• The Global Mosaic: RADARS System International Program Updates
  – Jody L. Green, PhD, CCRP
  – Director – Canadian Consumer Products & Pharmaceutical Safety, Inc

• Opioid Surveillance and Policy Evaluation: A Canadian Perspective
  – Tara Gomes
  – Scientist – St. Michael’s Hospital
• Comparative Assessments of the Prescription Drug Abuse Climate in the European Union and the United States: Scientific, Regulatory, and Cultural Factors
  – Scott P. Novak, PhD
  – *Director and Senior Research Scientist, Substance Abuse Research and Treatment, Public Health Center – Battelle Memorial Institute*

• Cross-border Trafficking of Prescription Oxycodone Products Manufactured in Canada
  – Richard Dart, MD, PhD
  – *President – Canadian Consumer Products & Pharmaceutical Safety, Inc.*

• Networking Welcome Reception
Which region’s prescription drug abuse trends are you most interested in hearing about?

- Australia
- Canada
- Europe
- Asia

- I thought we were here to talk about Marijuana in Colorado
2015 International Pre-Symposium

Which region’s prescription drug abuse trends are you most interested in hearing about?

<table>
<thead>
<tr>
<th>Region</th>
<th>Percent of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>43</td>
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<tr>
<td>Canada</td>
<td>30</td>
</tr>
<tr>
<td>Marijuana in CO</td>
<td>13</td>
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<tr>
<td>Australia</td>
<td>10</td>
</tr>
<tr>
<td>Asia</td>
<td>5</td>
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</tbody>
</table>
The Global Mosaic: RADARS® System
International Program Updates
11 May 2017

Jody L. Green, PhD, CCRP
Canadian Consumer Products & Pharmaceutical Safety, Inc.
RADARS International Program Development

- **2007**: Global Toxicosurveillance Network (GTNet) Program
- **2012**: StreetRx (CA)
- **2012**: EUROPAD
- **2013**: StreetRx (UK, EU)
- **2014**: Survey of Non-Medical Use of Prescription Drugs (UK)
- **2014**: Web Monitoring
- **2014**: Drug Diversion (CA)
- **2015**: SKIP (CA)
- **2016**: Survey of Non-Medical Use of Prescription Drugs (US, CA)

**Coming Soon!**
- **2017**: Survey of Non-Medical Use of Prescription Drugs (EU)
International RADARS® System
Mosaic Approach

GTNet
Global Toxicosurveillance Network

Acute Events Reported to PCs

NMURx
Non-Medical Use of Prescription Drugs

General Population

EUROPAD/SKIP
Patients in Treatment

Drug Diversion
Criminal Activity

Street Rx
Street Price Users/Buyers

Web Monitoring
Active Internet Users

International RADARS® System
Mosaic Approach
Mosaic Surveillance of Prescription Drug Abuse in Canada
# Programs in Canada

<table>
<thead>
<tr>
<th>Program</th>
<th>Status</th>
<th>Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian Poison Centre Network</td>
<td>In development</td>
<td>Anticipated 2Q2017</td>
</tr>
<tr>
<td>Survey of Non-Medical Use of Prescription Drugs</td>
<td>Launched</td>
<td>3Q2016</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PI: Jody Green, PhD, CCRP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Site PI: Beth Sproule, PharmD</td>
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<tr>
<td>Survey of Key Informants’ Patients</td>
<td>Launched</td>
<td>4Q2015</td>
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<tr>
<td></td>
<td></td>
<td>PI: Ted Cicero, PhD</td>
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<tr>
<td>Drug Diversion</td>
<td>Launched</td>
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<td></td>
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<td>PI: Steve Kurtz, PhD</td>
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<tr>
<td>StreetRx</td>
<td>Launched</td>
<td>English Language Website: 1Q2012</td>
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<td></td>
<td></td>
<td>French Canadian Website : 4Q2014</td>
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<tr>
<td></td>
<td></td>
<td>PI: Nabarun Dasgupta, PhD</td>
</tr>
<tr>
<td>Web Monitoring</td>
<td>Launched</td>
<td>1Q2014</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PI: Jody Green, PhD, CCRP</td>
</tr>
</tbody>
</table>
IMS Canada – Standard Units per Population

![Graph showing the standard units per population for various opioids from 2011 to 2016.](image-url)
Drug Diversion Program

• **Population**
  – Law enforcement officials reporting prescription drug diversion activity

• **Definition/Type of Cases**
  – Surveys of participating agents reporting new cases open during the specified study period by specific active ingredients and products

• **Methodology**
  – Law enforcement officials complete a standard questionnaire on a quarterly basis to indicate the number of new cases opened during the study period that involved each specific drug or drug product

• **Key Measures**
  – Number of new cases open (product specific)
  – Geographical location of each case
  – Street price paid in local currency (product specific)
Drug Diversion Program Cumulative Rates (per 100,000 Population) in Canada

1 October 2014 through 30 September 2016

<table>
<thead>
<tr>
<th>Drug</th>
<th># of Mentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxycodone</td>
<td>262</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>318</td>
</tr>
<tr>
<td>Buprenorphine</td>
<td>23</td>
</tr>
<tr>
<td>Codeine</td>
<td>65</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>181</td>
</tr>
<tr>
<td>Morphine</td>
<td>69</td>
</tr>
</tbody>
</table>
Drug Diversion Program Cumulative Rates (per 100,000 Standard Units) in Canada

1 October 2014 through 30 September 2016

Rate per 100,000 Standard Units

oxycodone hydromorphone buprenorphine codeine fentanyl morphine
Survey of Key Informants’ Patients Program (SKIP)

• **Population**
  – Patients entering treatment for opioid addiction

• **Definition/Type of Cases**
  – Self-reported use of prescription or illicit opioids “to get high” in the past 30 days

• **Methodology**
  – Patients entering treatment for opioid addiction are asked to voluntarily complete the questionnaire

• **Key Measures**
  – Gender, age, substance abuse treatment history, primary drug used “to get high,” source of primary drug acquisition and routes of abuse
  – Endorsement of drugs “to get high” in the past month (product-specific)
  – Route of abuse (chewed, snorted, smoked, injected)
SKIP Program Cumulative Rates (per 100,000 population) in Canada

1 January 2016 through 30 September 2016

- Oxycodone: 2.787
- Hydromorphone: 1.384
- Buprenorphine: 0.692
- Codeine: 0.692
- Fentanyl: 0.692
- Morphine: 0.692
SKIP Program Cumulative Rates (per 100,000 Standard Units) in Canada

1 January 2016 through 30 September 2016
SKIP Program Cumulative Proportions in Canada

1 January 2016 through 30 September 2016

Percentage of Respondents

- Codeine
- Fentanyl
- Heroin
- Hydromorphone
- Morphine
- Oxycodone
Distribution of Route of Abuse

- >60% chew codeine
- ~50% smoke fentanyl
- ~50% inject hydromorphone and/or morphine
- ~50% chew oxycodone
StreetRx Program
http://streetrx.com/canada

• Population
  – Any person with access to the internet

• Definition/Type of Cases
  – Utilize crowdsourcing methodology to calculate average price of specific prescription drug in particular location

• Methodology
  – Street price information is voluntarily submitted to the open access websites

• Key Measures
  – Date of submission
  – Geographical locator (country, state/province, city)
  – Drug/drug product purchased (product specific)
  – Amount and price paid for purchase
StreetRx Program Combined Number of Submissions in Canada (1q2012-4q2016)

Prince Edward Island is included in this map but is too small to be visible
StreetRx Program Number of Reports Over Time by Drug Substance in Canada

Number of Reports

- Buprenorphine
- Hydrocodone
- Hydromorphone
- Morphine
- Oxycodone

Years:
- 2011 to 2016
StreetRx Program Price per Milligram in Canada (1q2012 – 4q2016)

<table>
<thead>
<tr>
<th>Prescription</th>
<th>N</th>
<th>Median $ CAD (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxycodone</td>
<td>537</td>
<td>$1.00 ($0.50, $1.35)</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>1,174</td>
<td>$2.50 ($1.25, $3.75)</td>
</tr>
<tr>
<td>Buprenorphine</td>
<td>23</td>
<td>$3.13 ($1.25, $4.38)</td>
</tr>
<tr>
<td>Codeine</td>
<td>75</td>
<td>$0.13 ($0.05, $0.20)</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>16</td>
<td>$7.86 ($2.87, $11.26)</td>
</tr>
<tr>
<td>Morphine</td>
<td>118</td>
<td>$0.50 ($0.27, $1.00)</td>
</tr>
</tbody>
</table>
Survey of Non-Medical Use of Prescription Drugs Program (NMURx)

• Population
  – General population subscribed to an online survey panel (age 15+ years)

• Definition/Type of Cases
  – Non-medical use of prescription drugs
    • Non-medical use: without a doctor’s prescription or for any reason other than what was recommended by your doctor

• Methodology
  – Survey administration company invites members
  – 10,000 target enrollment reached ~7-10 days

• Key Measures
  – General use and non-medical use of prescription drugs
  – Reason for non-medical use (e.g. treat pain, to get high, curiosity)
  – Routes of non-medical use by product endorsed
  – Source of drug acquisition and price paid if purchased through illegitimate channels
Opioids, Benzos, and Stimulants… Oh My!

3Q 2016 Launch

Prevalence (95% CI)

- **Opioids**
- **Benzodiazepines**
- **Stimulants**

**Lifetime Use**

**Lifetime NMU**

**Last 90 day NMU**
Opioids, Benzos, and Stimulants… Oh My!

3Q 2016 Launch

Prevalence (95% CI)

- Opioids
- Benzodiazepines
- Stimulants

Lifetime NMU

Last 90 day NMU
Prevalence of Lifetime NMU and Last 90 Day NMU

3Q 2016 Launch

![Bar chart showing the prevalence of lifetime and last 90-day NMU for various opioids.](chart.png)
Canada Summary

- Hydromorphone appears to be an increasing risk (but has a long history in Canada), particularly with snorting and injection
- Each opioid appears to have a preferred route of ingestion in this sample
  - Chew: codeine, oxycodone
  - Injection: heroin, hydromorphone, morphine
  - Smoking: fentanyl
European Mosaic
Europe – Dosage Units per Population

Graphs showing the dosage units per population for different countries and drugs from 2011 to 2016:

- **France**
- **Germany**
- **Italy**
- **Spain**
- **Uk**

Drugs included in the graphs:
- Buprenorphine
- Codeine
- Fentanyl
- Hydrocodone
- Hydromorphone
- Methadone
- Morphine
- Oxycodone
- Sufentanil
- Tapentadol
- Tramadol
Primary Drug Used to Get High in Past Month

Prescription Opioids and Herion

Oxycodone
Tramadol
Methadone
Morphine
Morphine
Codeine
Buprenorphine
Heroin

Percent Respondents
0% 5% 10% 15% 20% 25%
France GTNet–Adult Human Exposures to Opioids

France Intentional Opioid Rate per 100,000 Population

Rate per 100,000 Population

Year-Quarter

20121  20122  20123  20124  20131  20132  20133  20134  20141  20142  20143  20144  20151  20152  20153  20154
France GTNet–Adult Human Exposures to Opioids

![Bar chart showing frequency of opioid exposure routes: Inhalation/Nasal, Oral, Parenteral, Unknown Route. The Oral route has the highest frequency, followed by Parenteral and Unknown Route.](chart.png)
France Summary

- Codeine and tramadol by far the most utilized, most other opioids increasing
- Patients entering substance abuse treatment most often report heroin and buprenorphine as their primary drug of abuse
  - Sniff/smoke primary drug 42%
  - Inject primary drug 34%
- Decreasing exposures reported to poison centres
Europe – Dosage Units per Population

France

Germany

Italy

Spain

Uk

Legend:
- Buprenorphine
- Codeine
- Fentanyl
- Fentanyl
- Hydrocodone
- Hydromorphone
- Methadone
- Morphine
- Oxycodone
- Sufentanil
- Tapentadol
- Tramadol
Primary Drug Used to Get High in Past Month

- Tramadol
- Morphine
- Buprenorphine
- Methadone
- Heroin

Percent Respondents

Germany - EUROPAD
Germany - EUROPAD

Route of Primary Drug

- Other
- Injected
- Dermal
- Sniffed/Snorted
- Smoked
- Dissolved in Mouth
- Chewed
- Swallowed

0% 10% 20% 30% 40% 50% 60%
Germany GTNet–Adult Human Exposures to Opioids

Germany Intentional Opioid Rate per 100,000 Population

Rate per 100,000 Population

Year-Quarter

20121 20122 20123 20124 20131 20132 20133 20134 20141 20142 20143 20144 20145 20146 20151 20152 20153 20154
Germany GTNet–Adult Human Exposures to Opioids

The bar chart shows the frequency of different routes of opioid exposure. The routes are categorized as:

- Inhalation/Nasal
- Oral
- Parenteral
- Transdermal
- Unknown Route

The chart indicates that the Oral route is the most common, followed by Parenteral and Inhalation/Nasal. TheUnknown Route category has the least frequency.
Germany Summary

- Oxycodone and hydromorphone utilization increasing
- Patients entering substance abuse treatment most often report heroin, benzodiazepines as their primary drug of abuse
  - Smoking and injection reported by ~22-26%
## Europe – Dosage Units per Population

<table>
<thead>
<tr>
<th>Year</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Spain</th>
<th>Uk</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td><img src="image1" alt="Graph" /></td>
<td><img src="image2" alt="Graph" /></td>
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<td>2016</td>
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<td><img src="image3" alt="Graph" /></td>
<td><img src="image4" alt="Graph" /></td>
<td><img src="image5" alt="Graph" /></td>
</tr>
</tbody>
</table>

**Legend:**
- Buprenorphine
- Codeine
- Fentanyl
- Oxycodone
- Tapentadol
- Tramadol
- Hydromorphone
- Methadone
- Morphine
- Sufentanil
- Hydrocodone

*Note: The graph shows the dosage units per population for selected countries in Europe from 2011 to 2016.*
Primary Drug Used to Get High in Past Month

- Methadone
- Oxycodone
- Tramadol
- Heroin

Percent Respondents
**Italy - EUROPAD**

**Route of Primary Drug**

- **Other**
- **Injected**
- **Dermal**
- **Sniffed Snorted**
- **Smoked**
- **Dissolved in Mouth**
- **Chewed**
- **Swallowed**
Italy GTNet–Adult Human Exposures to Opioids

![Bar chart showing frequency of different opioid routes: Inhalation/Nasal, Oral, Other Route, Parenteral, Transdermal, Unknown Route. The Oral route has the highest frequency.]
Italy Summary

- Codeine most commonly utilized opioid, oxycodone utilization increasing
- Patients entering substance abuse treatment most often report heroin as their primary drug of abuse
  - Smoking reported most often (49%)
  - Injection reported by ~27%
Europe – Dosage Units per Population
United Kingdom - EUROPAD

Primary Drug Used to Get High in Past Month

- Hydrocodone
- Oxycodone
- Morphine
- Methadone
- Buprenorphine
- Tramadol
- Codeine
- Heroin

Percent Respondents
United Kingdom - EUROPAD

Route of Primary Drug

- Other
- Injected
- Dermal
- Sniffed Snorted
- Smoked
- Dissolved in Mouth
- Chewed
- Swallowed
UK GTNet–
Adult Human Exposures to Opioids

Uk Intentional Opioid Rate per 100,000 Population

Rate per 100,000 Population

Year-Quarter

20121 20122 20123 20124 20131 20132 20133 20134 20141 20142 20143 20144 20151 20152 20153 20154
UK GTNet—Adult Human Exposures to Opioids

![Bar chart showing frequency of different routes of opioid exposure.]

- **Inhalation/Nasal**
- **Multiple Routes**
- **Oral**
- **Parenteral**
- **Unknown Route**

**Routes**

**Frequency**

- 0
- 50
- 100
- 150
- 200
- 250
United Kingdom Summary

• Codeine most commonly utilized opioid, morphine utilization increasing

• Patients entering substance abuse treatment most often report heroin and codeine as their primary drug of abuse
  – Smoking reported most often (46%)
Europe – Dosage Units per Population
EUROPAD – Primary Drug Used to Get High
EUROPAD – Primary Prescription Drug Used to Get High
Assembling the Mosaic

- UK and France endorsements match dispensing
- Fentanyl and morphine in Spain were endorsed more frequently than expected by dispensing
- While oxycodone use is increasing in Germany, endorsements were low, but methadone was endorsed more than expected
- But in Italy, the increase in oxycodone dispensing is reflected in treatment centre endorsements
A mosaic approach to surveillance provides valuable insight from multi-dimensional perspectives.

Each of the programs presented target different facets of prescription opioid abuse, misuse, and diversion.

While magnitude and patterns vary, heroin, THC, prescription opioids and benzodiazepines commonly abused/misused in many countries.
Questions?

Jody.Green@rmpdc.org