"Sisters, Mothers, Daughters and Aunties": HIV Vaccine Acceptability Among African, Caribbean and Other Black Women in Toronto

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ABSTRACT

OBJECTIVES: Black women in Canada are at disproportionately high risk for HIV. We assessed HIV vaccine acceptability and correlates of acceptability among Black women from African and Caribbean communities in Toronto.

METHODS: "Sisters, Daughters, Mothers, and Aunties" was a community-based research project. Black women of African and Caribbean descent were recruited using venue-based sampling across diverse community organizations in Toronto. We used a structured questionnaire to collect data on socio-demographic characteristics and acceptability of 8 future HIV vaccines, each defined by a set of 7 dichotomous attributes. Conjoint analysis was used to quantify the relative impact of vaccine attributes on acceptability, with multiple regression to adjust for socio-demographic characteristics associated with overall acceptability.

RESULTS: Mean vaccine acceptability was 58.8 (SD=17.2) on the 100-point scale. Efficacy had the greatest impact on acceptability, followed by side effects, cost, duration of protection, and number of doses. Acceptability of a high (99%) efficacy vaccine (70.1/100) was significantly greater than for a 50% efficacy vaccine (47.6/100). Vaccine acceptability was significantly higher among women of Caribbean versus African descent, ever married versus single women, and women with full-time versus part-time employment.

CONCLUSIONS: Black women in Toronto indicated a modest level of acceptability for future HIV vaccines. Educational interventions that address the benefits of partially efficacious vaccines and clearly explain potential side effects, as well as vaccine cost subsidies may promote HIV vaccine uptake. Differences in acceptability within Black communities suggest that tailored multi-level interventions may mitigate barriers to uptake.

KEY WORDS: AIDS vaccines; acceptability of healthcare; conjoint analysis; African, Caribbean and other Black women; Canada

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HIV vaccine development is well underway with a recent large-scale clinical trial indicating efficacy for the first time, although insufficient for public licensure.[1] Although current HIV preventive interventions and treatment advances have contributed greatly to controlling HIV transmission, with 2.5 million new infections in 2011 alone,[2] a vaccine remains the most promising means of reversing the global epidemic.

An HIV vaccine would circumvent some of the most pressing social and behavioural challenges that present obstacles to the effectiveness of products requiring pericoital use (e.g., condoms) and daily adherence (e.g., antiretroviral therapy). However, the availability of safe and efficacious HIV vaccines does not guarantee their effectiveness.[3-5] An important means of addressing anticipated gaps between clinical trial efficacy and effectiveness in the real world is to assess factors associated with the acceptability of hypothetical HIV vaccines among most-at-risk populations – before products are publicly available.[4,6]

Women constitute an understudied yet important demographic for HIV vaccine acceptability research. In a systematic review of research on HIV vaccine acceptability, including general and most-at-risk populations in both developed and developing countries,[6] none of the 18 investigations applied quantitative methods to assess HIV vaccine acceptability among women.

Women in high-income countries are increasingly at risk for HIV. In North America, Black women, in particular, are at disproportionately high risk. In Ontario, the province with the highest number of persons living with HIV in Canada, the proportion of new HIV diagnoses per year among women has risen from approximately 10% in the mid-1990s to 18.7% in 2009, having peaked in 2008 at 24.7%.[7] Available epidemiological data reveal that Black Ontarians (3.9% of the provincial population)[8] represented 9.7% of AIDS diagnoses reported from 1981-2004, including 7.4% of male and 38.5% of female diagnoses.[9] HIV prevalence data in Toronto reveal that from 1981-2004, Black Canadians represented 11.4% of male diagnoses and 55.1% of female diagnoses, constituting 17.1% of HIV diagnoses overall.[9] Similarly, in the US, African American women account for 57% of new HIV infections among all women, a rate 15 times higher than that among White women.[10,11]

Given disproportionately high HIV prevalence among Black women, we assessed HIV vaccine acceptability and correlates of acceptability among Black women from African and Caribbean communities in Toronto.

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METHODS

"Sisters, Daughters, Mothers, and Aunties" was a community–university collaboration between Women's Health in Women's Hands Community Health Centre (WHIWH) and the University of Toronto.[12] This community-based project was conducted under the guidance of a Community Advisory Board (CAB), composed of six diverse Black women who served as educators and advocates for the major African and Caribbean communities in Toronto. The CAB provided input on survey questionnaire items, sampling, recruitment, and interpretation of the data. We trained 12 peer research assistants from the communities who conducted recruitment, implemented the survey questionnaire, and entered and checked data.

This study received approval from the Research Ethics Board of the University of Toronto (Protocol ID 00016091). All participants provided written informed consent.

Recruitment

In collaboration with our community partner, WHIWH, and the CAB, we compiled a list of community organizations and health centres serving primarily African, Caribbean and other Black women in the Greater Toronto Area (GTA). Peer research assistants conducted recruitment through the identified organizations. Eligibility criteria included women in the GTA, 18 years of age or older, and self-identification as Black and of African, Caribbean or mixed origin.

Data collection

The survey questionnaire was constructed based on previous survey research on HIV vaccine acceptability among ethnic minority adults in Los Angeles[5] and formative qualitative research conducted with Black women from African and Caribbean communities that explored knowledge, attitudes and beliefs about HIV prevention and future HIV vaccines.[12,13] We assessed socio-demographic variables, including age, place of birth, years in Canada, primary ethnic origin (African or Caribbean descent, or multiple backgrounds), income, education, relationship status and employment status.

Conjoint analysis

Conjoint analysis is a technique used for assessing consumer product preferences that has increasingly been applied to health care services and technologies.[14,15] In this method, a hypothetical product is characterized by a set of defining attributes (e.g., efficacy), which can take on varying levels (e.g., 50%, 99%). A series of product scenarios are then created, which define the product by systematically designed combinations of attributes and levels. Study participants are then asked to select among the presented scenarios, requiring them to make tradeoffs between product attributes. As a decompositional approach, the importance of individual attributes can be determined from the presentation of a multi-attribute product, which is more similar to how products are presented to consumers in the real world than a compositional approach based on a series of single-attribute questions.[15]

We used conjoint analysis to measure participant preferences among different hypothetical HIV vaccines and to determine the impact of each vaccine attribute on overall vaccine acceptability scores. Participants rated the acceptability of each of 8 hypothetical vaccines on a 7-point Likert scale, from 1=definitely to 7=definitely not accept vaccination. These ratings were reversed and standardized to a 100-point scale to improve interpretability, with higher scores indicating greater vaccine acceptability.

Table 1. Socio-demographic Characteristics of African, Caribbean and Other Black Women in Toronto, Canada (N=206)

Characteristic	n (%)
Age in years*	35.08 (11.26)
Monthly income in $CAD*	$1682.65 ($1455.78)
Birthplace (missing n=1)	
Canada	39 (19.02)
Elsewhere	166 (80.98)
Years in Canada (for foreign-born)*	17.83 (9.48)
Ethnicity (missing n=14)	
African	93 (48.44)
Caribbean	99 (51.56)
Education (missing n=2)	
Less than high school	17 (8.33)
Completed high school	82 (40.20)
Completed college	71 (34.80)
Completed university	34 (16.67)
Relationship status (missing n=1)	
Single/never married	87 (42.44)
Married/separated/widowed	118 (57.56)
Employment status (missing n=8)	
Working full-time (paid)	79 (39.90)
Working part-time (paid)	49 (24.75)
Unemployed/work at home	55 (27.78)
Permanent/temp. disability/other	15 (7.58)

* mean (SD).

The hypothetical HIV vaccine scenarios combined the following 7 attributes: efficacy (99% vs. 50%), side effects (none vs. temporary aches and fevers), out-of-pocket cost ($10 vs. $250), duration of protection (10 years vs. 1 year), doses (1 vs. 4), cross-clade protection (Canadian and international strains vs. Canadian strains), and route of administration (oral vs. injection). These attributes were selected based on our formative qualitative research with women and community key informants[12] and review of the relevant literature.[16,17] The attribute combinations that made up the 8 vaccine profiles were constructed using an 8-run (2^{7-2}) Plackett-Burman fractional factorial design.[18] As a methodological check, we included an additional calibration scenario with all attributes set to the levels hypothesized as preferred. The acceptability score from the calibration scenario is not included in the conjoint analysis.

Data analysis

Overall vaccine acceptability was calculated by assessing the mean acceptability for each participant across all 8 vaccine scenarios, then taking the mean score across participants. To calculate vaccine attribute impact on acceptability, the mean acceptability of the 4 scenarios with the non-preferred attribute level (e.g., minor side effects) is subtracted from the mean acceptability of the 4 scenarios with the preferred attribute level (e.g., no side effects); this difference is the impact of side effects on acceptability. If a particular attribute has no effect on acceptability, its impact on acceptability should equal zero. We used a 1-sample t-test to test whether the impact of each attribute significantly differed from zero.

We then tested overall vaccine acceptability for association with socio-demographic characteristics using Pearson correlation with continuous variables, t-tests with binary variables, and analysis of variance with categorical variables. Acceptability of the 8 vaccine scenarios was calculated by taking the mean acceptability across participants for each scenario.

Table 2. HIV Vaccine Scenarios Ranked by Highest to Lowest Acceptability Score Among African, Caribbean and Other Black Women in Toronto, Canada (N=206)

HIV Vaccine Scenario*	HIV Vaccine Acceptability, Mean (SD)	Efficacy	Side Effects	Cost	Duration of Protection (Years)	Number of Doses	Cross-clade Protection	Route of Administration
1	82.07 (24.58)	99%	None	$10	10	1	Canadian	Injection
2	68.33 (27.53)	99%	None	$250	1	1	Canadian & international	Mouth
3	65.03 (29.20)	99%	Temporary aches & fevers	$250	10	4	Canadian & international	Injection
4	64.97 (27.98)	99%	Temporary aches & fevers	$10	1	4	Canadian	Mouth
5	52.24 (28.68)	50%	None	$10	1	4	Canadian & international	Injection
6	51.52 (28.67)	50%	Temporary aches & fevers	$10	10	1	Canadian & international	Mouth
7	49.60 (28.59)	50%	None	$250	10	4	Canadian	Mouth
8	37.07 (25.34)	50%	Temporary aches & fevers	$250	1	1	Canadian	Injection

* Ordered from highest to lowest vaccine acceptability score.

Table 3. Impact of HIV Vaccine Attributes on Vaccine Acceptability Among African, Caribbean and Other Black Women in Toronto, Canada (N=206)

HIV Vaccine Attributes	Attribute Levels	Preferred Value Mean Acceptability	Non-preferred Value Mean Acceptability	Impact on Acceptability, Mean (SD)
Efficacy	99% vs. 50%	70.12 (19.57)	47.56 (22.13)	22.56 (23.69)*
Side effects	None vs. temp. aches and fevers	62.99 (19.05)	54.43 (20.65)	8.56 (19.70)*
Cost	$10 vs. $250	62.48 (18.39)	54.91 (19.65)	7.57 (16.27)*
Duration of protection	10 years vs. 1 year	62.28 (18.63)	55.75 (19.22)	6.53 (15.57)*
Number of doses	1 vs. 4	59.68 (17.36)	57.93 (18.60)	1.75 (10.38)†
Cross-clade protection	Can. & intl strains vs. Can. strains	59.30 (19.95)	58.40 (17.67)	0.90 (15.12)
Route of administration	Oral vs. injection	58.64 (19.85)	58.89 (18.05)	-0.25 (15.79)

* $p<0.01$.
† $p<0.05$.

Because the attributes are dichotomous, each attribute impact score is mathematically equivalent to the corresponding coefficients in a multiple regression model that fits acceptability scores of the 8 hypothetical vaccines to the 7 attributes included as independent variables.[15] Calculating conjoint analysis impact scores using this method allows some of the flexibility of regression methods, namely, adjustment for possible socio-demographic confounders. We ran two multiple regression models, one that included socio-demographic characteristics that were associated with overall vaccine acceptability at the $p<0.05$ level, and another including those measures associated at the $p<0.1$ level. We then compared the adjusted impact scores with the unadjusted impact scores for differences.

RESULTS

Overall, 206 Black women of African and Caribbean descent completed the survey. Socio-demographic information is presented in Table 1. Participants were of mean age 35 years (SD=11), with mean monthly income of $1,683 Canadian dollars (SD=1,456); the majority (81%) were born outside of Canada. Those born elsewhere had spent a mean of 18 years (SD=9) in Canada. The majority of the sample (52%) were of Caribbean ethnic heritage; 40% had completed high school, 42% were single/never married, and 40% were working full-time.

Acceptability of the 8 vaccines ranged from 82.1 (24.6) to 37.1 (SD=25.3). The overall mean level of HIV vaccine acceptability was 58.8 (SD=17.2) on the 100-point scale. Table 2 shows the mean HIV vaccine acceptability score by vaccine scenario, ordered from highest to lowest, and the corresponding attribute profiles of each vaccine. The highest-rated vaccine had the following attribute profile: 99% efficacy, no side effects, cost $10, 10-year protection, one dose, protection against Canadian-only strains and administered by injection.

The calibration scenario, with all attributes set to levels hypothesized to be preferred, had an acceptability score of 86.3 (23.4). This was the highest score of all scenarios, which confirmed the selection of preference levels across attributes. This scenario was not included in conjoint analysis.

The impact of HIV vaccine attributes on acceptability is presented in Table 3. Efficacy had the greatest impact on acceptability, with an impact score of 22.6 (SD=23.7, $p<0.01$). In decreasing order, side effects (8.6, SD=19.7, $p<0.01$), out-of-pocket cost (7.6, SD=16.3, $p<0.01$), duration of protection (6.5, SD=15.6, $p<0.01$), and number of doses (1.8, SD=10.34, $p<0.05$) had significant impacts on vaccine acceptability. Cross-clade protection and route of administration did not affect vaccine acceptability.

Table 4 presents the association of overall mean HIV acceptability score with the sample socio-demographic characteristics. HIV vaccine acceptability significantly differed by ethnicity, relationship status, and employment status. Women of African descent had lower acceptability scores than women of Caribbean descent (-4.9, $p=0.05$). Single/never married women had lower scores than those who were married (-5.5, $p=0.02$) and those working part-time had lower scores than women working full-time, at home or on disability ($p=0.03$). Monthly income was positively correlated with HIV acceptability at a trend level of significance ($p<0.064$).

The impact of vaccine attributes on vaccine acceptability was virtually unchanged after adjusting for ethnicity, relationship status, and employment status.

DISCUSSION

This investigation among Black women from African and Caribbean communities in Toronto revealed a modest level of acceptability of future HIV vaccines. To our knowledge this is the

first study to quantify HIV vaccine acceptability, and the relative impact of vaccine attributes on acceptability, among Black women. Previous research similarly indicates that HIV vaccine acceptability is not guaranteed, even among populations with elevated rates of HIV diagnoses.[5,6,15] As Black women are a population at disproportionately high risk for HIV, it is important to identify vaccine attributes and other correlates of acceptability among this population in order to guide evidence-informed interventions to support future HIV vaccine uptake.

Among 7 HIV vaccine attributes, efficacy had the greatest impact on acceptability. A high efficacy vaccine would have moderately high acceptability, while a partial efficacy vaccine resulted in acceptability less than 50 on the 100-point scale. The primacy of efficacy in determining HIV vaccine acceptability is similar to findings among other populations, including ethnic minorities and other key populations in the US at higher risk of HIV exposure.[5] Nevertheless, the likelihood that initial HIV vaccines will not confer sterilizing immunity, unlike many existing childhood vaccines, suggests an important role for information and education about the benefits of partially efficacious vaccines as a component of combination prevention for Black women.

The impact of side effects on acceptability, the second most influential attribute, is similar to findings from previous research with African American women.[17,19] Given mistrust of medical research based on past unethical experimentation involving Black communities,[13,20] it may be important to directly address this mistrust and provide transparent information from trusted sources, including ethnospecific health care centres.[12]

The significant impact of out-of-pocket cost on acceptability, a finding similar to previous studies among low-income US ethnic minority adults,[5] suggests a key role for public policy in supporting HIV vaccine uptake. Participants demonstrated tolerance for low out-of-pocket cost of $10, but were significantly less likely to accept a vaccine that cost $250. The positive correlations between employment status and income, respectively, and HIV vaccine acceptability further support the importance of financial considerations among an under-employed sample with average income less than $20,000 per year. Key populations at higher risk of HIV exposure are often low income; in Canada, Black women are among the most economically marginalized groups.[21] Given lifetime costs for HIV treatment in excess of $400,000,[22] HIV vaccine cost subsidies may prove a cost-effective public policy intervention. Qualitative studies with low-income Black Canadian[12,18] and African American women[17,19,23] highlight concerns about HIV vaccine access in the context of out-of-pocket cost, stigma, and discrimination in the health care system. Accordingly, targeted structural interventions in health care policy, funding mechanisms and health care institutions may be an important component of future HIV vaccine roll-out for Black women.[24]

We found that ever being married was associated with higher overall HIV vaccine acceptability. Although higher vaccine acceptability among married women may be counterintuitive in light of assumptions that single women are at greater risk for HIV infection, particular risks for married, largely immigrant, women may result from gendered cultural traditions and financial dependence on male spouses[25] as well as stigma, all of which constrain women's ability to implement existing HIV preventive interventions, such as condom use and HIV testing.[12,13] HIV vaccines, though not without their own challenges, may obviate some of the barriers for women in negotiating male-controlled prevention technologies and products requiring pericoital use.[17]

Table 4. HIV Vaccine Acceptability by Socio-demographic Characteristics Among African, Caribbean and Black Women in Toronto, Canada (N=206)

Characteristic	HIV Vaccine Acceptability, Mean (SD)	p-value
Age in years*	0.040	0.577
Monthly income in $CAD*	0.164	0.064
Birthplace		0.197
Canada	62.01 (16.67)	
Elsewhere	58.06 (17.29)	
Years in Canada (for foreign-born)*	0.050	0.540
Ethnicity		0.051
African	56.41 (17.61)	
Caribbean	61.27 (16.70)	
Education		0.296
Less than high school	62.30 (10.96)	
Completed high school	56.24 (17.55)	
Completed college	60.14 (18.74)	
Completed university	61.33 (14.56)	
Relationship status		0.023
Single/never married	55.63 (17.87)	
Married/separated/widowed	61.16 (16.38)	
Employment status		0.025
Working full-time (paid)	60.62 (18.34)	
Working part-time (paid)	53.26 (16.03)	
Unemployed/work at home	59.80 (15.02)	
Permanent/temp. disability/other	66.72 (18.90)	

* Correlation coefficient.

Finally, the lower levels of HIV vaccine acceptability among women of African versus Caribbean descent may be a function of the particular stigma associated with HIV among people from African communities. Stigma has been identified as a barrier to uptake of a broad array of HIV prevention and treatment interventions, including condom use,[26] HIV testing,[27] prevention of mother-to-child transmission[28] and antiretroviral therapy.[29] Thus while an HIV vaccine as a universal preventive intervention may help to mitigate the stigma of AIDS, that same stigma may function as a barrier to vaccine uptake.[6]

Limitations to this study include the nonrandom sampling; the results may not be generalizable across Black Canadian women. We also did not assess differences among Black women by language, religion or sexual orientation. Nevertheless we implemented a broad recruitment strategy in collaboration with women from African, Caribbean and Black communities across the Greater Toronto Area; and we achieved a diverse sample of women by age, national origin and marital status – a population over-represented in HIV prevalence statistics, yet under-represented in research on new HIV prevention technologies. Additionally, we are only able to assess the impact of HIV vaccine attributes included in the conjoint scenarios; other attributes also may influence acceptability. Finally, by necessity, women assessed hypothetical HIV vaccines; acceptability may change once a vaccine is publicly available. However the purpose of this investigation was to anticipate and in turn mitigate challenges to future HIV vaccine roll-out.

CONCLUSIONS

Overall, this community-based investigation suggests several challenges to the acceptability of future HIV vaccines among Black women from African and Caribbean communities, some of which (e.g., partial efficacy) are similar to those among other populations and other challenges (e.g., ethnicity, marital status) that may be

population- and subpopulation-specific. Educational interventions that explain the benefits of partially efficacious vaccines as a component of combination HIV prevention and clearly describe possible risks and side effects, along with structural interventions to subsidize out-of-pocket vaccine costs, may increase HIV vaccine uptake. Differences in acceptability within Black communities indicate that tailored interventions to address what may be distinct barriers to uptake among single and married women, and to support uptake among women from African communities may promote increased HIV vaccine coverage.

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RÉSUMÉ

OBJECTIFS : Le risque de contracter le VIH est démesurément plus élevé chez les femmes noires au Canada. Nous avons évalué l'acceptabilité des vaccins anti-VIH et les corrélats de cette acceptabilité chez les femmes noires des communautés africaines et caribéennes de Toronto.

MÉTHODE : « Sisters, Daughters, Mothers, and Aunties » est le nom d'un projet de recherche communautaire. Des femmes noires d'ascendance africaine et caribéenne ont été recrutées par échantillonnage dans les lieux de rencontre de divers organismes communautaires de Toronto. Nous avons utilisé un questionnaire structuré pour recueillir des données sur les caractéristiques sociodémographiques et l'acceptabilité de huit futurs vaccins anti-VIH, chacun étant défini par un ensemble de sept attributs dichotomiques. Une analyse conjointe a servi à chiffrer l'impact relatif des attributs des vaccins sur leur acceptabilité, et nous avons fait appel à la régression multiple pour tenir compte des caractéristiques sociodémographiques associées à leur acceptabilité globale.

RÉSULTATS : L'acceptabilité moyenne des vaccins était de 58,8 (écart-type de 17,2) sur une échelle de 100 points. L'efficacité potentielle du vaccin avait le plus grand impact sur son acceptabilité, suivie par ses effets secondaires, son coût, sa durée de la protection et son nombre de doses. L'acceptabilité d'un vaccin à haute (99 %) efficacité potentielle était significativement plus élevée (70,1/100) que celle d'un vaccin à l'efficacité potentielle de 50 % (47,6/100). L'acceptabilité des vaccins était significativement plus élevée chez les femmes d'origine caribéenne que chez celles d'origine africaine, chez les femmes ayant été mariées que chez les célibataires, et chez les femmes ayant un emploi à plein temps plutôt qu'un emploi à temps partiel.

CONCLUSIONS : Le niveau d'acceptation des futurs vaccins anti-VIH par les femmes noires de Toronto est modeste. Des interventions éducatives qui portent sur les avantages des vaccins partiellement efficaces et qui expliquent clairement leurs effets secondaires potentiels, ainsi que des subventions au coût des vaccins, pourraient favoriser le recours aux vaccins anti-VIH. Les écarts dans les niveaux d'acceptabilité au sein de la communauté noire montrent que des interventions multiniveaux adaptées pourraient atténuer les obstacles à l'acceptation de ces vaccins.

MOTS CLÉS : vaccins contre le SIDA; acceptation des soins; analyse conjointe; femmes africaines, caribéennes et autres femmes noires; Canada