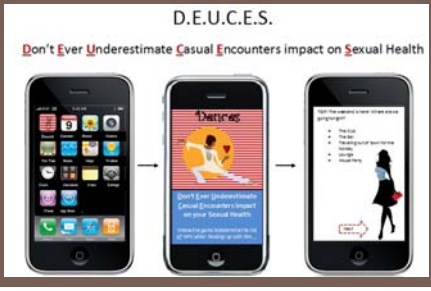
IS THE INVESTMENT OF DEVELOPING A SMARTPHONE APPLICATION BASED INTERVENTION PROMOTING HPV VACCINE UPTAKE AND COMPLETION AMONG YOUNG ADULT, AFRICAN AMERICAN WOMEN WORTHWHILE? FEASIBILITY ASSESSMENTS OF AN INTERNET COMMUNITY COMPARED TO AN EMERGENCY DEPARTMENT BASED POPULATION




Session: Health Informatics Information Technology Innovation Part I

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(1) The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

*"No Relationships to Disclose"*



## OVERVIEW

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1. Significance of HPV disease to public health
2. Cost of building a smartphone application
3. Cost benefit analysis of building a smartphone application for sexually transmitted disease prevention
4. Study findings assessing the willingness of the target population to engage in a smartphone application based prevention intervention
5. Evaluation of whether the investment in smartphone technology for research purposes is worthwhile



## Significance of HPV disease to public health

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- Disproportionate burden of disease to African American women
  - African American women with a human papillomavirus (HPV) infection develop cervical cancer 50% more than Caucasian American women [1-5]
- Disproportionate burden of disease to adolescents/young adults
  - Genital HPV infects 50% of adolescents and young adults, contributing to 20 million new cases annually in the US [6].
  - 74% (4.6 million of 6.2 million) of new HPV cases were among youth (15 -24 years) who account for 48% of sexually transmitted infections (STI) [7-9].
- Higher morbidity/mortality among African American women
  - two times more likely to die from cervical cancer than Caucasian women [1-5]
  - have the highest national HPV rates among young adults [10]
  - 2 times more likely to develop cervical cancer amidst an HPV infection than their Caucasian female, young adult counterparts [1-4].



## Cost of building a smartphone application

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- Average app developer in US: $100/hour[11]
- Average cost to develop an app[11]
  - 'small apps':$3K-$8K
  - 'more complex and recognized brand apps':$50K - $150K
  - iPAD app:$12K- $150K or more
- Given the goal of the research, which is to develop a culturally sensitive, interactive application, the cost is expected to be $50K/year for the app alone



## Available funding mechanisms

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- Inter-institutional pilot awards
  - $30-$50K annually
- NIH level pilot awards
  - RO3 (pilot/feasibility award): $100K over 2 years
  - R21(high risk research award): $275K over 2 years

## Limitations presented by funding mechanisms

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- Majority of funding mechanisms are not enough to cover all funding associated areas:
  - Direct Costs
    - Personnel
    - Travel
    - Resources (app development) and other supplies
  - Indirect Costs
    - Office space
    - Equipment – laptops, paper, copies, etc…



## Cost benefit analysis - Benefits

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- Does the potential benefit of building a smartphone application for sexually transmitted disease prevention justify the cost?
  - Potential benefits:
    - Changes to the epidemic:
      - Significant decrease in the transmission of HPV to uninfected persons
      - Significant decrease in new cervical cancer cases among African American women
      - Significant decrease in mortality caused by cervical cancer among African American women
    - Changes to research modalities:
      - Ability to capture layered information in a person's life 'real time'
        - Allows operationalization of the teachable moment
      - The ability to motivate and influence health behavior change



## Cost benefit analysis - Costs

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- Does the potential benefit of building a smartphone application for sexually transmitted disease prevention justify the cost?
  - Costs[12]:
    - Building the application: $50K-$150K + associated research costs
    - Health care associated costs per patient (of cervical cancer care/treatment per year among Medicaid beneficiaries younger than 65 years of age)[1]:
      - *At 6 months*: $3,807, $23,187, $35,853, and $45,028 for in situ, local, regional, and distant cancers, respectively.
      - *Incremental costs*: $13,935 and $26,174 for local and regional cancers
        - *At 12 months*: $15,868 and $30,917



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## Feasibility Study

**A Smartphone application based intervention promoting HPV vaccine uptake and completion among young adult, African American women**



## Feasibility Study

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- Cross sectional, observational pilot study
- N=41 young adult, African American women ages 18-26 years
- Setting:
  - Online (n=21)
  - Local Emergency Department (n=19)
- Survey composed of 30 questions
- Variables assessed included:
  - Demographics
  - Sexually based
  - Smartphone based
  - HPV knowledge based

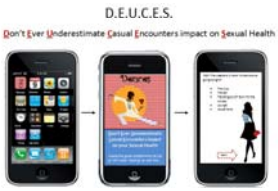




**Table 1: Frequency Analysis of Demographic Variables (N=40)**

| Variable | Categories of Variable | Total N (%) Online | Total (N%) Emergency Department |
|---|---|---|---|
| Age | 18-19 years<br>20-21 years<br>22-23 years<br>24-26 years | 1 (4.8)<br>6 (28.6)<br>5 (23.8)<br>9 (42.9) | 3 (15.8)<br>9 (47.4)<br>5 (26.3)<br>2 (10.5) |
| Income 1 | None<br>Less than $500<br>$501 - $1,000<br>$1,001 - $1,500<br>$1,501 - $2,000<br>$2,001 - $2,500<br>$2,501 - $3,000<br>$3,001 and over | 2 (9.5)<br>2 (9.5)<br>4 (19.0)<br>3 (14.3)<br>1 (4.8)<br>3 (14.3)<br>2 (9.5)<br>4 (19.0) | 2 (10.5)<br>2 (10.5)<br>2 (10.5)<br>7 (36.8)<br>2 (10.5)<br>1 (5.3)<br>2 (10.5)<br>1 (5.3) |
| Income 2 | Less than $1,000<br>$1,001 - $2,000<br>$2,001 and more | 8 (38.1)<br>4 (19.0)<br>9 (42.9) | 6 (31.6)<br>9 (47.4)<br>4 (21.1) |
| Income 3 | No income<br>Some income | 2 (9.5)<br>19 (90.5) | 5 (26.3)<br>14 (73.7) |
| Education | Junior high school<br>High school or GED<br>Some college<br>College<br>Graduate school | 0 (0)<br>0 (0)<br>14 (66.7)<br>2 (9.5)<br>5 (23.8) | 3 (15.8)<br>5 (26.3)<br>10 (52.6)<br>1 (5.3)<br>0 (0) |

**Table 1: Frequency Analysis of Demographic Variables (N=40) continued**

| Variable | Categories of Variable | Total N (%) Online | Total (N%) Emergency Department |
|---|---|---|---|
| Sexual preference | Women<br>Men | 2 (9.5)<br>19 (90.5) | 0 (0)<br>19 (100) |
| Contraception use | Yes<br>No | 7 (33.3)<br>14 (66.7) | 4 (21.1)<br>15 (78.9) |



**Summary of research populations**

| Variables | Online Community | Emergency Department |
|---|---|---|
| Age at sexual debut | 18 years (28.6%) | 16 years (31.6%) |
| Existing health insurance coverage | Private (57.1%) | Medicaid (47.4%) |
| No source of income | 9.5% | 26.3% |
| Previously had a sexually transmitted infection | 19.0% | 15.8% |
| Lacked a consistent sexual partner | 47.6% | 21.1% |
| Reported two sexual partners | 14.3% | 31.6% |
| Comfort with smartphone use | 38.1% | 52.6% |
| Reported receipt of the HPV vaccine | 14.3% | 21.1% |
| Belief that HPV can be transmitted via skin to skin contact in the genital area | 57.1% | 15.8% |
| Belief that a smartphone based intervention would be effective at improving HPV vaccine uptake | 61.9% | 57.9% |
| Confirmed willingness to participate in a smartphone based intervention | 66.7% | 47.4% |



**Table 2: Bivariate Analysis on willingness to participate in a Smartphone based intervention**

| Independent variable | Stratification | Online | | Emergency Department | |
|---|---|---|---|---|---|
| | | Pearson's $\chi^2$ | P-value | Pearson's $\chi^2$ | P-value |
| Comfort with HPV messages on mobile phone | Not comfortable<br>A little comfortable<br>Somewhat comfortable<br>Comfortable<br>Very comfortable | -- | -- | 16.36 | 0.037* |
| Participants who actually receive the HPV vaccine | Yes<br>No | 1.75 | 0.19 | 5.63 | 0.06* |
| Use of contraception | Yes<br>No | 0.43 | 0.51 | 5.63 | 0.06* |
| Perceived availability of the HPV vaccine, excluding cost as a cofounder | Not likely<br>A little more likely<br>Somewhat more likely<br>More likely<br>Much more likely | 8.23 | 0.08 | 15.31 | 0.053 |
| Comfort with STI (HPV) mobile application on mobile phone | Not comfortable<br>Partially comfortable<br>Comfortable | 4.39 | .11 | 8.02 | .09 |



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## Discussion



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- Significant differences among emergency department participants:
  - Comfort with HPV messages on mobile phone
  - Participants who received the HPV vaccine
  - Use of contraception



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## Based upon costs and research findings…

## The investment is worthwhile because…

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- Innovative:
  - Behavioral science is need of relevant methods to reach populations most adversely affected by STI related epidemics.
- Ease of Use:
  - Members of the target population readily have access to the intervention instrument – smartphones.
- Reasonable costs:
  - Costs of development via a funding mechanism is feasible if employing an app developer as part of the research team at a percent effort.
- Realism surrounding potential for behavior change:
  - The ability to exchange information in 'real time' creates utility of the 'teachable moment', whereby, the transfer of information designed to inform sexual decisions is promptly assessed.



## Q & A

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*Health is a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity.*
–World Health Organization, 1948

D.E.U.C.E.S.

Don't Ever Underestimate Casual Encounters impact on Sexual Health




## Acknowledgement

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