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Short communication

Socioeconomic disparities in outdoor branded advertising in San Francisco and Oakland, California

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ABSTRACT

Advertising exerts a powerful influence over consumer decision-making, and disproportionate marketing for unhealthy products may contribute to health inequities. The objective of this study was to examine socioeconomic and racial and ethnic disparities in outdoor branded advertising for products harmful to health in San Francisco and Oakland, CA. We collected cross-sectional data on outdoor advertising from 372 blocks with ≥ 1 residential or mixed-residential parcel in SF and Oakland in 2018–2019. Blocks were randomly sampled by city, land use, majority vs. non-majority Black and/or Hispanic composition, and upper and lower tertiles of household income. Advertisements were coded by product, healthfulness, and branding. Exposure variables were neighborhood household median income and percent of residents who were Hispanic of any race, non-Hispanic Asian, non-Hispanic Black, and non-Hispanic White. The primary outcome variable was block-level dichotomous presence of any unhealthy branded advertisement for food, beverage, alcohol, or tobacco. Analyses were unadjusted and adjusted for land use and number of total advertisements on each block. Each additional $10,000 in neighborhood household median income was associated with an 11% lower adjusted odds of having any unhealthy branded advertisements on the block (95%CI: 0.80–0.99; P = 0.03). There were no significant associations between neighborhood racial and ethnic composition and presence of unhealthy branded advertisements, but with each 10% higher neighborhood composition of Hispanic residents, there was a borderline significant higher presence of unhealthy branded advertisements (OR = 1.23; 95%CI: 1.00–1.51; P = 0.05). Results indicate that low-income neighborhoods were disproportionately exposed to outdoor branded advertisements for unhealthy products.

1. Introduction

Marketing for unhealthy products disproportionately affects lower-income communities and communities of color (Backholer et al., 2021; Grier & Kumanyika, 2008; Williams et al., 2012; Harris et al., 2020, 2021). Excessive exposure to unhealthy food, beverage, alcohol, and tobacco advertisements may contribute to disparities in cardiometabolic disease and cancer (Backholer et al., 2021; Biglan et al., 2019; Grier & Kumanyika, 2008; Lee et al., 2015; Williams et al., 2012).

Research on U.S. disparities in marketing exposure has focused largely on television and the internet (Backholer et al., 2021; Biglan et al., 2019). The distribution of outdoor advertising, especially for food, beverage, and alcohol, is less well-documented, despite evidence that the built-environment is an important behavioral determinant (Backholer et al., 2021; Biglan et al., 2019).

Recent studies have assessed the association between neighborhood characteristics and outdoor advertising of foods, beverages, and/or alcohol, specifically in Sacramento and Los Angeles, CA; Austin, TX; Philadelphia, PA; New York City (NYC), NY; and Boston, MA and a national sample of retail exteriors (Adjoian et al., 2019; Cassady et al., 2015; Dowling et al., 2020; Gentry et al., 2011; Isgor et al., 2016; Lowery & Sloane, 2014; Lucan et al., 2017; Yancey et al., 2009). Most but not all of these studies have found that lower-income or higher-poverty neighborhoods (Adjoian et al., 2019; Dowling et al., 2020; Gentry et al., 2011; Isgor et al., 2016; Lowery & Sloane, 2014; Lucan et al., 2017; Yancey et al., 2009) and neighborhoods with a higher

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composition of Asian, Black, or Latino residents (Adjoian et al., 2019; Cassady et al., 2015; Dowling et al., 2020; Isgor et al., 2016; Lowery & Sloane, 2014; Lucan et al., 2017; Yancey et al., 2009) had higher exposure to unhealthy outdoor advertising. However, there have been mixed findings; for example, one study in NYC found a positive association between outdoor sugary drink advertisements and neighborhood composition of Black residents in three boroughs, but in Queens, found an inverse association with Latino neighborhood composition (Dowling et al., 2020). In this small but growing area of research, there is a lack of data on outdoor advertisements in some of the U.S.' most populous regions, including the San Francisco (SF) Bay Area, CA.

This study aimed to investigate socioeconomic and racial/ethnic disparities in outdoor branded advertising for unhealthy products, consisting of specific types of foods, beverages, alcohol, and tobacco on blocks with ≥ 1 residential or mixed-residential parcel in the SF Bay Area.

2. Materials and methods

2.1. Sample and data collection

Data were collected from SF and Oakland, two of the most populous Bay Area cities with similar walkability (EPA National Walkability Index), urbanicity (U.S. 2010 Census), racial/ethnic diversity (2015–2019 American Community Survey[ACS]), retail environments, and support for health policies (e.g., sugar-sweetened beverage taxes) (Falbe et al., 2020). A random sample of 192 blocks per city from SF and Oakland (3% and 4% of total blocks, respectively) was selected, stratified by median household income (top and bottom tertile), land-use characteristics (residential, mixed-commercial/high-residential, and mixed-commercial/low-residential), and having a majority of Black and/or Hispanic residents vs. non-majority (e.g., majority of residents were non-Hispanic White, Asian, or a combination). In total, there were 12 strata (Appendix Table 1), with an average of 32 blocks per strata. We used block-group level data from the 2012–2016 ACS Estimates to determine median household income and used block-level data from the 2010 U.S. Decennial Census to determine land-use characteristics and racial/ethnic composition.

Initial data collection occurred in both cities in December 2018-April 2019 (n = 192) with additional blocks sampled from October 2019-December 2019 (n = 192). Two data collection periods occurred due to uncertainty around the number of advertisements we would observe per block. The second period was added to increase the sample size. After excluding 12 duplicate blocks sampled in SF, the sample contained 372 blocks: 180 (48%) from SF and 192 (52%) from Oakland. Because this study did not involve human subjects, IRB approval was not applicable.

Trained data collectors walked the perimeter of each block to photograph all visible outdoor advertisements, including advertisements and signage on storefronts, billboards, bus stops, bus benches, pictorial menus, and other locations visible from the street, following prior procedures (Cassady et al., 2015; Yancey et al., 2009). Signs for business names alone and those inside stores but not displayed right against the window glass were not considered advertisements. A smartphone application (GTField, Geomatics Apps) that recorded coordinates or smartphone camera and Google Drive (with folders labeled with the block identifiers) were used to upload images in real time.

2.2. Coding

Each advertisement and sign was coded by whether it was branded, the product type/behavior (food, non-alcoholic beverage, alcohol, tobacco, physical activity, or other), and healthfulness: healthy (e.g., water, "no smoking" signs, fruits, vegetables, yoga, fitness), unhealthy (e.g., fast-food-type foods, fast-food chain advertisement unless only promoting a healthy item, candy, sweets, processed meats, salty snacks, sugary cereals, ice cream, sweetened beverages [e.g., soda; sweetened fruit-flavored, tea, coffee, or energy drinks], beer, liquor, wine, tobacco and e-cigarettes), and ambiguous (e.g., foods with unclear ingredients [mixed dishes, sandwiches], nutrient-dense foods also high in added sugars or refined carbohydrates, and ads for brands not clearly associated with product healthfulness [e.g., coffee brand associated with plain and sweetened coffee]). Appendix Fig. 1 contains examples of classifications. Advertisements that contained multiple products were considered one advertisement but coded as having multiple product types (e.g., a sign advertising chips and soda was coded as both food and beverage). An advertisement displaying multiple soda types counted as just one unhealthy branded beverage advertisement. A single coder (NZ) coded all pictures after data collection for each period using Microsoft Excel 2018 [Redmond, WA]. Coding was verified by JF and KM, and

Table 1
Association of Neighborhood[a] Income and Race/Ethnicity with Block-level Outdoor Advertising (n = 372 blocks[b]).

	Outcome: Presence of Unhealthy Branded Advertising[b] (OR; 95% CI)[c]				
	All unhealthy branded advertising	Food	Beverage	Alcohol	Tobacco
Median income ($10,000)					
Unadjusted	0.91; (0.86–0.97)**	0.92; (0.81–1.05)	0.93; (0.85–1.00)+	0.92; (0.86–1.00)*	0.91; (0.81–1.02)
Adjusted[d]	0.89; (0.80–0.99)*	0.92; (0.79–1.07)	0.92; (0.82–1.03)	0.92; (0.83–1.02)+	0.90; (0.77–1.05)
Percent Hispanic (10%)					
Unadjusted	1.07; (0.91–1.27)	1.20; (0.90; 1.60)	1.05; (0.84–1.32)	1.01; (0.82–1.24)	0.85; (0.61–1.20)
Adjusted[d]	1.23; (1.00–1.51)+	1.31; (0.94–1.81)	1.12; (0.85–1.46)	1.06; (0.83–1.35)	0.89; (0.65–1.23)
Percent non-Hispanic Asian (10%)					
Unadjusted	0.98; (0.85–1.14)	0.78; (0.58–1.07)	1.08; (0.88–1.32)	0.96; (0.79–1.17)	0.81; (0.61–1.09)
Adjusted[d]	0.99; (0.77–1.27)	0.74-(0.49–1.12)	1.11; (0.87–1.41)	0.95; (0.76–1.20)	0.79; (0.54–1.15)
Percent non-Hispanic Black (10%)					
Unadjusted	0.94; (0.78–1.12)	1.02; (0.77–1.35)	0.93; (0.72–1.20)	0.97; (0.78–1.22)	1.06; (0.80–1.41)
Adjusted[d]	0.97; (0.75–1.26)	1.13; (0.86–1.49)	1.02; (0.77–1.35)	1.06; (0.85–1.33)	1.17; (0.89–1.55)
Percent non-Hispanic White (10%)					
Unadjusted	1.01; (0.90–1.13)	1.00; (0.79–1.26)	0.96; (0.81–1.14)	1.04; (0.91–1.18)	1.15; (0.97–1.37)
Adjusted[d]	0.88; (0.74–1.04)	0.89; (0.66–1.20)	0.84; (0.67–1.05)	0.96; (0.82–1.13)	1.08; (0.88–1.33)

*P < 0.05; **p < 0.01; +p < 0.10.

[a] Defined as the reachable 5-minute walking vicinity from each sampled block.

[b] Of the 372 blocks, 60 (16%) had any unhealthy branded ads; and the numbers of blocks with unhealthy branded food, beverage, alcohol, and tobacco ads were 17 (5%), 27 (7%), 38 (10%), and 17 (5%), respectively. The total number of unhealthy branded advertisements was 377: 41 coded as food, 69 coded as beverage (with 6 of these also coded as food), 221 coded as alcohol, and 52 coded as tobacco.

[c] Logistic regression models with robust standard errors.

[d] Adjusted for land use (dichotomous for residential vs. mixed) and number of total advertisements, regardless of healthfulness or branding.

disagreements were resolved through discussion. The primary outcome variables exclude unbranded (e.g., "no smoking" signs, generic fruit), ambiguous, and healthy advertisements. We did not examine unbranded advertising because we were interested in identifying advertising that may have been targeted based on neighborhood characteristics (rather than a homemade sign in a mom-and-pop business).

2.3. Primary exposure and outcome variables

Exposure variables included neighborhood median household income and percent of Hispanic, non-Hispanic Asian, non-Hispanic Black, and non-Hispanic White residents and were drawn from the data sources described in 2.1. Neighborhood was defined as the area reachable within a 5-minute walking time of each block, determined using tools for Network-Based Distances in ArcGIS (ESRI, Redlands, CA). Neighborhood median household income was calculated by taking the average of household median incomes of each block group reachable within a 5-minute walking distance. Neighborhood racial and ethnic composition was calculated by taking the total count of residents in each group and dividing by the total population residing on blocks within the same 5-minute distance.

The primary outcome variable was block-level presence of any unhealthy branded advertising (dichotomous). Due to limited power, block-level presence of specific types of unhealthy branded advertising (food, beverage, alcohol, and tobacco) were exploratory outcomes.

2.4. Analysis

We modeled the outcomes using logistic regression, with robust standard errors, using unadjusted models and models adjusted for land-use characteristics (dichotomous variable for residential vs. mixed) and number of total advertisements, regardless of branding or healthfulness. As a robustness check, we ran models also adjusting for land use as a 3 category variable and defining neighborhood as the 2.5- and 10-minute walking time, which did not alter the primary findings. Because there was no evidence of effect modification by city, data from SF and Oakland were combined. All analyses and hypothesis testing (two-sided alpha = 0.05) were conducted in Stata v15.1 (College Station, TX).

3. Results

3.1. Descriptive results

We observed 988 total advertisements, of which 597 were unbranded or ambiguously coded for healthfulness. Sixteen percent of blocks (N = 60) had any outdoor branded advertisements. On these blocks, there were 391 branded advertisements, of which 377 were unhealthy and 14 healthy, for a ratio of 27:1 unhealthy to healthy branded advertisements. The ratios of unhealthy to healthy branded advertisements for foods and beverages were 21:1 and 14:1, respectively.

Appendix Table 1 summarizes demographic and advertisement data by strata. Appendix Table 2 shows the frequency of branded advertisements per block by land-use and healthfulness across both cities combined, and Appendix Table 3 shows number and percent of blocks with each type of unhealthy branded ad. Appendix Figure 2 shows a map of sampled blocks.

3.2. Income and advertisements

Table 1 shows associations of neighborhood income with block-level outdoor branded advertising. For each additional $10,000 in neighborhood household median income, there was a significant unadjusted 9% lower odds of having any unhealthy branded advertisements on a block (OR = 0.91; 95%CI: 0.86–0.97; P < 0.01) and a significant adjusted 11% lower odds of having any unhealthy branded advertisements on a block (OR = 0.89; 95%CI:0.80–0.99; P = 0.03).

In exploratory analyses, neighborhood income was associated with a significantly lower unadjusted odds of having branded alcohol advertisements on a block (OR = 0.92; 95%CI: 0.86–1.00; P = 0.04), which was a borderline significant association in the adjusted model (OR = 0.92; 95%CI: 0.83–1.02; P = 0.09). Also, in the unadjusted model only, neighborhood income was associated with a borderline significant lower odds of having any unhealthy branded beverage advertisements on a block (OR = 0.93, 95% CI: 0.85–1.00; p = 0.07). There were no significant associations of neighborhood income with unhealthy food or tobacco advertisements.

3.3. Racial and ethnic compositon and advertisements

In unadjusted and adjusted models, there were no statistically significant associations of race and ethnicity with presence of unhealthy branded advertisements. However, for each additional 10% in neighborhood Hispanic composition, there was a borderline significant higher adjusted odds of having any unhealthy branded advertisements (OR = 1.23, 95% CI: 1.00–1.51; p = 0.05) on the block.

4. Discussion

In this cross-sectional study of 372 blocks in SF and Oakland, higher neighborhood household income was significantly associated with a lower presence of outdoor unhealthy branded advertisements. This finding is consistent with prior observations that low-income neighborhoods have a higher prevalence of unhealthy outdoor advertisements (Adjoian et al., 2019; Dowling et al., 2020; Gentry et al., 2011; Isgor et al., 2016; Lowery & Sloane, 2014; Lucan et al., 2017; Yancey et al., 2009). However, some of these studies had mixed findings. For example, Adjoian et al. (2019) found a significantly higher density of tobacco and alcohol (but not food or beverage) advertisements in high- compared to low-poverty neighborhoods in adjusted models. Another study in NYC found a significantly higher adjusted sugary drink advertisement density in high- or medium-poverty compared to low-poverty neighborhoods in Brooklyn and Staten Island but not in other boroughs (Dowling et al., 2020). In exploratory analyses, higher neighborhood income was associated with a lower odds of unhealthy branded alcohol advertising, consistent with prior research examining alcohol advertisements in Boston metro stations (Gentry et al., 2011).

In the current study, neighborhood Hispanic composition was associated with a borderline-significant higher adjusted odds of unhealthy advertisements, but we did not detect other relationships between neighborhood racial or ethnic composition and advertisements. In contrast, other studies found that neighborhood racial or ethnic composition was associated with unhealthy outdoor advertising. In NYC, Latino composition was associated with higher exposure to unhealthy food, beverage, and alcohol advertisements in the Bronx (Lucan et al., 2017), while in other studies of NYC, Asian and Black (but not Latino) composition was associated with higher exposure to sugary drink advertisements (Adjoian et al., 2019; Dowling et al., 2020). Further, in a national study of soda advertisements on store exteriors (Isgor et al., 2016) and studies of multiple unhealthy products in Sacramento, Los Angeles, and multiple US cities (Cassady et al., 2015; Lowery & Sloane, 2014; Yancey et al., 2009), neighborhood Black and Latino compositions were associated with higher advertisement exposure. Asian composition was also associated with advertisements for addictive products/behaviors in Los Angeles (Lowery & Sloane, 2014).

Our sample was likely underpowered to detect significant differences by racial and ethnic composition due to the number of blocks and relatively low prevalence of blocks with unhealthy branded advertisements. This could also be due to including only blocks with ≥ 1 residential parcel and inclusion of high-residential blocks. It is also possible that SF and Oakland have unique characteristics like food justice coalitions that have successfully advocated for healthy retail policy and

systems change (Minkler et al., 2018). Also, high housing costs and gentrification have contributed to rapidly shifting demographics (https://bit.ly/2SpACZX).

Our finding of higher exposure to advertising for unhealthy products in lower-income neighborhoods and the high ratio of unhealthy to healthy branded advertisements support the need for policies to equitably reduce exposure to unhealthy advertising (Chung et al., 2022; Gelormino et al., 2015). Proposed policies include ones that address food and beverage advertising in school zones, residentially-zoned areas, or public transit systems, as was done in London. Limiting window space that can be covered by signs and limiting overall outdoor advertising have also been enacted and proposed (Adjoian et al., 2019; Dowling et al., 2020). Additional policy measures include requiring warning labels on advertisements for sugary drinks or healthy retail policies that address storefronts and within-store marketing (Falbe et al., 2021; Harris et al., 2021).

A limitation of this study was including only SF and Oakland, which are not representative of all U.S. cities. We could not determine how change in neighborhood demographics related to change in advertising due to the cross-sectional design. Finally, the sample size and low proportion of blocks with any branded advertisements limited statistical power and precluded the ability to examine associations with healthy branded advertising.

5. Conclusion

There was a significant inverse relationship between neighborhood income and outdoor unhealthy advertising in two Bay Area cities. Future research should continue to investigate disparities in outdoor, in-store, and digital advertising.

CRediT authorship contribution statement

Neha Zahid: Conceptualization, Data Collection, Data Cleaning, Analysis, Writing. **Richard Pulvera:** Data Collection, Analysis, Editing. **Kristine A. Madsen:** Conceptualization, Methodology, Supervision, Editing. **Matthew M. Lee:** Data Cleaning, Analysis, Editing. **Ana Ibarra-Castro:** Data Collection. **Jennifer Falbe:** Conceptualization, Methodology, Supervision, Writing – review & editing.

Declaration of Competing Interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2022.101796.

References

Adjoian, T., Dannefer, R., Farley, S.M., 2019. Density of outdoor advertising of consumable products in NYC by neighborhood poverty level. BMC Public Health 19 (1), 1479. https://doi.org/10.1186/s12889-019-7821-y.

Backholer, K., Gupta, A., Zorbas, C., Bennett, R., Huse, O., Chung, A., Isaacs, A., Golds, G., Kelly, B., Peeters, A., 2021. Differential exposure to, and potential impact of, unhealthy advertising to children by socio-economic and ethnic groups: A systematic review of the evidence. Obes. Rev. 22 (3), e13144 https://doi.org/10.1111/obr.13144.

Biglan, A., Van Ryzin, M., Westling, E., 2019. A public health framework for the regulation of marketing. J. Public Health Policy 40 (1), 66–75. https://doi.org/10.1057/s41271-018-0154-8.

Cassady, D.L., Liaw, K., Miller, L.M., 2015. Disparities in Obesity-Related Outdoor Advertising by Neighborhood Income and Race. J. Urban Health 92 (5), 835–842. https://doi.org/10.1007/s11524-015-9980-1.

Chung, A., Zorbas, C., Riesenberg, D., Sartori, A., Kennington, K., Ananthapavan, J., Backholer, K., 2022. Policies to restrict unhealthy food and beverage advertising in outdoor spaces and on publicly owned assets: A scoping review of the literature. Obes. Rev. 23 (2), e13386 https://doi.org/10.1111/obr.13386.

Dowling, E.A., Roberts, C., Adjoian, T., Farley, S.M., Dannefer, R., 2020. Disparities in Sugary Drink Advertising on New York City Streets. Am. J. Prev. Med. 58 (3), e87–e95.

Falbe, J., Lee, M.M., Kaplan, S., Rojas, N.A., Ortega Hinojosa, A.M., Madsen, K.A., 2020. Higher Sugar-Sweetened Beverage Retail Prices After Excise Taxes in Oakland and San Francisco. Am. J. Public Health 110 (7), 1017–1023. https://doi.org/10.2105/ajph.2020.305602.

Falbe, J., White, J. S., Sigala, D. M., Grummon, A. H., Solar, S. E., & Powell, L. M. (2021). The Potential for Healthy Checkout Policies to Advance Nutrition Equity. *Nutrients*, *13*(11), 4181. PubMed. 10.3390/nu13114181.

Gelormino, E., Melis, G., Marietta, C., Costa, G., 2015. From built environment to health inequalities: An explanatory framework based on evidence. Prev. Med. Rep. 2, 737–745. https://doi.org/10.1016/j.pmedr.2015.08.019.

Gentry, E., Poirier, K., Wilkinson, T., Nhean, S., Nyborn, J., Siegel, M., 2011. Alcohol advertising at Boston subway stations: An assessment of exposure by race and socioeconomic status. Am. J. Public Health 101 (10), 1936–1941. https://doi.org/10.2105/ajph.2011.300159.

Grier, S.A., Kumanyika, S.K., 2008. The context for choice: Health implications of targeted food and beverage marketing to African Americans. Am. J. Public Health 98 (9), 1616–1629. https://doi.org/10.2105/AJPH.2007.115626.

Harris, J.L., Fleming-Milici, F., Kibwana-Jaff, A., & Phaneuf, L. (2020). *Sugary Drink Facts 2020*. UConn Rudd Center For Food Policy & Obesity.

Harris, J.L., Fleming-Milici, F., Phaneuf, L., Jensen, M., Choi, Y.Y., McCann, M., Mancini, S., 2021. Fast Food Facts 2021. UConn Rudd Center for Food Policy & Obesity. https://uconnruddcenter.org/research/food-marketing/facts/.

Isgor, Z., Powell, L., Rimkus, L., Chaloupka, F., 2016. Associations between retail food store exterior advertisements and community demographic and socioeconomic composition. Health Place 39, 43–50. https://doi.org/10.1016/j.healthplace.2016.02.008.

Lee, J.G., Henriksen, L., Rose, S.W., Moreland-Russell, S., Ribisl, K.M., 2015. A systematic review of neighborhood disparities in point-of-sale tobacco marketing. Am. J. Public Health 105 (9), e8–18. https://doi.org/10.2105/ajph.2015.302777.

Lowery, B.C., Sloane, D.C., 2014. The prevalence of harmful content on outdoor advertising in Los Angeles: Land use, community characteristics, and the spatial inequality of a public health nuisance. Am. J. Public Health 104 (4), 658–664. https://doi.org/10.2105/AJPH.2013.301694.

Lucan, S.C., Maroko, A.R., Sanon, O.C., Schechter, C.B., 2017. Unhealthful food-and-beverage advertising in subway stations: targeted marketing, vulnerable groups, dietary intake, and poor health. J Urban Health 94 (2), 220–232. https://doi.org/10.1007/s11524-016-0127-9.

Minkler, M., Estrada, J., Thayer, R., Juachon, L., Wakimoto, P., Falbe, J., 2018. Bringing healthy retail to urban "food swamps": a case study of CBPR-informed policy and neighborhood change in San Francisco. J Urban Health 95 (6), 850–858.

Williams, J.D., Crockett, D., Harrison, R.L., Thomas, K.D., 2012. The role of food culture and marketing activity in health disparities. Prev. Med. 55 (5), 382–386. https://doi.org/10.1016/j.ypmed.2011.12.021.

Yancey, A.K., Cole, B.L., Brown, R., Williams, J.D., Hillier, A., Kline, R.S., Ashe, M., Grier, S.A., Backman, D., McCarthy, W.J., 2009. A Cross-Sectional Prevalence Study of Ethnically Targeted and General Audience Outdoor Obesity-Related Advertising. Milbank Q. 87 (1), 155–184. https://doi.org/10.1111/j.1468-0009.2009.00551.x.