

Individualism, acceptance and differentiation as attitude traits in the public's response to vaccination

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The attitude of the general public to vaccination was evaluated through a survey conducted on a representative sample of the Israeli population (n = 2,018), in which interviewees were requested to express their standpoints regarding five different vaccination programs. These included: pandemic influenza vaccination, seasonal influenza vaccination, travel vaccines, human papilloma virus vaccine and childhood vaccinations. Analysis of the responses reveals three major attitude traits: (a) acceptance, characterized by the opinion that targets should be vaccinated; (b) individualism, characterized by the opinion that vaccination should be left to personal choice; and (c) differentiation, characterized by the tendency to express different attitudes when addressing different vaccination programs. Interestingly, direct opposition to vaccination was found to be a minor attitude trait in this survey. Groups within the population could be defined according to their tendency to assume these different attitudes as acceptors, judicious-acceptors, differentiators, soft-individualists, and hard-individualists. These groups expressed different standpoints on all five vaccination programs as well as on other health recommendations, such as screening for early detection of cancer. Attitude traits could be also correlated, to a certain extent, with actual compliance with vaccination programs. Interestingly, attitudes to vaccination were not correlated with social profiles related to income or education, although younger individuals exhibited higher degrees of individualism and differentiation. Taken together, all this is in accordance with the current social settings, underlining the individual's tendency for critical evaluation and self-stirring. This should be taken into consideration by health authorities involved in vaccination programs.

Introduction

Vaccine-preventable diseases have been a major cause of illness, death, and disability throughout human history. The advent of the modern vaccine era has changed this significantly. Immunization saves more than three million lives worldwide each year, and it saves millions more from illness and lifelong disability.¹

Despite this, vaccination has been met with strong opposition from its early beginning.² Anti-vaccination attitudes are rooted in strong personal convictions, which are grounded on religious beliefs, libertarian ideologies and adherence to divergent perceptions of medicine.^{3,4} Anti-vaccination is also nurtured by the belief that vaccines, or their ingredients, are responsible for a range of maladies, with autism being the prominent example.^{5,6} These polarized attitudes toward vaccination are gradually being replaced by more balanced views, in which benefits and dangers of vaccines are evaluated rationally. This has been manifested in recent years by the multifaceted response of the public to a number of vaccination programs, including childhood, adolescent as well as adult vaccination.⁷

During the past decade, we have witnessed the rise and fall of the autism-associated scare with the measles-mumps-rubella vaccine (MMR). The MMR controversy was initiated by a scientific article proposing an association between the MMR vaccination and autism,⁸ which was propelled extensively by the popular media. This resulted in a drop of MMR vaccine uptake in the UK, from 92% in 1995–96 to 80% in 2003–2004.⁹ Nevertheless, once the autism allegations were refuted by the scientific community, the confidence of the British public was restored and uptake of MMR in 2011 reached levels of about 90%.¹⁰

Another example of attitude changes that led to increased acceptance is the response to human papilloma virus (HPV) vaccination of adolescent girls. When this vaccine was launched, it was met with a great deal of controversy.^{11–13} This was related to the young age of vaccination recipients, to the association with engagement in sexual behavior, to practical difficulties (cost, regimen), to the lack of public knowledge, as well as to resentment for the marketing and publicity tools used by the manufacturers¹⁴

Nevertheless, accumulating evidence to the expected benefits of the HPV vaccine, as well as to its safety, are gradually leading to increased acceptance in industrialized European countries and

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many US states.^{15,16} At the same time, HPV vaccine uptake rates are still low among certain ethnic groups in the US.¹⁷

The events related to vaccination against A/H1N1 influenza during the 2009 pandemic provide an example where expectations for high coverage at the early stages were later replaced by very low uptake.^{18,19} This was linked to the lingering belief that proof of safety for the A/H1N1 vaccine was not sufficient,^{7,20} and more importantly to the realization that severity of the disease turned out to be much lower than expected.²¹ The critical attitude of the public toward vaccination, demonstrated by these three examples, is being echoed in the increasing tendency of parents to be selective about childhood vaccination. This trend, often defined as “vaccination hesitancy,” is characterized by vaccination to a selected list among the many vaccines offered to children, as well as by intentional delay in the administration of certain childhood vaccines.²²⁻²⁴

All these tendencies are also reflected in the attitude of the Israeli population toward vaccination. Compliance with the non-mandatory childhood vaccination programs, is generally very high, reaching ~95% coverage.²⁵ This could be related to well organized childhood vaccination system,²⁶ which provides high access and uses effective promotion tools. Nevertheless, pockets of low coverage can be found in ultra-orthodox communities,²⁷ in communities that embrace a natural lifestyle, and in some middle-upper class urban communities (Anat Amit-Aharon, personal communication). Compliance with influenza vaccination in Israel is traditionally lower. Flu vaccination rates in the senior population, which is funded and promoted by Israeli HMOs is about 56%,²⁵ while much lower coverage is reached in the general population. Most notably, during the H1N1 epidemic of 2009, a very intensive government-run vaccination campaign was met with high controversy and low rates of compliance.²⁰

HPV vaccination has been approved for use in Israel by the ministry of health in 2007. At present, HPV vaccination is not included in the state-funded vaccination program, yet is subsidized by the supplemental health plans. HPV vaccination is strongly promoted by HMOs and drug companies, and appears to gain acceptance among certain fraction of the population (official coverage rates are not available). It should be noted that the Israeli Vaccination and Infectious Disease Advisory Committee recommended the introduction of HPV vaccination in the government-funded national program in the near future²⁶

Taken together, these examples suggest that the modern public is judgmental about vaccination and reacts differentially when addressing different vaccination programs. These changes in attitude toward vaccination could be viewed as manifestations of the prevalent, late-modern socio-cultural setting. This setting, dubbed as “second modernity,” “reflexive modernity”^{28,29} or “liquid modernity”³⁰ is characterized by a heightened sense of the individual’s “mission” to construct her/his own world as an autonomous individual.

A major implication of this is the nourishing of a strong sense that the individual bears a personal responsibility for managing an overwhelming list of risks. While management of risk has always been a matter of importance and attention, “second modernity” marks a shift in responsibility from state agencies to

individuals. The “first modernity,” which introduced the large-scale management of public health, instilled the state and its government with the responsibility for managing health risks. The “second modernity,” on the other hand, puts the burden of responsibility on the individual agent, as the state’s agencies assume a rather “consultancy-like” or “advocacy-like” status.

The new social atmosphere is characterized by the realization that not all dangers can be controlled and that coping with risk requires a continuous process of evaluation, reassessment, reorientation and redirection through a reflexive circular feedback loop. This process forces individuals to differentiate between ongoing dangers and apply selectivity to their actual responses to the plethora of risks encountered at given points in time.³¹⁻³³

This study attempts to search for manifestations of current social settings in the attitudes of the public toward vaccination. It examines the positions of the general public on five different vaccination programs, and searches for standpoints expressing compliance, rejection and belief in personal choice. Based on this, we try to define different attitude traits, focusing on individualism acceptance and differentiation.

Results

Survey sample. The survey population included 2,018 adult participants. The socio-demographic characterization of the survey group included: gender (46% males, 54% females), income (38% below average; 23% average; 26% above average, 13% non-disclosure), ethnicity (18% Arabs; 72% Jews), education (43% with ≤ 12 y of schooling; 57% with > 12 y of schooling) and Age (34% aged 21–39; 36% aged 40–59; 30% aged 60 and older). Representation of the main socio-demographic variables in the sample was not significantly different from their representation in the adult Israeli population³⁴ in terms of gender, income, and ethnicity. The exceptions were the over-representation of the ≥ 60 age group (30% vs. 22% in the general population), and the over-representation of individuals with ≥ 12 y of schooling (57% vs. 47% in the general population).³⁵

Analysis of attitudes. All 2,018 respondents were requested to state their standpoints on the following vaccination programs: (a) pandemic influenza vaccination (referring to the A/H1N1 strain outbreak in 2009); (b) seasonal influenza vaccination (referring to the winter of 2010/2011); (c) travel vaccination (with no reference to a specific vaccine); (d) vaccination of adolescent girls against human papilloma virus (HPV); and (e) childhood vaccination (without reference to a specific vaccine).

Respondents were offered four possible answers: (a) I think that everyone within the target groups should be vaccinated; (b) I think that individuals at risk within the target groups should be vaccinated; (c) I think that compliance with vaccination should be left to the personal choice of each individual; (d) I think that there is no need to get vaccinated. Respondents also had the option of stating that they had no opinion on the matter. It should be noted that response (b), was not offered as an option in the case of childhood or travel vaccination. Attitudes toward screening for early detection of colon cancer by occult blood tests

Table 1. Attitude of the general public on compliance with different vaccination programs (n = 2,018)

Standpoints on compliance	Distribution of standpoints on different vaccination programs (%) ^(a)				
	H1N1 vaccination	Seasonal-flu vaccination	Travel (b) vaccination	HPV vaccination	Childhood (c) vaccination
Compliance of all targets	23.3	23.3	77.4	39.0	70.3
Compliance of targets at risk	29.0	29.1	—	23.0	—
Compliance by personal-choice	40.8	43.4	17.1	29.2	21.6
No compliance	3.3	2.2	3.2	1.7	4.4
No opinion	3.6	20	2.3	7.1(b)	3.7

(a) Standpoints expressed by the entire survey population (see Methods) on compliance with five vaccination programs. (b) Only four response options were offered to this question. (c) This included 2.8% reports stating specifically lack of knowledge about this vaccine.

were similarly evaluated, except that the term “should be vaccinated” was replaced by “should be screened.”

Target groups for vaccination were defined differently for each program. The target group for childhood vaccination was defined as the entire population of children. The target group for HPV vaccination was defined as all adolescent girls. The target group for travel vaccination was defined as all travelers to countries in the far-east, Latin America and Africa. The target group for both influenza vaccination programs was defined as the entire population. The target group for occult blood test was defined as individuals aged > 50.

Standpoint of the public on compliance with various vaccination programs. The analysis of the attitudes of the responders toward vaccination reveals several distinct characteristics (Table 1) related to rejection, acceptance and belief in choice. Total rejection of vaccination was surprisingly low for all five vaccination programs; the percentage of individuals believing that there is no need to get vaccinated ranged from 1.7–4.4. Belief in compliance with vaccination program was rather high, ranging from about 52% for both of the influenza vaccines (combination of both “compliance by all targets” and “compliance by targets at risk”), to about 77% for travel vaccines. In three of the queries the interviewees were offered the option of distinguishing between vaccinating the entire target group or only people at risk within the target group. In the case of the two influenza vaccination programs the tendency was to favor vaccination of people at risk, whereas in the case of HPV vaccination the tendency was to favor vaccination of all targets (i.e., adolescent girls).

A substantial number of respondents expressed the belief that compliance with vaccination should be left to the choice of the vaccinee (or his/her guardian). The proportion expressing this attitude was similar for the two flu vaccines ($p = 0.09$) yet differed significantly between the other programs ($p < 0.003$). Over 40% of the respondents thought that influenza vaccinations (seasonal and pandemic) should be left to personal choice, while only 21.6% thought that this should be the case for childhood vaccination. Notably, support of personal choice for vaccination of traveler was the lowest (17%).

It should be noted that the awareness and interest of the public in vaccination appear to be very high, since the number of individuals that had no opinion regarding compliance with vaccination was very low (2–7%). Interestingly, the rate of “no opinion” responses was the highest (7%) regarding HPV vaccination

programs. This might be explained by relative lack of knowledge about this novel vaccine.

To evaluate the possible effect of personal involvement on attitude to specific vaccines, the survey population was divided into relevant groups and these sub populations were examined for their attitude to the specific vaccines. Thus, parents of young children were asked about childhood vaccines and parents of adolescent girls were asked about HPV vaccination. Interestingly, the distribution of the different standpoints on childhood vaccination was not different among parents of young children and the rest of the study population (not shown). Likewise, no difference was found in the standpoints toward HPV vaccination between parents of adolescent girls and the rest of the population.

Attitudes toward seasonal flu vaccination among the elderly (over 60 y of age) was similar to those of younger people, except for a lower tendency to support all target vaccination in the latter population (19% for < 60, and 33% for ≥ 60 $p < 0.0001$). Attitudes toward HPV vaccination were similar in males and females, except for a somewhat higher tendency to support vaccination among females (41% vs. 37%; $p < 0.01$)

Identification of distinct groups in the population, as defined by their attitudes regarding five vaccination programs. Examination of the attitudes of the entire study population to various vaccination programs (Table 1) revealed notable differences in the distribution of standpoints regarding compliance with the various programs (except for the similarity between attitudes toward pandemic and seasonal influenza). Moreover, it appears that the tendency to address differently the five vaccination programs is manifested by individuals, as well. Only 425 (21.0%) out of the 2,018 respondents reported the same standpoint when addressing all five vaccination programs.

Carefull examination of the reponse patterns of the 2018 responders revealed that in addition to the anticipated attitudes related to rejection and acceptance and individualism, one could identify a varied spectrum of intermediate attitudes. As a consequence, the study population was divided into seven “attitude groups.” These groups were defined as: acceptors, judicious-acceptors, differentiators, soft-individualists, hard-individualists, refuters and indifferent. The actual operational definition of these attitude groups, as well as the fraction of the population that adhere to these definitions are shown in Table 2. Thus, 21% and 18% of the study population can be defined as Acceptors or Judicious-acceptors, respectively, based on their tendency to

Table 2. Attitude Groups defined by their standpoint on vaccination

Attitude Group	Operational definition	Number	Percent
Acceptors	Favor compliance (by all targets group or by targets at risk) with all 5 vaccination programs	425	21.0
Judicious-acceptors	Favor compliance (by all target or targets at risk) with 3–4 vaccination programs	363	18.0
Differentiators	Express at least 3 different standpoints toward compliance with vaccination programs	735	36.5
Soft-individualists	Favor personal-choice in 3 of the vaccination programs	210	10.4
Hard-Individualists	Favor personal-choice in 4–5 of the vaccination programs	172	8.5
Refuters	Favor non-compliance with at least 3 vaccination programs	10	0.5
Indifferent	Have not formed opinion on at least 3 vaccination programs	17	0.8
Others	All other	86	4.3
Total		2018	100

believe in compliance with vaccination when addressing all or most programs evaluated. On the other hand, 10.4% and 8.5% of the population can be defined as soft-individualist and hard-individualists, respectively, since they tend to support (to different extents) personal choice toward vaccination. In addition, more than one-third of the population can be defined as differentiators. These manifested the tendency to use at least three different standpoints from four proposed answer options (namely: vaccination of all targets, vaccination of targets at risk, vaccination by personal choice, no vaccination) when addressing various vaccination programs

Two attitude groups were found to be of negligible proportions. Indifferent individuals, defined by the fact that they had not formed an opinion on at least three vaccination programs, constituted only 0.8% of the population, underlying the high degree of interest in vaccination. More interestingly, only 10 (0.5%) out of 2018 respondents could be defined as refuters, even when a non-stringent definition (favoring non-compliance with at least three programs) was used.

In the further characterization of attitudes toward vaccination we have not included in the analysis the Indifferent, the Refuters as well as a group of 86 individuals for which the combinations of responses did not fit the defined permutations of response patterns (“others” in Table 2). The five remaining attitude groups (acceptors, judicious-acceptors, differentiators, soft-individualists and hard-individualists) comprise together 94.4% of the survey population.

In order to test the division into five attitude groups, the specific standpoints of each one of these group regarding compliance with childhood vaccination was examined. This analysis revealed that support of the need to vaccinate all children is high among acceptors and decreases gradually when moving from acceptors to judicious-acceptors, differentiators, soft-individualists and hard-individualists (Table 3, first row). In parallel the belief in the right of personal choice is high among hard-individualists and exhibits a gradual decrease as one moves in the other direction, from hard-individualist to soft-individualists to differentiators and then to acceptors. In addition, the differentiators as a group express, as expected, a varied attitude: 63% favor all target vaccination, 26% favor personal choice and 9% state that there is no need for childhood vaccination. Thus, these observations can serve as preliminary confirmation for the operational definitions

(Table 2) used to categorize the various attitude groups (this cannot be used as validation because of the circulatory nature of the analysis).

The standpoints of different attitude groups regarding screening for early detection of colon cancer. To validate the division into the five attitude groups, standpoints regarding screening for colon cancer by fecal occult blood tests was examined. All respondents were asked to state their position on colon cancer screening, and were offered three options for response: (a) The target population should comply with the test; (b) People should act according to personal choice; (c) There is no need to comply with the test.

Analysis of the responses (Table 4) reveals that the categorization by attitudes to vaccination correlates, in general, with attitudes toward the colon cancer screen. Like in the case of childhood vaccination, moving from acceptors to individualist entails a decreasing gradient in the support of target compliance from 92% to 42% (P for trend < 0.0001), together with an increasing gradient in the support of personal choice, from 6% to 42%. Notably, the number of people in all groups that reject screening altogether is negligible. This again underlines the validity of grouping according to attitudes toward vaccination, and suggests that this grouping can be extended to attitude evaluation for other health recommendations

Identification of differences in the acceptability of various vaccination programs. The use of five vaccination protocols in parallel to monitor attitude allows one to search for specific differences in public response to individual vaccines. Thus, standpoints of the various attitude groups on childhood vaccination, travel vaccination, seasonal-influenza vaccination, pandemic-influenza vaccination and HPV vaccination were compared (Table 3). This comparison revealed two patterns of reactions. One pattern characterizes reaction to well-established “accepted programs” such as childhood vaccination (Table 3, first two rows). The other pattern characterizes reaction to “questionable programs” with the controversial pandemic influenza vaccination as prototype (Table 3, last three rows). The “accepted programs” group includes also travel vaccination, whereas the “questionable program” group includes also seasonal flu and HPV vaccinations.

The main difference between these two patterns is in the extent to which belief in personal choice is expressed, by the various attitude groups. Hard-individualists adhere to personal choice

Table 3. Standpoints on vaccination among the various attitude groups

Standpoints on Vaccination	Attitude Groups				
	Acceptor N=425 n (%)	Judicious-acceptor N=363 n (%)	Differentiator N=735 n (%)	Soft -individualist N=210 n (%)	Hard -individualist N=172 n (%)
Childhood Vaccines					
Compliance of targets	425 (100)	309 (85.1)	464 (63.1)	132 (62.9)	39 (22.7)
Personal-choice	0 (0)	38 (10.5)	193 (26.3)	66 (31.4)	122 (70.9)
No compliance	0 (0)	0 (0)	66 (9.0)	0 (0)	6 (3.5)
No Opinion	0 (0)	16 (4.4)	12 (1.6)	12 (5.7)	5 (2.9)
Travel Vaccines					
Compliance of targets	425 (100)	330 (91.0)	551 (75.0)	150 (71.4)	48 (27.9)
Personal-choice	0 (0)	23 (6.3)	126 (17.1)	54 (25.7)	122 (70.9)
No compliance	0 (0)	0 (0)	51 (6.9)	0 (0)	0 (0)
No Opinion	0 (0)	10 (2.7)	7 (1.0)	6 (2.9)	2 (1.2)
Pandemic influenza					
Compliance of targets	216 (50.8)	146 (40.2)	72 (9.8)	14 (6.7)	1 (0.6)
Compliance at risk	209 (49.2)	24 (6.6)	330 (44.9)	10 (4.7)	5 (2.9)
Personal-choice	0 (0)	177 (48.8)	269 (36.6)	181 (86.2)	159 (92.4)
No compliance	0 (0)	0 (0)	45 (6.1)	0 (0)	2 (1.2)
No Opinion	0 (0)	16 (4.4)	19 (2.6)	5 (2.4)	5 (2.9)
Seasonal influenza					
Compliance of targets	204 (48.0)	145 (39.9)	86 (11.7)	7 (3.3)	1 (0.6)
Compliance at risk	221 (52.0)	27 (7.5)	321 (43.7)	10 (4.7)	3 (1.7)
Personal-choice	0 (0)	178 (49.0)	293 (39.9)	191 (91.0)	167 (97.1)
No compliance	0 (0)	0 (0)	28 (3.8)	0 (0)	1 (0.6)
No Opinion	0 (0)	13 (3.6)	7 (0.9)	2 (1.0)	0 (0)
HPV vaccine					
Compliance of targets	286 (67.3)	255 (70.2)	170 (23.1)	48 (22.9)	3 (1.7)
Compliance at risk	139 (32.7)	14 (3.9)	296 (40.3)	6 (2.8)	8 (4.7)
Personal-choice	0 (0)	52 (14.3)	220 (29.9)	138 (65.7)	158 (91.9)
No compliance	0 (0)	0 (0)	23 (3.1)	0 (0)	0 (0)
No Opinion	0 (0)	42 (11.6)	26 (3.6)	18 (8.6)	3 (1.7)

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Table 4. Standpoints on screening for colon cancer by fecal occult blood tests among the various attitude groups

Standpoints on compliance	Attitude Groups				
	Acceptor N=425 n (%)	Judicious-Acceptor N=363 n (%)	Differentiator N=735 n (%)	Soft - individualist N=210 n (%)	Hard - individualist N=172 n (%)
Compliance of targets	392(92.2)	307(84.6)	585 (79.5)	147 (70.0)	89 (51.7)
Compliance by -Personal-choice	25 (5.9)	41 (11.3)	128 (17.4)	57 (27.1)	72 (41.9)
No Compliance	3 (0.7)	4 (1.1)	10 (1.5)	4 (1.9)	3 (1.7%)
No Opinion	5 (1.2)	11 (3.0)	12 (1.6)	2 (1.0)	8 (4.7%)

for all vaccines evaluated, yet this adherence differs significantly ($p < 0.0001$) when personal choice for pandemic flu, seasonal flu and HPV vaccination (over 90%, $p = 0.09$) is compared with that for childhood and travel vaccines (about 70%). This difference becomes more pronounced as one examines the attitude of soft-individualists. In the case of “questionable programs,” personal-choice is favored by 91–65% of the soft-individualists, whereas in the case of “accepted programs,” personal-choice is favored by only 26–31%. Differences can also be observed in the response of the judicious-acceptors, among whom only (6–10%) believes in personal choice for childhood and travel vaccination, yet nearly half believe in personal choice for both influenza vaccination programs.

Examination of the attitude of the differentiators to the various vaccines reveals a more complex profile. For all five vaccines a varied approach is observed, which includes support of compliance, and of personal choice, as well as of refusal to be vaccinated. Interestingly the division between “accepted programs” and “questionable programs” is less clear, and differentiators tend to address specifically each vaccination program. It should be noted however, that whenever the option of vaccination of population at risk was presented (pandemic vaccine, seasonal flu and HPV), it was favored by a large proportion ($\geq 40\%$) of this groups.

It is interesting to note that within the “questionable programs” group one can observe a certain hierarchy of acceptance. While attitudes to pandemic flu and seasonal flu are very similar, they do differ from attitudes to HPV. The support of full compliance with flu vaccines is lower than the support of compliance with HPV vaccination, and vice versa the support of personal choice is higher for flu vaccines than for HPV (for example among soft individualists 86.2% support personal choice for pandemic influenza compared with 65.7% for HPV vaccine; $p < 0.0001$). This observation is quite interesting and suggests that HPV vaccination is gaining a place among the accepted vaccines, and that acceptance of seasonal flu vaccination remains questionable.

Attitude traits to vaccination and vaccine uptake. The interrelationships between attitudes toward compliance with vaccination and actual vaccine uptake were evaluated for

two vaccination programs: seasonal influenza and childhood vaccination.

All interviewees were asked to indicate if they had been vaccinated against influenza during the winter of 2010/2011, and compliance rates were dissected according to attitude groups. High uptake was associated with the acceptors and judicious-acceptors (42%) and low uptake was associated with hard-individualists (12%). Intermediate values were observed for differentiators and soft-individualists (22% and 30%, respectively). These observations suggest that in general individuals act in accordance with their declared attitude.

However, careful evaluation reveals that the interrelationship between attitude and behavior appears to be more complex. For acceptors, association between the two could be observed: 48% of acceptors declared that everyone should get vaccinated against seasonal flu (Table 3) and 42% declared compliance with vaccination. The strength of agreement between attitude and behavior appears to be moderate with 74% observed agreements and a Kappa coefficient of 0.479 (95% C.I 0.39–0.56). In the case of hard-individualists only 3% favored compliance by target, while 97% favored personal choice (Table 3). In practice, as many as 12% of this sub-population did get vaccinated, suggesting that in some cases personal choice was interpreted by the individual as willingness to get vaccinated. This is even more pronounced among the soft-individualists, among whom 9% favored compliance, while 30% got vaccinated, suggesting that belief in personal choice does not necessarily mean rejection of influenza vaccines.

Uptake of childhood vaccination was examined by asking all parents with children of 5 y of age or less to report on the vaccination of their children. Respondents ($n = 297$) were offered three response choices: (a) I have vaccinated my children according to the recommended protocol; (b) I have vaccinated my children, but did not adhere to the recommended protocol (changing schedule, or omitting vaccines); (c) I did not vaccinate my children.

Only four parents (1.3%) did not vaccinate their children at all, while the majority (90.3%) fully complied with the vaccination protocol. Twenty five parents (8.4%) stated that they

Table 5. Multinomial logistic regression analysis of the interrelationship between attitude groups and socio demographic characteristics

Predictors	Judicious-acceptors vs. acceptors	Differentiators vs. acceptors	Soft-individualists vs. acceptors	Hard-individualists vs. acceptors
	OR (95% C.I.)	OR (95% C.I.)	OR (95% C.I.)	OR (95% C.I.)
Age, years				
21–39	0.92 (0.64–1.33)	1.37* (1.02–1.86)	1.22 (0.80–1.88)	1.56* (1.02–2.43)
40–59	1.0	1.0	1.0	1.0
60+	1.09 (0.73–1.62)	0.67* (0.47–0.95)	0.97 (0.60–1.58)	0.56* (0.33–0.97)
Ethnicity				
Jews	1.0	1.0	1.0	1.0
Arabs	0.49** (0.34–0.70)	0.34** (0.25–0.46)	0.14** (0.08–0.27)	0.08** (0.04–0.18)
Parenthood				
No	1.0	1.0	1.0	1.0
Yes	0.94 (0.64–1.34)	1.15 (0.86–1.54)	1.08 (0.71–1.63)	1.00 (0.66–1.54)
Income				
Below average	0.94 (0.65–1.38)	1.01 (0.73–1.41)	1.21 (0.73–2.00)	1.16 (0.70–1.92)
Average	1.0	1.0	1.0	1.0
Above average	0.62* (0.41–0.94)	0.74 (0.52–1.05)	1.49 (0.91–2.44)	0.76 (0.45–1.30)
Non-disclosure	1.13 (0.66–1.93)	1.01 (0.62–1.63)	2.00* (1.06–3.77)	1.72 (0.91–3.27)

OR, Odd Ratio; * - $p < 0.05$; ** - $p < 0.0001$

diverted from the recommended protocol. Sixteen out of these parents were differentiators and eight others were Individualists. This distribution suggests that the tendency to manipulate vaccination protocols (the so-called “vaccination hesitancy”¹⁸), is a manifestation of belief in individualism, and of parents’ tendency to differentiate between vaccines.

Attitude traits and socio-demographic characteristics. After the five major attitude groups were defined, their socio-demographic characteristics were examined. There were no significant differences between the groups regarding gender, marital status or level of education, and small differences were observed when income and parenthood were examined. However, the attitudes did differ significantly when Israeli Arabs were compared with Israeli Jews. Only 18.7% of Jews were acceptors compared with 39.9% of Arabs. In contrast 12.6% and 10.5% of Jews were soft and hard individualists, respectively, compared with 3.7% and 2.1% among Arabs ($p < 0.0001$). Differences were also noted when young people (below 40) were compared with those 60 y or over. Here, 20.6% and 14.6% of people below 40 were acceptors and judicious acceptors, respectively, compared with 24.3% and 31.6% among people of 60 y or older. In contrast the percentage of differentiators in the younger group was 43.7% compared with 31.6% in the older group ($p < 0.0001$).

To determine the actual predictors for belonging to the different attitude groups, multinomial logistic regression analysis with age, ethnicity, parenthood and income as predictors was performed (Table 5). According to the Pearson and the Deviance goodness-of-fit tests ($p = 0.20$), the model fits the data well. The likelihood ratio test was highly significant, indicating significant effect of the covariates on response ($p < 0.0001$). Analysis of effects for each predictor separately shows that the most significant ones were age ($p < 0.0001$) and ethnicity ($p < 0.0001$),

followed by income ($p < 0.01$). The covariate of parenthood did not have an effect on the attitude trait distribution ($p = 0.74$).

The association between Arabs and judicious-acceptors vs. the association with acceptors was 0.49 times less than that for Jews. Arabs were also 0.14 times less likely than Jews to be soft-individualists vs. acceptors. The association between Arabs and hard-individualists vs. acceptors was 0.08 times less than that for Jews.

Responders who were 21–39 y of age are more likely to be differentiators or hard-individualists over acceptors (OR = 1.37, 1.56) than respondents aged 40–59. On the other hand, responders aged 60 or more are less likely to be differentiators or hard-individualists over acceptors (OR = 0.67, 0.56).

In sum, these observations indicate that acceptance is associated with the traditional Arab society, as well as with people of older age, individualism and differentiation appears to be associated with young age.

Discussion

A large number of studies have been dedicated to the evaluation of public attitudes to specific vaccines in order to find correlates of acceptance and predictors of compliance (for example see references 36–40). In this study we attempted to gain a broader perspective on the attitudes of the public to vaccination in general.

To this end, the public’s standpoints regarding five vaccination programs were examined in parallel. The programs were selected to represent different approaches to vaccination and underline different dilemmas. Childhood vaccination represents a well-established and accepted program; HPV vaccination represents a novel vaccine targeted to adolescents; Seasonal flu vaccination represents a routine program targeted to all ages; A/H1N1

vaccine represents a vaccine developed rapidly during an emerging epidemic; and travel vaccination is a program directed to a specific group of people in specific circumstances.

The attitude of the public on these five vaccines were evaluated by surveying a large sample group representative of the entire Israeli population. Thus, both parents and non-parents were asked about vaccines targeted at children, and travelers and non-travelers were asked about travel vaccines. The queries were of a general nature, allowing the evaluations of: (a) support for vaccine acceptance by the population; (b) beliefs in the right of personal-choice (individualism); (c) tendency to express a different standpoint on different vaccines (differentiation); (c) opposition to vaccination. Based on this evaluation six attitude groups were defined: acceptors, judicious-acceptors, differentiators, soft individualists, hard-individualists and refuters.

Clear opposition to vaccination in general was found to be minimal: belief in “no-vaccination” for individual vaccines ranged from 1.7% to 4.4%. Previous estimations suggest that the percentage of supporters of anti-vaccination is about 3–8%.⁴¹ The values reported in this study are at the lower end of this range, and could be affected by a bias related to social desirability among respondents. Even if the values are corrected for this bias by a factor of two, they still remain low. This becomes even more evident when the consistency in the negative attitude was evaluated. Only one person out of the 2,018 surveyed expressed rejection of all five vaccination programs and only ten respondents were against more than three programs.

Acceptance, on the contrary, appears to be a major, although not always dominant, trait in the attitude toward vaccination. Acceptance of well-established vaccines was very high, and even the acceptance of new, sometimes controversial vaccines, was found to be rather high.

While the observations on vaccine acceptance were quite expected and are in agreement with data on vaccination uptake in many developed countries,^{41,42} the current attempt to evaluate individualism in attitude toward vaccination yielded new insights. Individualism was measured by recording the support of vaccination based on the vaccinee’s personal choice. Vaccination by personal choice was selected quite often by respondents with regard to each of the five programs. Moreover, this appeared to be the dominant standpoint among a substantial sub-group of the study population, which was defined as individualists, and divided into soft-individualists and hard-individualists, according to the extent to which they adhered to personal choice.

When defining individualists one should be careful to distinguish between “true” individualists, who honestly believe in the right of each person to control his/hers choices, and those who manifest individualism as an expression of anti-establishment sentiments, or mild anti-vaccination beliefs. The findings in this study do not enable the differentiation of these two options, yet we would suggest that “true” individualists would be clustered among the soft-individualists, who are more selective about their choices, i.e., apply personal choice to certain selected programs and not to others.

The concomitant examination of the public’s attitude to five different programs allowed for evaluation of an additional aspect

of the attitudes toward vaccination—that of differentiation between various vaccination programs. Differentiation was monitored by the tendency of individuals to choose three or more different response options (from the four offered in the query) when expressing standpoints on the five vaccination programs evaluated. More than a third of the survey population can be defined as differentiators by this criterion. This suggests that many individuals address specific vaccination programs according to their merits, and can distance themselves from pre-conceived stands on vaccination.

The tendency to differentiate is not restricted to the group defined as differentiators. Differentiation was manifested by the entire study group in exhibiting distinct attitudes toward various vaccines. In addition to differentiators, also judicious-acceptors and soft-individualists addressed differently well-established vaccination programs (childhood and travel vaccines) than questionable vaccines (A/H1N1 or HPV vaccines).

It is interesting to note that that all attitude groups failed to differentiate between seasonal influenza vaccination, which has been practiced routinely for many years, and A/H1N1-influenza vaccination, which was implemented, rather unsuccessfully, during the 2009 pandemics. This may reflect the fact that all flu vaccination programs are perceived by the public as questionable, based on the perception that the vaccines are not effective and the disease is not serious.⁴³ It should be noted that the evidence that the flu vaccines actually protect one of the major target population, (people over 65) is not convincing.⁴⁴

Interestingly, more respondents expressed acceptance toward HPV vaccination than toward the two influenza vaccination programs. HPV vaccine is novel and revolutionary in many ways: it is the first vaccine directed to cancer prevention, it combats a sexually transmitted disease, and it is targeted to adolescent girls.¹³ It appears that despite the controversy associated with HPV vaccination, the Israeli population appears to adopt a positive attitude. Formal data on the usage of HPV in Israel are not yet available, yet it appears that HPV vaccination programs are gaining acceptance in certain European countries,¹² while coverage in certain communities in the US remain low.¹⁷

Taken together, the observations in this study suggest that various groups in the population can be defined by their tendency to assume acceptance, individualism or differentiation toward vaccination, the two latter being of substantial weight. This appears to be a novel observation: to the best of our knowledge, previous studies did not focus on individualism and differentiation in the context of vaccination. It should be noted however that the actual behavior of populations in developed countries appear to substantiate our observations. One can note diversity in the compliance with different vaccination programs, as well as individualistic attitudes in balancing between risk from contagion vs. risk from specific vaccines.^{45,46}

The attitude traits identified in this study could not be correlated, in most cases, to specific social profiles, suggesting that they reflect genuine and universal traits. However, it is interesting to note that younger people tended to exhibit higher degrees of individualism and differentiation, whereas Israeli Arabs exhibit

higher degrees of acceptance (not related to lower income and lower education levels of this population). The age dependent attitude could be explained in terms of developmental changes in attitudes and perceptions with aging. Alternatively, it could be the reflection of changing attitudes among more recent age-cohorts, born and raised in the social settings of late modernity. Our results suggest that Israeli Arabs are more likely than non-Arabs to adhere to recommendations for vaccinations. Part of this difference could result from higher adherence of Israeli Arabs to Social desirability when responding to health related questions,⁴⁷ Nevertheless, evidence suggest that in practice, the compliance with childhood vaccination programs in Israel is higher among Arabs than among Jews⁴⁸ These puzzling observation call for a thorough examination that is beyond the scope of the current research. However, one could speculate that the traditional and conservative lifestyle of the Arab population nurtures to a lesser extent individualism and skepticism. One should be cautioned, however, against extrapolating from attitudes observed among Israeli Arabs to the attitudes of minorities in other countries.

An additional attitude trait that emerges from this study is related to the actual behavior of some of the respondents. About 8% of the parents reported that they vaccinated their children with childhood vaccines, but have deviated from the recommended protocol. About half of them stated that they modified the schedule of vaccination, by delaying administration or by increasing intervals between shots. Others indicated that they chose not to vaccinate their children with one of the recommended vaccines (MMR, varicella or rotavirus). Such behavior, which has become more prevalent in recent years, has been attributed to parental hesitancy.⁴⁹ We suggest that this behavior actually reflects personal agency, which is linked to differentiation and individualism. We suggest that these parents view themselves as free agents capable of pursuing the interest of their family.

Our studies on individualism, differentiation and personal agency are based on a survey of the Israeli population, and should be analyzed primarily in the context of the Israeli scene. The Israeli society is multi-cultural in nature, characterized by widely diverse population, with various ethnic, religious, cultural, political and social backgrounds. The Israeli political system is rather centralized, originally shaped as an interventionist entity. This interventionist attitude is eroding with time, as free market policies and neo-liberal concepts are gaining place. This transition is also reflected the health systems. State health agencies were originally viewed as the major health providers, and were active in shaping Israeli society as a “healthy” and “modern.” These perceptions are gradually replaced by more liberal and “laissez-faire” attitudes. All this is also true for implementation of the vaccination program, which in certain aspects (childhood vaccination) is very centralized, yet rather decentralized in others (HPV vaccination). It is worth noting that Israeli vaccination programs are on par with vaccination programs in most OECD member countries both in scope and achievements.²⁵

All this suggests that changes and diversities are deeply rooted in the Israeli way of life. This could have served as a catalyst for the emergence of differentiation and individualism attitude in vaccination. One could assume however that the findings of this

study are generalizable, and could be extended to other developed countries, as change and diversity are intrinsic to most modern societies.

Nevertheless, the data related to the attitude of Israeli Arabs suggest that generalization should be addressed carefully. Other limitations of the study include:

- (1) The study is based on a phone survey—where 62% reply while 15% of the population does not have phones.
- (2) The research was conducted in a relatively high-income country and would not be applicable in the third world, were considerations, attitudes and demands are quite different^{50,51}
- (3) The survey did not ask questions about negative experiences with vaccines (e.g., actual /perceived adverse events).
- (4) The survey did not cover items to assess respondents’ perceptions of disease severity and vulnerability.

Notwithstanding these limitations, our study points out individualism and differentiation as important motives in the attitude of individuals toward state-recommended vaccination. This is in accordance with the major markers of reflexive modernity.²⁹ This social setting underlines reflexive processes, which lead people to manage risks and uncertainty through reasoning, differentiation, self-steering, reorientation and redirection.^{29,31} Modern life is characterized by both the possibility and the necessity to choose: “we have no choice but to choose who to be and how to act”.³²

The findings of this study indicate that this new reality is infiltrating the vaccination scene, and may have an increasing impact on the interactions between the lay public, vaccination experts and decision makers. This should encourage the search for a new framework for dialog between all parties involved in public vaccination, a dialog that will allow the smooth transition to the new era.

The tendency of the public to evaluate vaccination programs through the prisms of differentiation and individualism should be taken into consideration in future attempts to promote vaccination. Public health officials tend to avoid the hierarchical classification of vaccines when addressing the public. Our findings suggest that this would be unacceptable for a large fraction of the population. It appears that people want to exercise prioritization when addressing vaccination, and should be guided in this matter by responsible agents. Individualism is in many ways contradictory to the hallmarks of public health, namely solidarity and search for common good. Nevertheless, vaccination experts cannot ignore the changing social atmosphere which emphasizes individualism. The new dialog on vaccination should therefore incorporate some of the prevailing paradigms of medical ethics: shared decision making and personalized health programing. Attempts should be made for the design of novel health communication strategies that would accommodate tailor-made vaccination protocols, and thus will fit the expectations of different individuals and different sub-groups.

Materials and Methods

Study population. This cross-sectional study was based on a randomly selected representative sample of the Israeli adult

population (aged 21 and over). A probabilistic stratified sampling of households was built, based on official statistical areas characterized by socio-demographic characteristics. Areas were then matched with the computerized list of subscribers to the national telephone company, and households were randomly chosen. Excluded were fax numbers, disconnected numbers and commercial numbers. The proportion of Israeli households with landline telephones is about 85%.⁵²

The number of households in the target sample was 4,370, of these 1,112 contacts turned out to be abortive (fax numbers, disconnected numbers, failure to establish contact following up to five trials). Contact was established with 3,258 households. Of these, 1,240 did not agree to take part in the survey. The final sample included 2,018 complete questionnaires, yielding a response rate of 62%. Only one adult in each household was interviewed.

Data collection. The survey was conducted by telephone during the month of March, 2011 by the Cohen Institute for Public Opinion Research at the Tel Aviv University. The telephone interviews were conducted in Hebrew, Arabic and Russian.

All interviewees were asked to respond to a series of questions relating to their attitude toward five vaccination programs (see below). In parallel interviewees were asked about their attitude toward a series of screening tests for early detection of cancer. All participants were also asked about their actual compliance with flu vaccination, and a selected sub-group (parents of children aged 5 y and under), was asked about compliance with childhood vaccination.

In addition, the questionnaire included data regarding gender, age, income, level of education and ethnicity (Jewish or Arab). Individuals of Arab ethnicity were defined as those describing themselves as Arab Muslims, Arab Christians or Druze. Levels of education were assessed by the number of years of schooling, and two categories were defined: those completing 12 y of schooling

or less, and those completing more than 12 y of schooling. Income was categorized as below average, average or above average as defined by the national average household income of 11,000 NIS.³⁴

The design of the study as well as the questionnaire used was approved by the ethics committee of the Sheba Medical Center.

Statistical analysis. Statistical analysis was performed using SAS statistical software (Version 9.2, SAS Institute Inc.). Categorical variables were compared by chi-square test, or Mantel-Haenszel test for trend. A two-sided p value < 0.05 was considered significant. Degree of agreement between attitude and behavior was measured by calculating Kappa coefficients. One of the aims of the study was to define Attitude Groups within the population according to standpoints on vaccination. Multivariable analysis to determine the independent predictors (age, ethnic group, parenthood and income) for these Attitude Groups was performed. Since the response variable of attitude is nominal, multivariable analysis was performed by Generalized Logits Model for Multinomial Logistic Regression. In order to access how well this model describes the data, Pearson and Deviance Goodness-of-Fit tests were applied. The Likelihood Ratio test was used for testing the fit of the overall model against the intercept-only model.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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References

- World Health Organization. Immunization highlights: 2010 <http://www.who.int/immunization/newsroom/highlights/2010/en/index.html>
- Durbach N. "They might as well brand us": working-class resistance to compulsory vaccination in Victorian England. *Soc Hist Med* 2000; 13:45-62; PMID:11624425; <http://dx.doi.org/10.1093/shm/13.1.45>.
- Velan B. Personal and State Responsibilities in Vaccination: A Two-Way Road. In: *Accountability and Responsibility in Healthcare*, Ed. Rosen B, Israeli A Shortell S; World Scientific. Singapore. 2012;pp 513-530.
- Blume S. Anti-vaccination movements and their interpretations. *Soc Sci Med* 2006; 62:628-42; PMID:16039769; <http://dx.doi.org/10.1016/j.socscimed.2005.06.020>.
- Kata A. Anti-vaccine activists, Web 2.0, and the post-modern paradigm—an overview of tactics and tropes used online by the anti-vaccination movement. *Vaccine* 2012; 30:3778-89; PMID:22172504; <http://dx.doi.org/10.1016/j.vaccine.2011.11.112>.
- Chatterjee A, O'Keefe C. Current controversies in the USA regarding vaccine safety. *Expert Rev Vaccines* 2010; 9:497-502; PMID:20450324; <http://dx.doi.org/10.1586/erv.10.36>.
- Velan B. Acceptance on the move: public reaction to shifting vaccination realities. *Hum Vaccin* 2011; 7:1261-70; PMID:22108039; <http://dx.doi.org/10.4161/hv.7.12.17980>.
- Wakefield AJ, Murch SH, Anthony A, Linnell J, Casson DM, Malik M, et al. Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. [Retraction in: *Lancet*. 2010; 375:445]. *Lancet* 1998; 351:637-41; PMID:9500320; [http://dx.doi.org/10.1016/S0140-6736\(97\)11096-0](http://dx.doi.org/10.1016/S0140-6736(97)11096-0).
- Health Protection Agency. Annual COVER report: 2005/06 Summary of trends in vaccination coverage in the UK. Available: http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1194947367316
- Health protection Agency press release 2011. <http://www.hpa.org.uk/NewsCentre/NationalPressReleases/2011PressReleases/110624Measlesstatement>.
- Haber G, Malow RM, Zimet GDJ. The HPV vaccine mandate controversy. *J Pediatr Adolesc Gynecol* 2007; 20:325-31; PMID:18082853; <http://dx.doi.org/10.1016/j.jpog.2007.03.101>.
- Colgrove J, Abiola S, Mello MM. HPV vaccination mandates—lawmaking amid political and scientific controversy. *N Engl J Med* 2010; 363:785-91; PMID:20818883; <http://dx.doi.org/10.1056/NEJMs1003547>.
- Schwartz JL. HPV vaccination's second act: promotion, competition, and compulsion. *Am J Public Health* 2010; 100:1841-4; PMID:20724671; <http://dx.doi.org/10.2105/AJPH.2010.193060>.
- Mello MM, Abiola S, Colgrove J. Pharmaceutical companies' role in state vaccination policymaking: the case of human papillomavirus vaccination. *Am J Public Health* 2012; 102:893-8; PMID:22420796; <http://dx.doi.org/10.2105/AJPH.2011.300576>.
- Bonanni P, Levi M, Latham NB, Bechini A, Tiscione E, Lai P, et al. An overview on the implementation of HPV vaccination in Europe. *Hum Vaccin* 2011; 7(Suppl):128-35; PMID:21245659; <http://dx.doi.org/10.4161/hv.7.0.14575>.
- CDC reports on vaccine coverage in the US. 2010 NIS-Teen Vaccination Coverage Data http://www.cdc.gov/vaccines/stats-surv/nisteen/data/tables_2010.htm
- Sadigh G, Dempsey AF, Ruffin M 4th, Resnicow K, Carlos RC. National patterns in human papillomavirus vaccination: an analysis of the National Survey of Family Growth. *Hum Vaccin Immunother* 2012; 8:234-42; PMID:22414967.
- Liao Q, Cowling BJ, Lam WW, Fielding R. Factors affecting intention to receive and self-reported receipt of 2009 pandemic (H1N1) vaccine in Hong Kong: a longitudinal study. *PLoS One* 2011; 6:e17713; PMID:21412418; <http://dx.doi.org/10.1371/journal.pone.0017713>.
- Walter D, Böhmer MM, Heiden M, Reiter S, Krause G, Wichmann O. Monitoring pandemic influenza A(H1N1) vaccination coverage in Germany 2009/10 - results from thirteen consecutive cross-sectional surveys. *Vaccine* 2011; 29:4008-12; PMID:21463683; <http://dx.doi.org/10.1016/j.vaccine.2011.03.069>.

20. Velan B, Kaplan G, Ziv A, Boyko V, Lerner-Geva L. Major motives in non-acceptance of A/H1N1 flu vaccination: the weight of rational assessment. *Vaccine* 2011; 29:1173-9; PMID:21167862; <http://dx.doi.org/10.1016/j.vaccine.2010.12.006>.
21. Van Kerkhove MD, Vandemaële KA, Shinde V, Jaramillo-Gutierrez G, Koukounari A, Donnelly CA, et al.; WHO Working Group for Risk Factors for Severe H1N1pdm Infection. Risk factors for severe outcomes following 2009 influenza A (H1N1) infection: a global pooled analysis. *PLoS Med* 2011; 8:e1001053; PMID:21750667; <http://dx.doi.org/10.1371/journal.pmed.1001053>.
22. Smith MJ, Marshall GS. Navigating parental vaccine hesitancy. *Pediatr Ann* 2010; 39:476-82; PMID:20704143; <http://dx.doi.org/10.3928/00904481-20100726-05>.
23. Limb M. "Vaccine hesitancy" means scientists need to be more honest about risks. *BMJ* 2011; 342:d2479; PMID:21498466; <http://dx.doi.org/10.1136/bmj.d2479>.
24. Schwartz JL, Caplan AL. Vaccination refusal: ethics, individual rights, and the common good. *Prim Care* 2011; 38:717-28, ix; PMID:22094142; <http://dx.doi.org/10.1016/j.pop.2011.07.009>.
25. OECD database on health care utilization <http://stats.oecd.org/>
26. Porter B, Rosen B, Rishpon S. Development and implementation of vaccine policy. *Health policy monitor 2009 Survey No 14*. <http://www.hpm.org/is/a14/4.pdf>
27. Muhsen K, Abed El-Hai R, Amit-Aharon A, Nehama H, Gondia M, Davidovitch N, et al. Risk factors of underutilization of childhood immunizations in ultra-orthodox Jewish communities in Israel despite high access to health care services. *Vaccine* 2012; 30:2109-15; PMID:22285273; <http://dx.doi.org/10.1016/j.vaccine.2012.01.044>.
28. Beck U, Giddens A, Lash S. *Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order*. Stanford University Press. Stanford California. 1994.
29. Beck U, Bonss W, Lau C. *The Theory of Reflexive Modernization: Problematic. Hypotheses and Research Programme* Theory Culture Society 2003; 20:1-33.
30. Bauman Z. *Liquid Modernity*. 2000. Blackwell Publishing Ltd. Cambridge, UK. 2000.
31. Giddens A. Risk and responsibility. *Mod Law Rev* 1999; 62:1-10; <http://dx.doi.org/10.1111/1468-2230.00188>.
32. Heiskala R. From modernity through postmodernity to reflexive modernization. Did we learn anything. *Int Rev Sociol* 2011; 21:1-19; <http://dx.doi.org/10.1080/03906701.2011.544177>.
33. Walklate S, Mythen G. Agency, reflexivity and risk: cosmopolitan, neurotic or prudential citizen? *Br J Sociol* 2010; 61:45-62; PMID:20377596; <http://dx.doi.org/10.1111/j.1468-4446.2009.01301.x>.
34. Israeli central bureau of statistics: Income survey. 2010. <http://www1.cbs.gov.il/publications12/1479/pdf/t01.pdf>
35. Israeli central bureau of statistics: Selected Data from the New Statistical Abstract of Israel No. 62. 2011 <http://fmx.sagepub.com/content/23/2/188>
36. Stefanoff P, Mamelund SE, Robinson M, Netterlid E, Tuells J, Bergsaker MA, et al.; VACSATC working group on standardization of attitudinal studies in Europe. Tracking parental attitudes on vaccination across European countries: The Vaccine Safety, Attitudes, Training and Communication Project (VACSATC). *Vaccine* 2010; 28:5731-7; PMID:20558250; <http://dx.doi.org/10.1016/j.vaccine.2010.06.009>.
37. Pearce A, Law C, Elliman D, Cole TJ, Bedford H; Millennium Cohort Study Child Health Group. Factors associated with uptake of measles, mumps, and rubella vaccine (MMR) and use of single antigen vaccines in a contemporary UK cohort: prospective cohort study. *BMJ* 2008; 336:754-7; PMID:18309964; <http://dx.doi.org/10.1136/bmj.39489.590671.25>.
38. Smith A, Yarwood J, Salisbury DM. Tracking mothers' attitudes to MMR immunisation 1996-2006. *Vaccine* 2007; 25:3996-4002; PMID:17395344; <http://dx.doi.org/10.1016/j.vaccine.2007.02.071>.
39. Raude J, Caille-Brillet AL, Setbon M. The 2009 pandemic H1N1 influenza vaccination in France: who accepted to receive the vaccine and why? *PLoS Curr* 2010; 2:RRN1188; PMID:20972476; <http://dx.doi.org/10.1371/currents.RRN1188>.
40. Horney JA, Moore Z, Davis M, MacDonald PD. Intent to receive pandemic influenza A (H1N1) vaccine, compliance with social distancing and sources of information in NC, 2009. *PLoS One* 2010; 5:e11226; PMID:20585462; <http://dx.doi.org/10.1371/journal.pone.0011226>.
41. Leask J. Target the fence-sitters. *Nature* 2011; 473:443-5; PMID:21614055; <http://dx.doi.org/10.1038/473443a>.
42. Health at a Glance: Childhood Vaccination Programmes. OECD Library: 2010. http://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-europe-2010_health_glance-2010-en
43. Poland GA. The 2009-2010 influenza pandemic: effects on pandemic and seasonal vaccine uptake and lessons learned for seasonal vaccination campaigns. *Vaccine* 2010; 28(Suppl 4):D3-13; PMID:20713258; <http://dx.doi.org/10.1016/j.vaccine.2010.08.024>.
44. Osterholm MT, Kelley NS, Sommer A, Belongia EA. Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis. *Lancet Infect Dis* 2012; 12:36-44; PMID:22032844; [http://dx.doi.org/10.1016/S1473-3099\(11\)70295-X](http://dx.doi.org/10.1016/S1473-3099(11)70295-X).
45. Haug C. The Risks and Benefits of HPV Vaccination *JAMA*. 2009; 302:795-6.
46. Brewer NT, Chapman GB, Gibbons FX, Gerrard M, McCaul KD, Weinstein ND. Meta-analysis of the relationship between risk perception and health behavior: the example of vaccination. *Health Psychol* 2007; 26:136-45; PMID:17385964; <http://dx.doi.org/10.1037/0278-6133.26.2.136>.
47. Baron-Epel O, Kaplan G, Weinstein R, Green MS. Extreme and acquiescence bias in a bi-ethnic population. *Eur J Public Health* 2010; 20:543-8; PMID:20439322; <http://dx.doi.org/10.1093/eurpub/ckq052>.
48. ICDC. (Israel Center for Disease Control) report 333 [Hebrew]. The state of Health in Israel 2011 www.pagegangster.com/p/v9rZd/23
49. Smith PJ, Humiston SG, Parnell T, Vannice KS, Salmon DA. The association between intentional delay of vaccine administration and timely childhood vaccination coverage. *Public Health Rep* 2010; 125:534-41; PMID:20597453.
50. Nichter M. Vaccinations in the Third World: a consideration of community demand. In: *Anthropology and International Health* (eds M Nichter & M Nichter) Gordon and Breach Publishers, Amsterdam, 1996; pp. 329-66.
51. Streefland P, Chowdhury AM, Ramos-Jimenez P. Patterns of vaccination acceptance. *Soc Sci Med* 1999; 49:1705-16; PMID:10574240; [http://dx.doi.org/10.1016/S0277-9536\(99\)00239-7](http://dx.doi.org/10.1016/S0277-9536(99)00239-7).
52. Gordoni G, Oren A, Shavit Y. Coverage Bias in Telephone Surveys in Israel *Field Methods* 2011; 23:188-203.