts to do so successfully.[40] The Military Services' prohibition on tobacco use during Basic Military Training and the early phase of Technical Training provides Airmen a unique opportunity to remain tobacco free and hence to enjoy improved long-term health and fitness for service. DoD pricing and promotion policies could, depending upon design and enforcement, either reinforce or inhibit this opportunity. Our study, like others conducted under the previous policy,[26,27] documents the easy accessibility of cheap tobacco products on-base for Airmen and other military personnel. The recently enacted DoD memorandum should result in higher on-base prices as it extends to all tobacco products, not just cigarettes, and it stipulates that the lowest local competitive price to which on-base prices are compared must include all taxes that would be applicable off-base.[22,23] However, as noted by Poston and colleagues, the definition of 'local' and the local price comparisons military exchanges use can vary greatly,[29] so continued pricing surveillance is necessary to ensure policy compliance.

This study contributes the first assessment of price disparities for other tobacco products prior to the new DoD memorandum and will aid in ongoing efforts to monitor for compliance with the new regulations. Even under this most recent policy, on-base stores are permitted to advertise and accept interior price promotions that may offset projected price increases. Several states and local governments have explored policies to set a clear minimum floor price[11,41] for tobacco products, as well as laws to restrict coupons or ban price promotions.[42] Each of these is a plausible strategy by which to ensure that cheap on-base prices do not impede on Airmen and other military populations who wish to remain tobacco-free. For most bases in our study, off-base community tobacco retailers are within two miles of base, so restrictions to on-base tobacco sales do not unduly burden those Airmen who will continue using tobacco products.

Our findings are limited by the sample from which they derive. Although we had sufficient price variation to allow analysis of differences controlling for potential area-level clustering, the small number of military base tobacco retailers prevented us from assessing statistically meaningful differences between on- and off-base product availability and promotions. Furthermore, our analysis is limited to Technical Training bases and may not represent pricing and marketing differences on all military bases. It is, however, conceivable that our results generalize to other military populations, as two of our study areas are also Army bases on which Airmen train, and at which many other military personnel (including non-trainees) from across services are also stationed, but further research is needed to confirm this supposition. Finally, while telephone surveys potentially allow greater geographical reach, we demonstrate the feasibility of using STARS [33] as an in-person measure that does not require clerk time and permits the opportunity to capture tobacco marketing characteristics.

Tobacco use is highly prevalent in military populations around the world.[43–46] Tobacco use among military personnel may weaken their physical and mental health and result in long-term costs for military health systems, as current military smokers are 30% more likely to report physical health problems and 41% more likely to have received mental health counseling.[6,7] To date, the DoD has implemented the most aggressive tobacco policy for

its members. [22,23] A similar trend has been observed in other countries around the world. In 2017, New Zealand announced their goal of establishing the first smoke-free military by 2020 through tobacco control policies such as banning the sale of cigarettes on camps and bases.[47] More restrictive policies for on-base tobacco sales present a clear opportunity to reduce tobacco use among service members but require ongoing monitoring and consistent enforcement to be effective.

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What this paper adds

- This study is the first to assess disparities in both the pricing and availability of multiple tobacco products on- and off-base.
- We also demonstrate the feasibility of conducting in-person tobacco retailer assessments at multiple tobacco retailer store types.
- Similar to previous studies, we document lower prices for premium cigarette brands for on-base retailers, and on-base stores sell packs and cartons of cigarettes and smokeless tobacco for less than neighboring retailers.
- Compared to off-base stores, on-base stores are also more likely to display interior price promotions for cigarettes and smokeless products, two products that are most widely used by Airmen.

Technical Training Base characteristics and proximity to off-base tobacco retailers, 2016

Table 1

	Number of on-base retailers visited	[‡] Number of Tech Training Airmen	Land area (square miles)	Proximity to closest off-base retailer (miles)	Average proximity to ten closest off-base retailers (miles)
Texas					
Camp Bullis [‡]	1	3,408	44.0	7.2	11.1
Ft. Sam Houston	6	1,590	4.6	2.0	3.3
Goodfellow AFB	3	2,067	1.7	1.1	2.2
Lackland AFB	6	7,860	7.5	1.6	2.5
Sheppard AFB	4	9,392	7.3	2.2	3.6
Mississippi					
Keesler AFB	4	4,088	2.5	1.5	2.5
California					
Presidio of Monterey	2	487	0.6	0.7	1.0
Vandenberg AFB	2	275	155.2	8.5	10.7

Note:

Proximity is measured from the centroid of each base to tobacco retailers using street networks.

[‡]Number of non-prior service enlisted Technical Training Graduates in Fiscal Year 2016

[‡]The number of Airmen that are included in Camp Bullis are also included in Lackland estimates because these Airmen spend training time on both bases.

Table 2

Availability of cigarettes and other tobacco products, on- vs. off- Technical Training Bases, 2016 (N=108)

	On base, % (n=28)	Off base, % (n=80)
Cigarettes		
Packs	100.0	94.9
Cartons	100.0	61.0
Marlboro Red		
Packs	82.1	93.8
Cartons	100.0	60.0
Newport Menthol		
Packs	82.1	91.3
Cartons	100.0	57.3
Cigarillos		
Any	85.7	87.5
Singles	78.6	80.0
Flavored	85.7	83.8
Cigar		
Any	66.7	25.0
Flavored	0.0	3.8
Smokeless		
Any	89.3	73.8
Flavored	89.3	68.8
Copenhagen	89.3	65.8
E-cigarettes		
Any	78.6	73.8
Flavored	75.0	68.8
Vuse	57.1	41.3

Note: Missing values ranged from one to five.

Table 3

Interior price promotions[†] on cigarettes and other tobacco products, on- vs. off- Technical Training Bases, 2016

	On base, % (n=28)	Off base, % (n=80)
Cigarettes	85.7	75.0
Menthol cigarettes	67.9	77.5
Smokeless	64.3	46.3
Cigarillos	25.0	40.0
E-cigarettes	21.4	26.3
Cigars	0.0	1.3

Note:

Missing values ranged from one to four.

[†] Interior price promotions include one or more of the following: special price (e.g., '50 cents off') on one product, special price on more than one product, multi-buy (e.g., 'buy one product, get one free').

Multilevel[†] models of tobacco product prices as a function of on- vs. off- Technical Training Base tobacco retailers, 2016**Table 4**

	Unadjusted Average Price Paid, \$USD		On-base (vs. Off-) B	
	On-base price (SD)	n	Off-base price (SD)	n
Cheapest Cigarettes				
Packs	4.40 (0.3)	23	4.93 (0.7)	75
			-0.54**	0.1
Cartons	45.46 (2.5)	28	47.82 (6.2)	47
			-2.60	1.2
Marlboro Red				
Packs	5.72 (0.3)	23	6.49 (0.6)	75
			-0.80***	0.1
Cartons	55.34 (2.1)	28	62.22 (4.9)	45
			-6.89***	0.8
Newport Menthol				
Packs	5.90 (0.4)	23	6.72 (0.8)	73
			-0.87***	0.2
Cartons	58.60 (2.8)	28	65.18 (6.2)	43
			-6.58***	1.1
Copenhagen	3.89 (0.7)	25	4.42 (1.1)	52
			-0.65**	0.2
Vuse	11.00 (0.0)	16	11.47 (1.4)	33
			-0.49	0.4

Note:

* p<0.05,

**

p<0.01,

p<0.001

Each table row represents a separate regression model for a specific product price, and all models included an indicator for base state. The nesting variable was base area, and the ICC ranged from 0.22–0.45.