Nationally Representative Estimates of Self-reported Adherence to Antiretroviral Therapy in the United States—Medical Monitoring Project, 2009

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The findings and conclusions presented are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention. The authors declare no conflicts of interest.
Background

- Adherence to antiretroviral therapy (ART) is critical for viral suppression

- Latest clinical guidelines recommend offering ART to all patients regardless of CD4
  - Increase in the number of persons in need of adherence support
  - Adherence may be more challenging for those with no symptoms

- No recent nationally representative U.S. estimates of ART adherence
  - Provides important information on areas for intervention that may improve health outcomes at the population level
Analytic questions

- What percentage of U.S. HIV-infected persons in care self-reported adherence to all ART doses during the past 72 hours?
  - Is self-reported adherence associated with viral suppression?
  - What is the level of use of and need for adherence support services?

- What factors are independently associated with adherence in this population?
Methods

- Analysis of Medical Monitoring Project (MMP) data collected June 2009 - May 2010
  - Ongoing supplemental HIV surveillance system
  - Interviews and medical record data from HIV-infected adults receiving care
    - 16 U.S. states (including 6 separately funded areas) and one territory
  - Three-stage sample design
    - States
    - HIV care-providing facilities
    - HIV-infected adults receiving care
  - Response rates for matched data
    - States = 100%
    - Facilities = 76%
    - Patients = 51%
    - Overall = 39%
Methods

- **Persons included:** MMP participants who reported current ART use and provided complete information about adherence to ART dosing (n = 3,606)

- **Estimated the prevalence of self-reported 100% adherence to ART doses in the past 72 hours (ACTG)**
  - Are you currently taking [INSERT DRUG NAME]?
  - How many times did you miss taking a dose or a set of pills, spoonfuls, or injections of [INSERT DRUG NAME]?
    - Yesterday, the day before yesterday, three days ago
  - If you only took part of your dose, please report this as the whole dose missed.
  - Show medication card to aid recall
### Nucleoside/Nucleotide Analogue Reverse Transcriptase Inhibitors (NRTI)

- **Emtriva**: Lamivudine, 3TC
- **Epivir**: Lamivudine, AZT, ZDV
- **Retrovir**: Didanosine, ddI
- **Videx EC**: Tenofovir, TDF
- **Zerit**: Stavudine, d4T
- **Ziagen**: Abacavir, ABC

### Protease Inhibitors (PI)

- **Aptivus**: Tipranavir, TPV
- **Crixivan**: Indinavir, IDV
- **Invirase**: Saquinavir hard gel capsules, SQV
- **Kaletra**: Lopinavir/ritonavir, LPV/r
- **Lexiva**: Tosaprenavir, FPV
- **Norvir**: Ritonavir, RTV
- **Prezista**: Darunavir, DRV
- **Reyataz**: Atazanavir, ATV
- **Viracept**: Nelfinavir, NFV

### Fixed Dose Combinations

- **Atripla**: TDF/FTC/EFV
- **Combivir**: AZT plus 3TC
- **Epzicom**: ABC plus 3TC
- **Trizivir**: AZT plus 3TC plus abacavir
- **Truvada**: TDF plus FTC

### Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTI)

- **Intelence**: Etravirine, FTV
- **Rescriptor**: Delavirdine, Dlv
- **Sustiva**: Efavirenz, EFV
- **Viramune**: Nevirapine, NVP

### Discontinued Medications or Formulations

- **Agenerase**: Amoprenavir, APV
- **Fortovase**: Saquinavir soft gel capsule, SQV

### Entry Inhibitors

- **Fuzeon**: Enfuvirtide, T-20 Fusion Inhibitor
- **Selzentry**: Maraviroc, MVC

### Integrase Inhibitors

- **Isentress**: Raltegravir, RAL

*Also available in liquid form

Medications current as of 3/08
Methods

- Used modified Rao-Scott chi-square tests to assess the relationship between adherence and
  - Two measures of viral suppression from medical record
    - Recent: most recent viral load undetectable or ≤ 200 copies/ml
    - Durable: all viral loads in past 12 months undetectable or < 200 copies/ml
  - Self-reported use of and unmet need for adherence support services

- Multivariable logistic regression to identify factors independently associated with adherence
  - Backward elimination with p < 0.10 inclusion and p < 0.05 retention criteria

- Analyses accounted for clustering, unequal selection probabilities, and non-response
ADHERENCE, VIRAL SUPPRESSION, AND ADHERENCE SUPPORT SERVICES
Prevalence of Self-Reported ART Adherence and Association with Viral Suppression

<table>
<thead>
<tr>
<th>100% adherent</th>
<th>Yes</th>
<th>No</th>
<th>Total%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Virally Suppressed</th>
<th>Row %</th>
<th>Durably Virally Suppressed</th>
<th>Row %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>82</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

All percentages are weighted.
# Self-Reported Use of and Need for Adherence Support Services Among HIV-infected Adults on ART, past 12 months

<table>
<thead>
<tr>
<th>Adherence support services</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received</td>
<td>20</td>
</tr>
<tr>
<td>Unmet need</td>
<td>2</td>
</tr>
<tr>
<td>Did not receive or need</td>
<td>78</td>
</tr>
</tbody>
</table>

| 100% adherent Row % |
|---------------------|---------|
| Adherence support services | Yes | No | P value |
| Received             | 83    | 17 |          |
| Unmet need           | 46    | 54 |          |
| Did not receive or need | 87   | 13 | <.0001   |

All percentages are weighted.
FACTORS INDEPENDENTLY ASSOCIATED WITH ADHERENCE
Variables Considered for Inclusion in Multivariable Logistic Model

- Age
- Gender
- Race
- Education
- Poverty
- Homelessness
- Incarceration
- Depression
- Stimulant use
- Binge drinking
- Health coverage/insurance
- Years since HIV diagnosis
- One daily dose
- Side effects
- Being sure can take medicine
- Being sure medication has positive effect
- Being sure of resistance if nonadherent
- Social support
## Multivariable Logistic Regression Model of Factors Independently Associated with Adherence, MMP 2009 (1 of 3)

<table>
<thead>
<tr>
<th></th>
<th>Adherent %</th>
<th>Adjusted Prevalence Ratio</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>78</td>
<td>Ref.</td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td>82</td>
<td>1.10</td>
<td>(1.01-1.19)</td>
</tr>
<tr>
<td>40-49</td>
<td>86</td>
<td>1.15</td>
<td>(1.05-1.27)</td>
</tr>
<tr>
<td>50+</td>
<td>88</td>
<td>1.16</td>
<td>(1.07-1.27)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>87</td>
<td>1.04</td>
<td>(1.01-1.07)</td>
</tr>
<tr>
<td>Females</td>
<td>83</td>
<td>Ref.</td>
<td></td>
</tr>
<tr>
<td>Transgender</td>
<td>75</td>
<td>0.97</td>
<td>(0.86-1.09)</td>
</tr>
<tr>
<td><strong>Years since HIV diagnosis</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>89</td>
<td>1.06</td>
<td>(1.02-1.10)</td>
</tr>
<tr>
<td>5-9</td>
<td>86</td>
<td>1.02</td>
<td>(0.98-1.07)</td>
</tr>
<tr>
<td>10+</td>
<td>84</td>
<td>Ref.</td>
<td></td>
</tr>
</tbody>
</table>

Variables included in the model: age, gender, years since HIV diagnosis, depression, stimulant use, binge drinking, once daily ART dosing, side effects, sure can take ART, sure of resistance. All percentages are weighted.
### Multivariable Logistic Regression Model of Factors Independently Associated with Adherence, MMP 2009 (2 of 3)

Variables included in the model: age, gender, years since HIV diagnosis, depression, stimulant use, binge drinking, once daily ART dosing, side effects, sure can take ART, sure of resistance. All percentages are weighted.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No</th>
<th>Yes</th>
<th>Adherent %</th>
<th>Adjusted Prevalence Ratio</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>87</td>
<td>80</td>
<td>1.04</td>
<td>(1.00-1.08)</td>
<td></td>
</tr>
<tr>
<td>Stimulant use</td>
<td>87</td>
<td>70</td>
<td>1.15</td>
<td>(1.09-1.23)</td>
<td></td>
</tr>
<tr>
<td>Binge drinking</td>
<td>88</td>
<td>76</td>
<td>1.11</td>
<td>(1.06-1.16)</td>
<td></td>
</tr>
</tbody>
</table>
### Multivariable Logistic Regression Model of Factors Independently Associated with Adherence, MMP 2009 (3 of 3)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Adherent %</th>
<th>Adjusted Prevalence Ratio</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once daily ART dosing</td>
<td>No</td>
<td>83</td>
<td>Ref.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>88</td>
<td>1.05</td>
<td>(1.02-1.09)</td>
</tr>
<tr>
<td>Troubled by side effects</td>
<td>Never/rarely</td>
<td>87</td>
<td>1.06</td>
<td>(1.01-1.11)</td>
</tr>
<tr>
<td></td>
<td>More than half time</td>
<td>Ref.</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>How sure can take ART as directed</td>
<td>Not at all/somewhat</td>
<td>53</td>
<td>Ref.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Very/extremely</td>
<td>88</td>
<td>1.44</td>
<td>(1.28-1.63)</td>
</tr>
<tr>
<td>Sure of resistance if do not take medications</td>
<td>Not at all/somewhat</td>
<td>79</td>
<td>Ref.</td>
<td>-</td>
</tr>
<tr>
<td>as instructed</td>
<td>Very/extremely</td>
<td>87</td>
<td>1.06</td>
<td>(1.01-1.11)</td>
</tr>
</tbody>
</table>

Variables included in the model: age, gender, years since HIV diagnosis, depression, stimulant use, binge drinking, once daily ART dosing, side effects, sure can take ART, sure of resistance. All percentages are weighted.
Model Summary: Variables Independently Associated with Adherence

- Age
- Gender
- Depression
- Stimulant use
- Binge drinking
- Years since HIV diagnosis
- One daily dose
- Side effects
- Being sure can take medicine
- Being sure of resistance if nonadherent
Limitations

- Adherence measure likely overestimates actual adherence
- Measurement of adherence and viral load were not necessarily contemporaneous
- Lower than optimal response rates, but estimates were adjusted for nonresponse
Conclusions

- High self-reported adherence, but differences between groups
  - Lower among groups studies have shown to have poorer health, lower access to care, and higher levels of sexual risk behaviors

- Multivariable analysis suggests key areas for intervention
  - Targeted programs for youth and females
  - Screen and treat for depression, drug use, and binge drinking
  - Address side effects and minimize daily doses
  - Regularly discuss medication beliefs and increase self-efficacy
Acknowledgments

- MMP facility staff and patients
- MMP Principal Investigators and Project Coordinators
- MMP Provider Advisory Board and Community Advisory Board members
- CDC Clinical Outcomes Team
Thank you!

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