OVERVIEW/OBJECTIVES

DESCRIBE MAJOR RESEARCH FINDINGS CULMINATING IN THE ROAD

- PILOT STUDY RESULTS & 10 YEAR FOLLOW-UP
- 3 PHASES OF CURRENT INVESTIGATION
- MAIN FINDINGS, INCLUDING DEVELOPMENT OF THE ROAD
- INTERPRETATION OF RESULTS
- Q & A

PILOT STUDY (Stones, 1999)

- First series of consecutive, first time admissions to program January 1997- November 1999
- N=37
- Most MMT research deals with program components
- Pilot study shifted focus onto client characteristics
- Retrospective study of predictors of “success” vs. “failure”, as defined by two outcome measures (urinalysis results and parole outcome)
- 50/50 split; stabilize quickly and thrive vs. multiple lapses/breaches, suspensions, new charges, revocation

PILOT STUDY RESULTS

Forward stepwise logistic regression revealed 4 salient predictors:

1) Detected or self-admitted inst drug use (yes/no)
2) Educational/vocational/volunteer status (some/none)
3) CMS (Wisconsin) group membership (4 types, mostly CC vs. LS)
4) # of institutional offence infractions

- Overall classification rate/predictive accuracy = 84%
- 75% successful & 91% failure/revoked group
- Can we predict treatment outcome? YES, using objective measures, quickly/easily located from unobtrusive review of offender/client’s Case Mgt file
- Limitations: small N, low statistical power and limited generalizability of results; significantly larger calibration sample required, with additional predictor variables

CURRENT INVESTIGATION: 2 Studies

- Study 1 - “where are they now” curiosity: 10-year follow-up of n ≥ 37 pilot group of recidivism rates and mortality data; added 37 more cases (1997-2001)
- Mean follow-up time approx 9 years N = 74
- Study 2-main study (N = 170)-correlates of Tx responsivity; MMT clients 1997-2009; responsivity defined 2 ways: forensic urinalysis & release outcome
- Main study designed to refine sensitivity, specificity & basic overall user mechanics of 1999 pilot study predictive instrument
- Modification of pilot study regression equation, to include more predictor variables reflective of offender/clients’ underlying antisociality and rule violation proneness...expressions of criminally-oriented attitudes, values and lifestyle
- Retrospective archival design; post-dictive; isolate variables that reliably differentiate the dichotomous group outcomes (i.e., high vs. low treatment responsivity cohorts)
Study 1 Results (N = 74)

- Recidivism and mortality data: first 74 consecutive admissions 1997-2001
- 18 Success to WED; Revoked = 56
- Mean follow-up 109 months = 9 years
- 55/74 (74.3%) reoffended during follow-up period
- 55/74 (74.3%) were from the Revoked group
- 11/19 (58%) who were crime free from Successful group
- 33/55 (60%) committed violent offences
- 29/33 (87%) by Revoked grp
- Mortality rate overall: 11/74 or 15% (no grp differences)

Main Research Questions: Study 1

- Did the treatment compliant (successful completers) versus non-compliant (revoked) MMT clients from pilot study differ qualitatively and or qualitatively in terms of their detected criminal activity during a 10-year follow up interval post-treatment?
- Pilot 37 + next 37 clients (N = 74) - a resounding YES
- MMT clients revoked 9 years earlier had accumulated:
  - significantly more sentencing dates (5.5 vs 1.9 = .01)
  - incurred more new convictions (10.6 vs 4.4 = .05)
  - higher scores on Cormier-Lang scale-most serious offence (.05)
  - committed more violent offences
  - very strong, positive correlation between release outcome and any recidivism AND violent recidivism –both chi .001

Main MMT Study (Study 2)

- 170 consecutive first-time admissions to MMTP from January 1997-August 2009
- Divided 170 cases along independent/criterion variable of “treatment responsivity”, defined 2 ways:
  a) % of clean urine results: clean vs. dirty/compromised (5 different measures focus on opioids and cocaine)
  b) Release outcome - completion of parole/SR to WED vs. revocation of release (binary success vs. failure)
- Started with 26 dependent (predictor) variables across 7 dimensions, plus 5 outcome measures re: drug compliance (urinalysis results)
- 3 phases: exploratory univariate analyses (t-test and chi-square), forward stepwise logistic regression, confirmatory AUC/ROC

Main Research Questions

1) Do treatment compliant vs. non-compliant MMT clients differ along series of objectively determined static (fixed, historical) and dynamic (fluid, changeable) variables?
2) If so, what are the risk factors (predictor variables) that are differentially associated with treatment/release outcome?
3) Relative weighting or importance of specific predictor variables correlated with positive treatment/release outcome?
   - Can we predict treatment/release outcome?
   - Centrality of predictive paradigm in risk mgt with forensic clientele by focusing on factors / specific behaviours reflecting antisociality, rule violation proneness & social conformity

Predictor Variables

1) Demographic factors = 4 DVs (age; race; marital status; sentence length)
2) MMT program factors = 2 (DAR in MMT program; # urine screens)
3) Drug & alcohol use = 3 (DAST; PRD; ADS; plus 5 MMTP urinalysis results, focusing on illicit opioids & cocaine (outcome measures reflecting MMT treatment compliance)
4) Integrity of social stability/support = 2 (accommodation type; educational/vocational/volunteer status at MMT termination)
5) Institutional comportment = 5 (# institutional infractions; detected inst drug use; admin seg; security level; release type)
6) Personality & behavioural profile = 4 (CMS category; PCL-R Total; PCL-R Factor 1-personality component; PCL-R Factor 2-behavioural)
7) General & violent recidivism = 6 (Offence type; Offence severity (Cormier-Lang); Prior federal sentence; Prior revocation; SR-R1; VRAG, plus release outcome

Aggregate Stats

- N = 170 adult males
  - Age Mean = 37yr; Min = 23; Max = 57; sd = 7yr
  - Average age onset of opioid and/or cocaine use late teens
  - Sent length: Mean = 5.2 yr Min = 2 yr Max = Life (50 yr-age 27 at time of conviction)
  - Schedule 1 (violent) = 121 Sched 2 (property/drugs) = 49
  - Robbery/armed robbery/robbery with violence = 81 (48%)
  - Caucasian = 148 (87%); Native American/Inuit/Metis = 6; Asian/SA = 7; AC/Black = 4; Hispanic = 3
DESCRIPTIVE STATS N=170

- Single = 129 (76%); Married or C/L = 41 (24%)
- 134/170 = 79% on SR/SRR; current rate in GTA is 66%
- First time fed = 101 (59%); Repeat federal = 69 (41%)
- Previously revoked current sentence = 58/170 (34%)
- Resided with family of origin or spouse/children/dependents = 82 (48%)
- Lived alone/non-spousal roommate = 24 (14%)

* = client’s status at MMT termination

DESCRIPTIVE STATS N=170

- Security: Min = 42 (25%) Med = 98 (58%) Max = 30 (17%)
- Admin Seg preceding MMT: Yes = 104 (61%)
- Detected (via urinalysis) inst drug use: Yes = 101 (59%)
- Educational/vocational/volunt status at MMT termination: NIL = 109 (64%), including being on ODSP/disability pension P/T work/school/volunteer = 23 (14%)
- FT = 38 (22%)

ACTUARIAL DESCRIPTIVE STATS N=170

- PCL-R Factor 1 = 8.2 (49 %ile) Min = 0 Max = 16 SD = 3.8
- PCL-R Factor 2 = 13.7 (65%ile) Min = 3 Max = 20 SD = 4.1
- PCL-R Total = 23.4 (55% %ile) Min = 4 Max = 37 SD=7.4
- SIR = 75/170 or 44% in highest risk bin (lowest success rate) & 80% rated as 50% or poorer success rate over 3 yr
- VRAG; 9 risk bins; 0% to 100% chance of violent reoffence < 7 years
- 22% rated low risk; 62% moderate; 16% high risk

MMT URINALYSIS RESULTS N=170

- 12 years of data (forensic urinalysis) collection; 6619 urine samples
- # of urine screens while in MMT: Mean = 39 (span approx 6 months); Range 0-355
- 60 clients totally clean (35%); 105 subjects (62%) clean for opioids; roughly the same (n=106) clean for cocaine metabolites
- VERY low overall rates of detected illicit drug use
- Successful grp mean = approx 60 tests; revoked = 30 tests. .001 Chi sq
- % of total urine screens + for illicit opioids: Mean = 5.5 SD = 12, Range 0-75%
- % total urine screens + for cocaine: Mean = 7.6 SD = 19 Range 0-100%
- Distribution for + pee tests highly positively skewed; Median = 0
- Minority of MMT clients accounted for majority of dirty pee test results

Changing drug use profiles of MMT clients

<table>
<thead>
<tr>
<th>Client/Grouping</th>
<th>% of total urine screens that tested dirty (first exposure)</th>
<th>% of total urine screens that tested dirty (total)</th>
<th>% of total urine screens that tested dirty for illicit opioids and cocaine metabolites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original 37 (1972-95) Mean</td>
<td>12.3493</td>
<td>7.1984</td>
<td>10.3400</td>
</tr>
<tr>
<td>N</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>St Deviation</td>
<td>17.9324</td>
<td>12.3200</td>
<td>18.2700</td>
</tr>
<tr>
<td>Recategorizing 100/1999 2000 Mean</td>
<td>4.5071</td>
<td>5.9933</td>
<td>11.6569</td>
</tr>
<tr>
<td>N</td>
<td>99</td>
<td>99</td>
<td>99</td>
</tr>
<tr>
<td>St Deviation</td>
<td>15.6333</td>
<td>15.1112</td>
<td>20.8275</td>
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<tr>
<td>N</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>St Deviation</td>
<td>29.5808</td>
<td>23.8452</td>
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</tr>
<tr>
<td>Total Mean</td>
<td>5.6318</td>
<td>7.6671</td>
<td>14.5059</td>
</tr>
<tr>
<td>N</td>
<td>178</td>
<td>178</td>
<td>178</td>
</tr>
<tr>
<td>St Deviation</td>
<td>14.4593</td>
<td>13.0592</td>
<td>23.5109</td>
</tr>
</tbody>
</table>

Predicting treatment compliance as defined by urinalysis results

- Looked at various ways of dividing up N=170 into 2 groups based upon urinalysis results...
- Clean vs. any opioids
- Clean vs. any cocaine
- <5% dirty vs. >5% opioids
- <10% vs. >10% opioids
- < mean of 5.5% opioids vs. >5.5% opioids
- < mean of 7.6% cocaine vs. >7.6% cocaine
- ANOVA, Chi-Sq and Pearson R showed statistically significant differences between the 2 groups on # of DVs
- Differences dissolved with stepwise logistic regression
- Only DV entered in model was work/school status
Release Outcome Stats: Odds of revocation 2.4 times that of success

Success Rate

- 50.29% Revoked
- 120, 71% Successful

Release Outcome Analyses-Phase 1

- ANOVA, Chi-Sq and Pearson R showed significant differences between the 2 groups on # of DVs
- 31 pairwise comparisons (Successful vs. Revoked)
- 26 predictor variables, & 5 urinalysis outcome measures
- NO differences re: age, race, sent length, DAR (max # of possible days under supervision: release to WED)
- 20 comparisons were statistically significant
- 13 at p<.001 level; 4 at p<.01; 3 at p<.05

Release Outcome Results-Phase 1

- Revoked group disproportionately single, half-way house residents who did not work or go to school on release
- Pre-release, they had higher rates of inst drug use, admission to admin seg, and inst offence infractions
- Revoked group higher rate of statutory (vs. conditional) release, particularly from maximum security facilities
- Revoked group disproportionately serving time for violent offences, belonged to LS CMS group, and higher risk measure profile (PCL-R, SIR-R1 and VRAG)
- On release, higher rates of illicit drug use & crim charges

PCL-R Factor 1, 2 and Total scores Successful vs. Revoked groups

<table>
<thead>
<tr>
<th>Factor</th>
<th>Successful Mean</th>
<th>Revoked Mean</th>
<th>Total Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>6.2 vs. 9.0 ***</td>
<td>11.3 vs. 14.6 ***</td>
<td>18.9 vs. 25.3 ***</td>
</tr>
<tr>
<td>Factor 2</td>
<td>11.3 vs. 14.6 ***</td>
<td>14.6 vs. 25.3 ***</td>
<td>23.3 vs. 33.5 ***</td>
</tr>
<tr>
<td>Total</td>
<td>18.9 vs. 25.3 ***</td>
<td>25.3 vs. 33.5 ***</td>
<td>42.2 vs. 58.8 ***</td>
</tr>
</tbody>
</table>

Note: Revoked vs successful all p< .001

PCL-R scores: Successful, Revoked & Total, all comparisons p<.001

SUCCESSFUL to WED n = 50
- Worked/school 36 = 72% ***
- PCL-R 1 = 6.2 vs. 9.0 ***
- PCL-R 2 = 11.3 vs. 14.6 ***
- PCL-R Total = 18.9 vs. 25.3 ***
- Fewer Inst charges (38% vs. 5%) ***
- 2% max ; 42% min security ***
- Detected inst drug use 34% ***
- Admin segregation (42%) ***
- 52% on conditional release**, where revocation rate was <5%

REVOKED n = 120
- Due to technical violations = 93 (77%)
- Due to new charges & TVs = 27 (23%)
- No work/school (95 % = 79%)
- ↑ PCL-R 1, 2 and Total
- ↑ Inst infractions (77% > 5)
- ↑ 1 security (24% max . , 17% min)
- ↑ Inst drug use (70%)
- ↑ rate of admin seg (50%)
- ↑ VRAG* & lower (worse) SIR** scores
- Predominantly SR (134/170); Revocation rate among SR=75% (101/134)
RELEASE OUTCOME (Phase 2)

Forward stepwise logistic regression
1) Step 1 - Work/school status (dynamic) – Odds ratio 15.5
2) Step 2 - Institutional drug use (static)
3) Step 3 - PCL-R Total (primarily static)
4) Step 4 - Days at Risk in MMT (static)
5) Step 5 - Security level of releasing institution (static)

Estimated effect size of final model = .55; Wald ch-square p<.001

Correct prediction rate:
- 72% for successful completion to WED
- 95% for revoked (irrespective of reason)
- 88.2% overall classification accuracy

Classification Table with PCL-R-Total in equation
**Table 20**

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Significance (p-values)</th>
<th>Odds Ratio (Success)</th>
<th>Odds Ratio (Revocation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.92</td>
<td>1.07</td>
<td>21.12</td>
<td>1</td>
<td>.000</td>
<td>136.38</td>
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<tr>
<td>Work/School (1=Yes)</td>
<td>2.74</td>
<td>0.52</td>
<td>27.91</td>
<td>1</td>
<td>.000</td>
<td>15.499</td>
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</tr>
<tr>
<td>Institutional Security Level</td>
<td>7.88</td>
<td>2.019</td>
<td>8.88</td>
<td>2</td>
<td>.003</td>
<td>25.533</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>0.34</td>
<td>1.20</td>
<td>0.36</td>
<td>1</td>
<td>.547</td>
<td>1.035</td>
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<tr>
<td>Medium</td>
<td>0.97</td>
<td>0.57</td>
<td>2.94</td>
<td>1</td>
<td>.087</td>
<td>2.638</td>
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</tr>
<tr>
<td>Institutional drug use (1=No)</td>
<td>1.01</td>
<td>0.47</td>
<td>4.59</td>
<td>1</td>
<td>.032</td>
<td>2.746</td>
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<tr>
<td>PCL-R Total</td>
<td>0.08</td>
<td>0.04</td>
<td>4.99</td>
<td>1</td>
<td>.026</td>
<td>1.083</td>
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</tr>
<tr>
<td>Days at Risk (DAR)</td>
<td>0.002</td>
<td>0.00</td>
<td>9.84</td>
<td>1</td>
<td>.002</td>
<td>1.002</td>
<td></td>
</tr>
</tbody>
</table>

Note. a Compared to Minimum

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**Logistic Regression Model: Odds ratios**

- Odds ratio of chance is 50:50, or 1; odds ratio of 3 is large
- Work/school status had extremely large, positive association with parole outcome: odds ratio = 15.5
- Security level: Min. 25 times more likely success than Max
- PCL-R: every 1 point increase decreased success 8%
- DAR: each day increased odds of revocation by 0.2%
- Inst drug use: No use increased odds of success 2.7 times

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**Logistic Regression Model: Algorithm for ROAD**

- Odds [success on parole or SR] = exp [log odds], ergo

- Log odds [chance of success on parole or SR] = \(4.92 + 2.74\) (if working/attending school) - 3.24 (if released from maximum security) \([-0.97\) (if released from medium security)] + 1.01 (if no institutional drug use) – (0.08 x Total PCL-R score) – (0.002 x number of days at risk)

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**ROAD Decision Rules**

- ROAD formula yields a number (log odds); compute exponent of that number
- If that statistic < 1, odds are guy will be revoked
- If number > 1, odds are guy will successfully reach WED
- High the number, better the odds of success
- Risk multipliers" - client’s standing on one or more of the 5 factors can drastically change odds of outcome

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**ROAD EXAMPLE 1**

**Scenario 1**

- We have a person who, upon release, is NOT working or going to school, DID use drugs while incarcerated, was released from MEDIUM security, his PCL-R score is 24, and he has 365 days at risk. The odds of successful completion of parole/SR for this person are computed as follows:

  \[
  \text{Log odds [chance of success on parole or SR]} = 4.92 - 0.97 - 0.08 \times 24 - (0.002 \times 365) = 1.30
  \]

  Odds [success on parole or SR] = exp [1.30] = 3.67
  This guy is 3.67 times more likely to succeed on parole/SR than to be revoked.
**ROAD EXAMPLE 2**

**Scenario 2**
- Individual with identical characteristics, but he **DOES** work or attend school; odds of his success on release become:
  - Log odds [chance of success on parole or SR] = 4.92 + 2.74 - 0.97 - (0.08 x 24) - (0.002 x 365) = 4.04
  - Odds [success on parole or SR] = exp [4.04] = **56.82**
- This guy is **56.82 times** more likely to successfully complete his period of community supervision than to be revoked. Odds of success improved by approximately 15 times simply by the change in work/school status.

**ROAD EXAMPLE 3**

**Scenario 3**
- Next, person with similar characteristics to previous scenario, but he was released from the **MAXIMUM** security facility, the odds of his success are:
  - Log odds [chance of success on parole or SR] = 4.92 + 2.74 - 3.24 - (0.08 x 24) - (0.002 x 365) = 1.77
  - Odds [success on parole or SR] = exp [1.77] = **5.87**
- This guy is **5.87 times** more likely to succeed on release than to be revoked. But, **being released from maximum security facility reduced odds of success by almost 10 times** compared to previous person; only change was security level (maximum versus minimum) of releasing institution.

**ROAD EXAMPLE 4**

**Scenario 4**
- Finally, person with similar characteristics to previous two cases but released from **MINIMUM** security:
  - Log odds [chance of success on parole or SR] = 4.92 + 2.74 - (0.08 x 24) - (0.002 x 365) = 5.01
  - Odds [success on parole or SR] = exp [5.01 ] = **149.90**
- This guy almost **150 times** more likely to succeed on release than be revoked (for 150 chances of successful completion until WED, only 1 chance of revocation).
- **3 times** more likely to succeed compared to guy with similar characteristics but released from medium security, and **30 times** more likely to succeed than his maximum security counterpart.

**ROAD-Reference Points**

- **Area Under Curve (AUC) or C (concordance) statistic**
  - Gives you integrated, non-parametric statistic that speaks to specificity and sensitivity simultaneously...unlike Stepwise Logistic Regression
  - Value varies from 0-1; < 0.5 signifies inverse relationship; 0.5 (discriminating power not better than chance) to 1.0 (perfect discriminating power)
  - The area under the ROC curve (AUC) is a way to compare classifiers
  - **Perfect classifier has an AUC of 1.0 and a completely bogus (random) classifier has an AUC of 0.5**
  - Industry standards for best actuarial risk assessment instruments (PCL-R, VRAG, HCR-20 and LSI-R) in .75 range
  - **Our AUC, based on predicted probabilities for 5-step forward stepwise logistic regression was .899...excellent sensitivity & specificity**

**2015 Cross Validation of ROAD**

- Consecutive admissions 2012-13 ; N = 100, post-dictive
  - Dr. Joelle Mamuza 16/21 = 76.1%*
  - Dr. Tania Stirpe 20/24 = 83.3%*
  - Me (first pull) 30/36 = 83.3%
  - Me (second pull) 17/19 = 89.5%
- Overall classification accuracy 83/100 = 83%
- * caveats/limitations of ROAD target population
**MAIN FINDINGS STUDY 1**

- High mortality rate (15%) of MMT clients post-WED
- Revocation = negative trajectory for next decade
- Revocation = significantly higher rates of recidivism
- More serious offences
- & more violent recidivism

**POINTS TO CONSIDER**

- CBT programs-deficit based; abstract concepts to persons with low average IQ, low literacy skills (Gr 6-8) & poor academic Hx
- What if we reframed CBT programs-reflection of change rather than vehicle for change; elaborate screening tool of risk
- Work/school - strength-based & putting the “B” back in CBT IQ-How good a fit is CBT for average forensic client?
- What does treatment compliance really mean?

**MAIN FINDINGS STUDY 2**

- Can predict release outcome: YES-88% accuracy
- High sensitivity (89%) & specificity (86%)
- 90% confidence (AUC/ROC analysis)
- Work/school best predictor of release outcome
- Protective factor: Dynamic; makes intervention possible; Risk assessment vs Risk mgt
- No work/school a proxy for anti-sociality/risk

**Advantages of the ROAD**

- 1) Pragmatic, intuitive and face valid; easily understood; "makes sense"
- 2) Has strong theoretical basis – Andrews and Bonta’s Big 4, Maruna, Roger Boe, Christine Gillis, Urban Institute
- 3) Work/school factor that drives the robust predictive model is dynamic and bi-directional, thus provides intervention target
- 4) Strength-based and within client’s sphere of control

**Main Findings Study 2**

1) Stability of model shows centrality of work/school as predictor of release outcome
2) Changing drug use profiles of MMT clients-moving target
3) Significant reduction in risk-taking behaviour while in MMT, most notably greatly reduced illicit opioid use (62% clean), moderated cocaine use (also 62% clean) and low rates of crime
4) Yet high rate (71%) of revocation…Incompatibility of abstinence-based decision making model versus harm reduction program delivery models
5) Emergence of the ROAD as a useful predictor of release outcome
Advantages of the ROAD

5) Case-based, thus truly psychometric, not sociometric
6) Focuses on time client is under sentence, not beyond
7) Economical to administer, compute and communicate the results to client and decision-makers; only 5 factors
8) Strong psychometric properties; high predictive accuracy, sensitivity, specificity, PPP and NPP
9) Works with broad range of adult male offenders

CONCLUDING REMARKS

1. Empirical support for MMT efficacy to WED
2. Incompatibility of harm reduction and abstinence-based decision making models
3. Revocation a meaningful indicator of rate and type of recidivism over extended timeframes
4. Practical illustration of user friendly screening algorithm for case-based prediction of release outcome
5. The value in multi-method assessment of treatment needs, given limitations of currently used substance abuse questionnaires (DAST, PRD, ADS-low validity/reliability)

CONCLUDING REMARKS

6. Longitudinal design illustrates important changes in drug use profiles of MMT clients over time
7. Speaks to the value in a strength-based correctional intervention focused on educational & vocational initiatives
8. Work/school example of desistance signalling
9. Highlights that a blend of static and dynamic factors are most predictive
10. Need to control for risk in forensic research
11. ROAD limitations: ill suited for long term, low functioning clients, particularly in CRFs/CCCs (minimum security)

Future Directions

• Flesh out the issue of education/employment being key to offender success, tie in work in desistance signalling by Maruna
• Roger Boe’s work from CSC re: the relationship between educational upgrading and reduced recidivism rates
• Christa Gillis and associates at Carleton on value in work initiatives for CSC clients
• Re-entry research from Urban Institute showing relationship between work and recidivism for offenders in the US
• Pilot study employing screening algorithm for prediction of release outcome using different offender populations