

# Trends and predictors of primary dental care health services for adults in Israel

C. Zlotnick<sup>1</sup>, O. Baron-Epel<sup>2</sup>, S. Paul Zusman<sup>3</sup> and L. Keinan-Boker<sup>2,4</sup>

<sup>1</sup>Department of Nursing, University of Haifa, Haifa, Israel; <sup>2</sup>School of Public Health, University of Haifa, Haifa, Israel; <sup>3</sup>Division of Dental Health, Ministry of Health, Israel; <sup>4</sup>Israel Center for Disease Control, Ministry of Health, Israel

**Objectives:** Guided by the Andersen-Aday Behavioral Model of Health Care Utilization, this study compared primary dental care use trends between 2000 and 2010, and differences in primary dental care use between Israel's two largest ethnic groups, Jews and Arabs. **Methods:** Two waves (years 2000 and 2010) of existing cross-sectional data collected from a nationwide sample on the population's health knowledge, attitudes and practice were used. This study uses the sample of Israeli-Jews (n=2806) from 2000; and the nationally representative sample of Israeli-Jews (n=2539) and Israeli-Arabs (n=1723) from 2010. **Results:** Primary dental care use increased between 2000 and 2010 in Israel. Israelis who had at least a high school diploma, average or higher income, no dental pain and reported flossing their teeth were more likely to use primary dental care, but this was true of fewer Israeli-Arabs than Israeli-Jews. Other variables, associated with use of primary dental care but differing by ethnic group, were: being older than 65 years, being a native-born Israeli, employment, and health risk factors such as smoking and obesity. **Conclusions:** As with other western societies and as indicated by the model's three factors (i.e., predisposing, enabling and reinforcing/need), disparities in primary dental care use were found based on income (i.e., enabling); immigrants and ethnic minority status (i.e., predisposing), and health risk such as smoking (i.e., reinforcing/need). It is evident that health promotion activities are needed to target specific population subgroups to reduce disparities in primary dental care utilisation.

**Key words:** oral hygiene, oral health behaviour, oral health promotion, socioeconomic factors, inequalities, Israel

## Introduction

Most oral health research worldwide emphasises health status and indicators for treatment (Feingold and Setcos, 2004; Levin and Shenkman, 2004; Zadik *et al.*, 2009). Yet, preventive care behaviors such as obtaining routine examinations as well as practicing good health habits (i.e., brushing teeth and flossing) are considered the prerequisites to good oral health (Reich *et al.*, 1999; Sambunjak *et al.*, 2011). In the general population, basic preventive care recommendations for oral health, particularly obtaining routine dental examinations, are often ignored. In Israel, under 60% of adults obtained routine annual dental examination (Horev *et al.*, 2004). Israelis also have poor attitudes to dental health. A survey asking Israelis to prioritise health services by assuming "they were the Minister of Health...[and could] allocate an extra budget," found they were less likely to choose dental health than nursing care for the frail elderly, building a new hospital, preventive medicine or additional clinic staff (Kaplan and Baron-Epel, 2013).

The Andersen and Aday's Behavioral Model of Health Care Utilization is a well-known model which can identify characteristics and attributes of adults using dental health services in Sweden, the UK and Canada (Lundegren *et al.*, 2013; Marshman *et al.*, 2012; Muirhead *et al.*, 2009). The model suggests three major components lead to service use: predisposing factors (e.g., demographic characteristics and attitudes), enabling factors (e.g., internal resources comprised of personal health-related habits/behaviours

and external resources such as socioeconomic status that facilitate service use), and reinforcing/need factors (e.g., reasons to use services such as pain and increased risk of oral health disease) (Andersen, 1995). Existing studies have demonstrated that many predisposing and enabling factors are related to use of primary dental care. For example, although no peer-reviewed studies have compared the use of these services between Israel's two ethnic groups (i.e., Israeli-Jews, the dominant ethnic group, versus Israeli-Arabs), disparities have been found in several health outcomes (Balicer *et al.*, 2011; Baron-Epel *et al.*, 2007). Among Israeli-Jews studies have found that native-born Israelis and their children demonstrated better dental health than the many immigrants from the Middle East Asia (e.g., Iran, Iraq, Yemen, Libya) and Africa (e.g., Ethiopia, Morocco, Algeria) (Feingold and Setcos, 2004; Sgan-Cohen *et al.*, 2000; Zini *et al.*, 2009). Among enabling variables, lower socioeconomic status has been linked to poorer dental health (Schoen, 1975; Watt, 2005). Lastly, besides pain, very few studies have examined reinforcing/need factors.

This study addresses that gap by applying the Andersen and Aday's Behavioral Model of Health Care Utilization comparing the use of primary dental care services between the years 2000 and 2010, assessing whether conditions increasing the risk of oral health disease are related to seeking primary dental care, and examining whether the factors associated with using primary dental care services differ between Israel's two

largest ethnic groups, Jews and Arabs. For the purpose of this study we define primary dental care as a dental visit made for the purpose of a check up and/or for dental hygienist services.

## Materials and Methods

This study used two national, cross-sectional, datasets (years 2000 and 2010) of surveys administered by the Israel Center for Disease Control (ICDC) that explored **knowledge** of eating, smoking and other habits or behaviours; **attitudes** towards health behaviours; and activities indicating use and **practice** of health behaviours (KAP) (ICDC, 2002). Institutional Ethics Committee approval was obtained for this secondary data analysis (#13/056).

KAP survey data were collected in 2000 (KAP2000) from Israeli adults aged 18 years and over. The sampling frame consisted of telephone numbers from the national phone registry, Bezek. A total of 5,954 households were available for the telephone survey, which was administered in Hebrew. At least 8 attempts were made. Unsuccessful contacts accounted for 22.4% of the sample; and non-responses due to refusal accounted for 24.0%. The resulting sample consisted mainly of Israeli-Jews (n=2,920) leaving insufficient numbers to conduct analyses on Israeli-Arabs (n=20). A total of 253 individuals were excluded from the KAP2000 sample in this study since they wore dentures, and therefore, potentially observed different dental care and service use practices. The resulting sample consisted of 2,806.

The 2010 KAP survey (KAP2010) was designed to represent both Israeli-Jews and Israeli-Arabs, with over-sampling of the Israeli-Arab minority to ensure sufficient responses for comparisons. The sample frame used "Data rings", a commercial software that included all Israeli household landline numbers that were not privileged or under protection. The original sample contained 11,689 Israeli-Jews and 11,024 Israeli-Arabs; however, 4,092 and 3,574 respondents were eliminated from the samples of Israeli-Jews and Israeli-Arabs, respectively, due to commercial numbers, disconnected lines, households with no inhabitants above the age of 21, etc. At this stage, 7,597 Israeli-Jews and 7,450 Israeli-Arabs were in the KAP2010 sample. However, 1,147 Israeli-Jews refused or were not available after 6 tries, and 58 were excluded due to technical reasons, resulting in a sample of 2,739 Israeli-Jews (30.2% response rate). Of the 7,450 Arab-Israeli in the KAP2010 sample, 625 refused, 4,344 were not located after 6 tries, and 29 were excluded due to technical reasons, resulting in 2,452 Israeli-Arabs (36.4% response rate). The KAP2010 survey was administered in Hebrew, Arabic and Russian. Those using dentures and with insufficient data on ethnicity or dental variables were eliminated resulting in the final KAP2010 sample of 2,593 Israeli-Jews and 1,723 Israeli-Arabs.

Both surveys contained approximately 60 questions with most questions using standardised closed-ended responses. Most questions and response options were identical in both the KAP2000 and KAP2010 surveys, such as:

1. predisposing and demographic variables - gender (male/female), age (birth date), education (college degrees, diploma from a high school, no diploma),

marital status (married, divorced, separated, single) and country of birth (Israel or not);

2. enabling variables such as brushing teeth (>once/day, once/day, not regularly and never), smoker (current – yes/no; past history-yes/no);
3. reinforcing/need variables such as reported physical status (excellent, very good, good, not good, poor), weight (kilograms) and height (centimetres); and
4. dental care use such as time of last visit (last half year, more than a half year ago to one year; more than a year ago to two years, more than two years ago, and never), and reason for dental visit (dental check up visit; dental hygienist visit including cleaning; treatment for fillings, dental extraction or root canal; treatment for dentures, bridge or orthodontics; treatment for gums; and treatment for injury).

Not all variables in KAP2010 were asked in KAP2000. For example, KAP2000 did not include the following variables: income level, employment, flossing. For income level, respondents in KAP2010 were told the average monthly income (10,500 shekels), and asked if they made more, less, or about the same. For employment, there were three responses: receipt of a regular salary, being self-employed or working on a kibbutz – all these were categorised as employed. Respondents answering the question on health status in KAP2000 were asked to rate their health on a one to ten scale; however the same variable in KAP2010 were asked to rate their health using a four-category response (very good, good, not so good, not good). Consequently, health status was defined as good in KAP -2000 with values of six to ten and in KAP2010 by categories of very good and good. Also, a question specifying seeking dental care for pain was formatted differently between the two surveys, so data from this variable was only used in KAP2010 analyses.

Some variables were recoded for the logistic models due to small cell sizes, ease of interpretation, convenience of analysis, or model fit. Body mass index (BMI), using the standard formula of weight in kilogram divided by height in meters squared, was calculated and categorised to represent normal or under-weight BMI ( $BMI \leq 24.9$ ), overweight ( $BMI = 25-29.9$ ) and obese ( $BMI \geq 30$ ) (NIH, 1998). This variable was further categorized into a dichotomous variable as average or below BMI versus above. Age categories were: 25 to 34, 35 to 44, 45 to 54, 55 to 64, and 65 and the referent group was the youngest category (18 to 24). Education was dichotomised into obtained at least high school diploma or not. Other binary variables were: married, born in Israel, at least average income, brushed teeth at least daily, reported flossing ever, normal or underweight BMI, current smoker, and employed. A binary categorical variable, created to represent use of primary dental care, consisted of a positive or negative response indicating that the last dental visit was made for a check up or to use the services of prophylaxis/cleaning dental hygienist and not for any type of treatment (fillings, tooth extraction, gum treatment, root canal, etc). This definition of a primary or preventive dental care visit has been used in other studies (Boehmer *et al.*, 1999; Ronis *et al.*, 1993).

Data were analysed using SAS v9.3 with the significance level set at  $p < 0.05$ . Since the KAP2000 did not survey sufficient numbers of Israeli-Arabs, the comparison

of the predisposing, enabling and reinforcing/need factors over the 10-year period only included the ethnic subgroup of Israeli-Jews. To conduct comparisons of all factors (predisposing, enabling and reinforcing/need) between the two major ethnic groups of Israel (i.e., Israeli-Jews and Israeli-Arabs), KAP2010 was used. Frequencies for categorical variables were compared using Chi-square Test for Independent Samples. Logistic regression models were constructed first by examining blocks of predisposing, enabling and reinforcing/need variables with the goal of identifying variables associated with the dependent variable of use of primary dental care (“yes/no”), second by using stepwise elimination to determine best the most significant variables of the variable blocks. Odds ratios (OR), 95% confidence intervals (CI), p values, and Wald Chi-square statistics (with degrees of freedom or df) for model fit are presented for each significant variable in the logistic regression model.

## Results

In the KAP2000 (representing Israeli-Jews), there were slightly more females than males, more than half the adults were between 25 and 54 years, most were married, and most had high school or higher levels of education (See Table 1). Under half were born in Israel. KAP2010 demonstrated similar trends in gender, age, marital status and education for all respondents; however, between Israeli-Jews in KAP2000 and KAP2010, the frequency of being Israeli-born differed. From 2000 to 2010, greater proportions of Israeli-Jews were older, Israeli-born, and had at least a high school education. In 2010, comparisons between Israeli-Jews and Israeli-Arabs indicate significant differences, with Israeli-Arabs comprising a younger population, lower levels of education, and higher likelihood of being Israeli-born.

**Table 1.** Demographic Characteristics and Predisposing Factors Influencing Dental Health Care - National Health Survey (Knowledge, Attitude and Practice or KAP) of Israel for Years 2000 and 2010

<i>Predisposing Factors</i>	<i>Year 2000</i>		<i>Year 2010</i>		<i>Israeli-Jews Year 2000 versus 2010</i>	<i>Year 2010</i>		<i>Israeli-Arabs versus Israeli-Jews Year 2010</i>
	<i>Israeli-Jews</i>	<i>Israeli-Jews</i>	<i>Israeli-Jews</i>	<i>Israeli-Arabs</i>		<i>p-value</i>	<i>p-value</i>	
	<i>%</i>	<i>(n)</i>	<i>%</i>	<i>(n)</i>		<i>%</i>	<i>(n)</i>	
Gender								
Male	45.2	(1268)	46.7	(1210)	NS	47.1	(811)	NS
Female	54.8	(1538)	53.3	(1383)		52.9	(912)	
Age (years)								
18-24	7.9	(221)	3.9	(100)		9.3	(160)	
25-34	21.4	(601)	14.4	(372)		18.1	(312)	
35-44	19.4	(544)	22.6	(586)		31.2	(537)	
45-54	18.8	(528)	19.1	(494)		24.6	(423)	
55-64	14.5	(406)	20.9	(542)		10.3	(178)	
65+	18.0	(506)	19.2	(499)	<0.0001	6.6	(113)	<0.0001
Married	76.2	(1959)	82.6	(2139)	<0.0001	81.5	(1401)	NS
Born in Israel	49.8	(1397)	63.9	(1657)	<0.0001	96.9	(1670)	<0.0001
Education Level								
<High School	23.1	(432)	17.7	(447)		35.5	(602)	
High School	45.9	(860)	45.9	(1162)		39.4	(668)	
>High School	31.0	(581)	36.4	(921)	<0.0001	25.2	(427)	<0.0001

**Table 2.** Enabling, Reinforcing/Need and Use Factors Influencing Dental Care - National Health Survey (Knowledge, Attitude and Practice or KAP) of Israel for Years 2000 and 2010

<i>Enabling Factors</i>	<i>Year 2000</i>		<i>Year 2010</i>		<i>Israeli-Jews Year 2000 versus 2010</i>	<i>Year 2010</i>		<i>Israeli-Arabs versus Israeli-Jews Year 2010</i>
	<i>Israeli-Jews</i>	<i>Israeli-Jews</i>	<i>Israeli-Jews</i>	<i>Israeli-Arabs</i>		<i>p-value</i>	<i>p-value</i>	
	<i>%</i>	<i>(n)</i>	<i>%</i>	<i>(n)</i>		<i>%</i>	<i>(n)</i>	
Income level								
below average			37.2	(810)		68.7	(1,083)	
at average			21.7	(473)		18.9	(298)	
above average			41.1	(894)		12.4	(196)	<0.0001
Employed			67.1	(1,740)		53.3	(919)	<0.0001
Brushing teeth - daily	96.8	(2,707)	98.6	(2,555)	<0.0001	85.4	(1,469)	<0.0001
Flossing - ever			26.0	(671)		10.8	(183)	<0.0001
Smoker								
current	21.2	(907)	18.7	(485)		25.0	(431)	
past	18.2	(778)	22.7	(589)		11.2	(193)	
never	60.7	(2,597)	58.6	(1,517)	<0.0001	63.8	(1,099)	<0.0001

**Table 3.** Reinforcing/Need and Use Factors Influencing Dental Care - National Health Survey (Knowledge, Attitude and Practice or KAP) of Israel for Years 2000 and 2010

Reinforcing/Need Factors	Year 2000		Year 2010		Israeli-Jews Year 2000 versus 2010	Year 2010 Israeli-Arabs	Israeli-Arabs versus Israeli-Jews Year 2010	
	Israeli-Jews		Israeli-Jews		p-value	p-value	p-value	
	%	(n)	%	(n)				
Dental pain			5.4	(141)	-	17.4	(299)	<0.0001
Good physical health	80.1	(2,234)	87.3	(2,236)	<0.0001	91.9	(1,551)	<0.0001
Body Mass Index (BMI)								
<24.9	52.3	(1,464)	48.1	(1,161)		38.6	(602)	
25.1-29.9	32.6	(912)	35.8	(864)		39.0	(608)	
≥30.0	15.1	(424)	16.1	(389)	0.0112	22.4	(350)	<0.0001
Use of dental health services, most recent dental visit								
primary dental care	68.5	(1,919)	72.0	(1,865)	<0.0001	61.7	(1,062)	<0.0001

Enabling factors include personal habits and resources that contribute to service use. KAP2000 had fewer of these variables; however, results showed that almost all Israeli-Jews brushed their teeth daily and almost half were current smokers or smoked in the past (See Table 2). In KAP2010, most respondents were employed, less than a third flossed their teeth, and under half smoked. From 2000 to 2010, Israeli-Jews reported higher rates of brushing teeth daily and fewer were smoking. In 2010, marked differences were found between Israeli-Jews and Israeli-Arabs in all enabling factors (i.e., income levels, employment, brushing teeth daily, flossing and smoking), with Israeli-Jews reporting higher income, more likely to be employed, brushing teeth daily and flossing. Lower proportions of Israeli-Jews were smoking compared to Israeli-Arabs.

Reinforcing/need factors are indicators of need for use of primary dental care, based on past evidence, such as health status. In KAP2000, most Israelis reported being in good health and slightly over half were within the low to normal range of BMI (See Table 3). In KAP2010, less than a quarter of respondents reported dental pain, most reported good health, and less than half had BMIs in the low or normal range. Comparisons between year 2000 and 2010 demonstrated significant differences, with greater proportions of Israeli-Jews reporting good physical health, and reporting BMIs indicating being overweight or obese. Additionally, differences were found between Israeli-Jews and Israeli-Arabs in all reinforcing/need factors: dental pain, reported physical health, and BMI. Larger proportions of Israeli-Arabs than Israeli-Jews reported better physical health, despite a greater proportion of Israeli-Arabs had dental pain and BMIs indicating overweight or obesity.

In KAP2000, the most recent dental care visit for fewer than half of Israeli-Jews was to obtain treatment services and not to access primary dental care services; however, by 2010 significantly more Israeli-Jews reported that their most recent dental visit was for primary care (rather than for treatment). Although overall 67.9% of Israelis used primary dental care services, still more Israeli-Jews (72.0%) than Israeli-Arabs (61.7%) reported using primary dental care services at their most recent dental visit.

In KAP2000, logistic models with the dependent variable of primary dental care used the following independent variables: predisposing (gender, age, married, born in Israel, at least high school education), enabling (brushes teeth, flosses teeth) and reinforcing/need (current smoker, health status, under- or normal-weight BMI) (See Table 4). Models using KAP2000 indicated that primary dental care was sought by Israeli-Jews who: were unmarried (OR=0.74, CI=0.58,0.94); were born in Israel (OR=1.41, CI=1.13,1.77); had at least high school education (OR=1.66, CI=1.24,2.21); brushed their teeth at least daily (OR=2.85; CI 1.28,6.35); reported good health (OR=1.55, CI=1.14,2.11).

Due to the substantial number of differences found between Israeli-Jews and Israeli-Arabs in KAP2010, separate logistic regression models were created to indicate use of primary dental services. Stepwise logistic regression models with the dependent variable of using primary dental care introduced the following blocks of independent variables: predisposing (gender, age, married, born in Israel, at least high school diploma), enabling (employed, at least average income, brushes teeth, flosses teeth) and reinforcing/need (current smoker, health status, under- or normal-weight BMI, dental pain). Results indicated that primary dental care was sought by Israeli-Jews who: were born in Israel (OR=1.49, CI=1.21,1.83); had at least a high school diploma (OR=1.59, CI=1.20,2.11); were employed (OR=1.31, CI=1.05,1.64); reported at least average income (OR=1.88, CI=1.53,2.32); flossed their teeth (OR=1.79, CI=1.49,2.28); reported no pain (OR=0.51, CI=0.02,0.12); had a normal BMI (OR=1.29, CI=1.02,6.06); and were not smokers (OR=0.69, CI=0.54,0.89). Using KAP2010, primary dental care was sought by Israeli-Arabs who: were less likely to be aged 65+ (OR=0.45, CI=0.21, 0.95), compared to age <24 years; had at least high school education (OR=1.62, CI=1.19, 2.20); reported at least average income (OR=1.63, CI=1.25,2.11); flossed their teeth (OR=2.16, CI=1.52,3.08); and reported no pain (OR=0.36, CI=0.24,0.54).

Between Israeli-Arabs and Israeli-Jews who used primary dental care, there were as many similarities as differences. Both groups who used primary dental care reported the enabling factors comprised of socio-economic

**Table 4.** Logistic Regression Models: Use of Primary Dental Care with Odds Ratios (OR) and 95% Confidence Intervals (CI) (by Behavioural Health Care Model Components: Predisposing, Enabling and Need) in Israeli-Jews (2000, 2010) and Israeli-Arabs (2010)

Model Components	Israeli-Jews - 2000		Israeli-Jews - 2010		Israeli-Arabs - 2010	
	OR	95% CI	OR	95% CI	OR	95% CI
Predisposing						
Age -referent <24 yrs						
25-34					1.20	0.75-1.91
35-44					0.89	0.57-1.37
45-54					0.64	0.41-1.02
55-64					0.62	0.35-1.11
65+					<b>0.45</b>	0.21-0.95*
Married	<b>0.74</b>	0.58-0.94*				
Born in Israel	<b>1.41</b>	1.13-1.77**	<b>1.49</b>	1.21-1.83***		
Enabling						
At least High School	<b>1.66</b>	1.24-2.21***	<b>1.59</b>	1.20-2.11***	<b>1.62</b>	1.19-2.20**
Employed			<b>1.31</b>	1.05-1.64**		
≥ Average Income			<b>1.88</b>	1.53-2.32****	<b>1.63</b>	1.25-2.11***
Brushes Teeth ≥ Daily	<b>2.85</b>	1.28-6.35*				
Flosses			<b>1.79</b>	1.44-2.23****	<b>2.16</b>	1.52-3.08****
Need						
Pain			<b>0.51</b>	0.02-0.12****	<b>0.36</b>	0.24-0.54****
Normal BMI			<b>1.29</b>	1.06-1.56*		
Current Smoker			<b>0.69</b>	0.54-0.89**		
Good Health	<b>1.55</b>	1.14-2.11**				
-2 Log Likelihood - intercept		2,063.29		2,739.34		1,636.55
-2 Log Likelihood +covariates		1,998.93		2,468.77		1,514.84
Wald Statistic, df		57.00, 5****		202.52, 8****		121.71, 9****

\* p≤0.05    \*\*p≤0.01    \*\*\*p≤0.001    \*\*\*\*p≤0.0001

resources, high school diploma and having at least average income, the enabling health habit of flossing, and not having the reinforcing/need factor of dental pain. However, among Israeli-Arabs, those in oldest age-group (i.e., 65+) were less likely to seek primary dental care than other Israeli-Arabs. Among Israeli-Jews, those who were born in Israel and employed, were not current smokers, and had an average BMI were more likely to seek primary dental care than other Israeli-Jews.

## Discussion

Although the proportion of Israeli adults using primary dental care is similar to other western countries, 67.9% vs 67.7% of adults in the UK and 70% in Canada (Marshman *et al.*, 2012; Muirhead *et al.*, 2009), there is evidence of ethnic disparities in which more adults from the Israeli-Jewish majority use primary dental services than the Israeli-Arab minority (72.0% vs 61.7%). Moreover, the two ethnic groups shared enabling factors (i.e., possession of internal or external resources) such as higher level socio-economic status, high school education factors, positive dental health behaviours factors, and the commonly examined reinforcing/need factor of pain; however, only with the Israeli-Jewish majority was another reinforcing/need factors such as BMI associated with seeking primary dental care.

### Reinforcing/Need Factors

Increasing evidence indicated that health problems such as smoking, obesity and poor physical health, also are associ-

ated with poor oral health. However, study findings on the relationship between physical health problems and use of primary dental care were ambiguous. For example, smokers were less likely to seek primary dental care despite the fact that smoking is a risk factor for poorer dental health. Yet, obesity and poor health, also risk factors for poorer dental health, were associated with using primary dental care services in the KAP2000 and KAP2010, respectively. The need to inform the public and change attitudes, knowledge and health behaviours is evident.

### Enabling Factors

Enabling factors reflect the possession of *external* resources such as wealth and *internal* resources such as education and positive health behaviours are linked. The relationship between higher income and education with better health habits such as flossing or brushing teeth has been found before (Boehmer *et al.*, 1999; Ronis *et al.*, 1993). Higher income level may increase exposure to education on preventive oral health habits such as brushing teeth and flossing. Consistent with our findings, other studies have noted that when dental care services are not a regularly covered service, lower service use results. Moreover, while possession of health insurance is not always correlated with engaging in better health habits, possession of health insurance is almost always related to use of primary dental care (Ronis *et al.*, 1998). Such results indicate that income level is a strong determinant of primary dental care use.

In fact, due to the evidence linking poor dental health to morbidity, increasingly, national health care programs

(including Israel's) have instituted, as a regularly covered service, either no-cost or low-cost dental care services for children up to age eight, and after 2012, for children up to age 12 (Kaidar *et al.*, 2010). A second change, instituted by some of Israel's four national health maintenance organisations (HMOs), has been to place dental services within or adjacent to primary health clinics. A third effort was to provide dental care services in supplemental health service plans, which are offered in conjunction with health services. Studies are needed to determine whether these policy changes made a significant impact on the use of primary dental care.

Still, cost of services is not the only barrier to primary dental care. Attitudes also pose barriers to use of services and good health habits. Current evidence suggests that Israeli adults do not rank dental health care as a funding priority compared to other health services (Kaplan and Baron-Epel, 2013; Levin and Shenkman, 2004). Based on results, daily tooth-brushing was a widely accepted habit for both Israeli-Arabs and Israeli-Jews (although significantly higher for Israeli-Jews), while rates of flossing were remarkably low for both ethnic groups. Clearly, more work is needed to change attitudes and health behaviours so *both* flossing and tooth-brushing become regular health habits.

Employment exhibited an independent association with use of primary dental care for Israeli-Jews but not Israeli-Arabs. Employment often is linked to education and income, as both are considered aspects of socioeconomic status. However, while employment was independently associated with use of primary dental care in Israeli-Jews, no independent association was found in Israeli-Arabs. A possible explanation is that some Israeli-Jews may have attained higher income and education without being currently employed, while for Israeli-Arabs these variables are linked.

### *Predisposing Factors*

Predisposing factors, such as being a non-immigrant and in selected age-groups, were linked to use of primary dental care, however these differed between Israeli-Arabs and Israeli-Jews. Being a native-born Israeli, versus immigrant, was associated to use of primary dental care for Israeli-Jews. Among Israeli-Arabs, those ages 65 and above were less likely than young Israeli-Arab adults to obtain primary dental care. A study comparing older age groups with 30-39 year olds, found that the older groups were also less likely to obtain primary dental care (Ronis *et al.*, 1998), while yet another study found that younger adults, ages 18 to 24, were less likely to access primary dental care services (Muirhead *et al.*, 2009). Still other study samples found no association between age and use of primary dental care (Ronis *et al.*, 1993). Based on these conflicting results, more targeted research is needed to determine if specific age groups, or perhaps specific age-groups within minority subgroups, such as Israeli-Arabs, would benefit from health promotion activities to increase appropriate primary dental care usage.

Among Israeli-Jews, being an immigrant versus native-born was significantly associated with lower use of primary dental care in 2000 and 2010. This same relationship was found in non-native born immigrant citizens

of Canada (Muirhead *et al.*, 2009). Both studies found that being native-born had independent effects from other socioeconomic variables; thus, rather than service cost, potential explanations for lower use of primary dental care could be knowledge or language barriers (Muirhead *et al.*, 2009). Attitudes towards preventive care also may be a possible explanation (Machnes and Carmeli, 2009). Almost 20% of Israeli citizens are non-native born and more than 15,000 new immigrants arrive each year (CBS, 2010; 2012). With the importance of oral health and mounting evidence of the disparity between native-born and immigrant citizens, this subgroup may need a targeted strategy to promote primary dental care.

It is important to acknowledge this study's limitations. These include the use of self-reported responses on cross-sectional surveys, where verification of responses was not possible. Moreover, due to the uniqueness of the State of Israel, generalisability of these national results may be limited. Additionally, response bias has been found in reporting personal habits – in particular reports of flossing were found to be biased in Israeli-Arabs (Baron-Epel *et al.*, 2010). Still, the samples used by this study are drawn from two nationwide surveys on a topic not commonly studied in the peer-reviewed literature. In conclusion, although Israelis overall have demonstrated continued improvement in dental outcomes (Feingold and Setcos, 2004; Levin and Shenkman, 2004) and use of primary dental care services, disparities in use of preventive services that could promote better dental outcomes are apparent in vulnerable subgroups such as ethnic minorities and those with less education and low income.

## **Conclusions**

This study's findings show that in Israel, a country with a mixed western and middle-eastern culture, the use of primary dental care is an indicator of health care inequity for vulnerable population subgroups including minorities, immigrants, and those of lower socioeconomic status. Therefore, the onus is on policymakers, researchers and health professionals to identify methods of raising public awareness in minority and disadvantaged communities, using culturally-appropriate strategies, to reduce the existing disparities in primary dental care services. A recent recommendation was made to institute efforts at the following four-levels: reduce the inequities based on social and economic differences, create supportive environment to decrease the exposure to health risk factors, conduct health promotion activities that target vulnerable population subgroups, and ensure access to oral health services for prevention and treatment (Watt, 2012).

## **References**

- Andersen, R.M. (1995): Revisiting the behavioral model and access to medical care: does it matter? *Journal of Health and Social Behavior* **36**, 1-10.
- Balicer, R.D., Shadmi, E., Lieberman, N., Greenberg-Dotan, S., Goldfracht, M., Jana, L., Cohen, A.D., Regev-Rosenberg, S. and Jacobson, O. (2011): Reducing health disparities: strategy planning and implementation in Israel's largest health care organization. *Health Services Research (HSR)* **46**, 1281-1299.

- Baron-Epel, O., Garty, N. and Green, M. S. (2007): Inequalities in use of health services among Jews and Arabs in Israel. *Health Services Research* **42**, 1008-1019.
- Baron-Epel, O., Kaplan, G., Weinstein, R. and Green, M.S. (2010): Extreme and acquiescence bias in bi-ethnic population. *European Journal of Public Health* **20**, 543-548.
- Boehmer, U.N., Kressin, R. and Spiro III, A. (1999): Preventive dental behaviors and their association with oral health status in older white men. *Journal of Dental Research* **78**, 869-877.
- Central Bureau of Statistics (2010): *CBS, Statistical Abstract of Israel 2010. Jews by country of origin and age (2.24)*. [www1.cbs.gov.il/reader/shnaton/templ\\_shnaton\\_e.html?num\\_tab=st02\\_24x&CYear=2010](http://www1.cbs.gov.il/reader/shnaton/templ_shnaton_e.html?num_tab=st02_24x&CYear=2010)
- Central Bureau of Statistics (2012): *Monthly Bulletin of Statistics N. 12/2012. Table E/4.-Immigrants, by last country of residence*. [www1.cbs.gov.il/www/yarhon/e4\\_e.htm](http://www1.cbs.gov.il/www/yarhon/e4_e.htm)
- Feingold, G. and Setcos, J. (2004): [Oral health in Israel. A review of surveys over several decades]. *Refu at Ha-peh Veba-shinayim* **21**, 15-21.
- Horev, T., Berg-Warman, A. and Zusman, S.P. (2004): [Disparities in the Israeli oral healthcare delivery system]. *Refu at Ha-peh Veba-shinayim* **21**, 35-42, 100.
- Israel Center for Disease Control (2002): [Knowledge, Attitudes and Health Behaviors 2000-2002]. Jerusalem: Department of Education and Health Promotion.
- Kaidar, N., Horev, T. and Rosen, B. (2010): Public insurance for dental care for children. *Health Policy Monitor* **2010**, November. <http://hpm.org/is/a16/1.pdf>
- Kaplan, G. and Baron-Epel, O. (2013): The public's priorities in health services. *Health Expectations*. <http://onlinelibrary.wiley.com/doi/10.1111/hex.12064/pdf>.
- Levin, L. and Shenkman, A. (2004): The relationship between dental caries status and oral health attitudes and behavior in young Israeli adults. *Journal of Dental Education* **68**, 1185-1191.
- Lundegren, N., Axtelius, B., Isberg, P.E. and Akerman, S. (2013): Analysis of the perceived oral treatment need using Andersen's behavioral model. *Community Dental Health* **30**, 102-107.
- Machnes, Y. and Carmeli, A. (2009): The provision of oral care by local government authorities in Israel: policy issues and empirical evidence. *Health Policy* **89**, 107-114.
- Marshman, Z., Porritt, J., Dyer, T., Wyborn, C., Godson, J. and Baker, S. (2012): What influences the use of dental services by adults in the UK. *Community Dentistry and Oral Epidemiology* **40**, 306-314.
- Muirhead, V.E., Quinonez, C., Figueiredo, R. and Locker, D. (2009): Predictors of dental care utilization among working poor Canadians. *Community Dentistry and Oral Epidemiology* **37**, 199-208.
- National Institutes of Health (1998): *Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults: The Evidence Report (Vol. NIH Publication No. 98-4083)*. Bethesda, MD: National Heart Lung and Blood Institutes.
- Reich, E., Lussi, A. and Newbrun, E. (1999): Caries-risk assessment. *International Dental Journal* **49**, 15-26.
- Ronis, D.L., Lang, W.P., Antonakos, C.L. and Borgnakke, W.S. (1998): Preventive oral health behaviors among African-Americans and whites in Detroit. *Journal of Public Health Dentistry* **58**, 234-240.
- Ronis, D.L., Lang W.P., and Passow, E. (1993): Tooth brushing, flossing, and preventive dental visits by Detroit-area residents in relation to demographic and socioeconomic factors. *Journal of Public Health Dentistry* **53**, 138-145.
- Sambunjak, D., Nickerson, J.W., Poklepovic, T., Johnson, T.M., Imai, P., Tugwell, P. and Worthington, H.V. (2011): Flossing for the management of periodontal diseases and dental caries in adults. *Cochrane Database of Systematic Reviews*, **Dec 7**, CD008829.
- Schoen, M.H. (1975): Dental Care and the Health Maintenance Organization Concept. *The Milbank Memorial Fund Quarterly: Health and Society* **53**, 173-193.
- Sgan-Cohen, H.D., Katz, J., Horev, T., Dinte, A. and Eldad, A. (2000): Trends in caries and associated variables among young Israeli adults over 5 decades. *Community Dentistry and Oral Epidemiology* **28**, 234-240.
- Watt, R.G. (2012): Social determinants of oral health inequalities: implications for action. *Community Dentistry and Oral Epidemiology* **40**, 44-48.
- Watt, R.G. (2005): Strategies and approaches in oral disease prevention and health promotion. *Bulletin of the World Health Organization* **83**, 711-718.
- Zadik, Y., Zusman, S. P. and Galor, S. (2009): Dental attendance and self-assessment of dental status by Israeli military personnel according to gender, education, and smoking status, 1998-2006. *Military Medicine* **174**, 197-200.
- Zini, A., Vered, Y. and Sgan-Cohen, H.D. (2009): Are immigrant populations aware about their oral health status? A study among immigrants from Ethiopia. *BMC Public Health* **9**, 205.