Working Specifications for Initial Measurements Under ESHB 1774 and SSHB 1566

Joseph Mienko[1]

[1]Partners for Our Children, School of Social Work
University of Washington, Seattle, Washington

1. Safety

1.1. Safety Concerns

1.1.1. Incidence Rate of Referrals (IRR)

The incidence of reports of household safety concerns (IRR) shall be defined as the total number of first referrals to Children's Administration (CA) per month, per 1,000 households with own children under the age of 18 as defined by the US Census. This measure will focus only on those referrals aledging child maltreatment or an eminent risk of serious harm to the child. This rate shall be calculated simply by

$$IRR = (I_R \div P_{H<18}) \cdot 1,000 \tag{1}$$

where I_R represents the total number of first referrals occuring during the month and $P_{H<18}$ the number of households with own children under the age of 18 as defined by the US Census. To the extent that estimates are available, values of $P_{H<18}$ (and subsequent measures of the general population used in this document) shall be calculated from the following sources in order of priority:

1. US Census,
2. American Community Survey (ACS),
3. Office of Financial Management (OFM), and
4. Linear interpolation taking the above estimates as "True" values.

1.1.2. Finding Rate (FR)

The rate of household findings (FR) shall be defined as the monthly total number of first findings of child-abuse or neglect per 1,000 referrals to CA with no prior history of a founded allegation of child abuse or neglect. This measure will focus only on those referrals aledging child maltreatment or an eminent risk of serious harm to the child and will be calculated at the household level. A household is considered to have a finding if any allegation from a given referral is founded. This rate shall be calculated as

$$FR = (F \div I_{R_{NPF}}) \cdot 1,000 \tag{2}$$

where F represents the total findings occuring during the month among referrals for households with no previous finding ($I_{R_{NPF}}$).

1.2. Recurrence of Safety Concerns

1.2.1. Second-Order Rereferral Rate (RRR_2)

In measuring rereferrals, it is important to distinguish between first referrals (IR_S) and rereferrals. In general, those households that experience at least one referral to the child welfare system are at an increased risk of rereferral. As such, there is interest in distinguishing between first and higher order referrals (e.g. second referrals, third referrals, etc.).

The order-specific rereferral rate is defined as the number of referrals of a given order during a month per 1,000 households with own children under the age of 18. The formula for the first referral is given in formula 13. The formula for ith order rereferral rates is

$$RRR_i = \frac{I_{R_i}}{P_{i-1PR<18}} \cdot 1,000 \tag{3}$$

where I_{R_i} represents the total number of ith order rereferrals and $P_{i-1PR<18}$ represents the number of $ith-1$ order referrals in which all children in the household are still under the age of 18. At this time, it is proposed that only second-order rereferrals (RRR_2) be used as measures under 1774. Future reports may include higher-order rereferrals.

1.2.2. Second-Order Refinding Rate (RFR_2)

Similarly to rereferrals, those households that experience at least one finding (FR) to the child welfare system are at an increased risk of refinding. As such, there is interest in distinguishing between first and higher order referrals (e.g. second referrals, third referrals, etc.).

The order-specific refinding rate is defined as the number of findings of a given order during a month per 1,000 households with own children under the age of 18 who have received $i-1$ prior referrals. The formula for the first referral is given in formula 16. The formula for ith order rereferral rates is

$$RFR_i = \frac{I_{F_i}}{P_{i-1PF<18}} \cdot 1,000 \tag{4}$$

where I_{F_i} represents the total number of ith order refindings and $P_{i-1PF<18}$ represents the number of $ith-1$ order findings in which all children in the household are still under the age of 18. As with rereferrals, it is proposed that only second-order refindings (RFR_2) be used as measures under 1774. Future reports may include higher-order refindings.

1.3. Placement in Out-Of-Home Care

1.3.1. Incidence Rate of Placement (IRP)

The incidence of placement into out-of-home care (IRP) shall be defined as the monthly total number of referrals to Children's Administration per 1,000 persons under the age of 18. This rate shall be calculated simply by

$$IRP = (I_P \div P_C) \cdot 1,000 \tag{5}$$

where I_P represents the total number of placements occuring during the month and P_C the number of children under the age of 18 in the general population. To the extent that estimates are available, values of P_C shall be calculated from the same sources and order of priority as in P_H above.

1.3.2. Placement Rate (PR)

The rate of placement (PR) shall be defined as the monthly total number of first placements per 1,000 referrals to CA with no prior history of a placement in the household. For consistency with previous measurements, this measure will focus only on those referrals aledging child maltreatment or an eminent risk of serious harm to the child and will be calculated at the household level. A household is considered to have a placement if any child associated with the home on a given referral is placed into out-of-home care. This rate shall be calculated as

$$PR = (P \div I_{R_{NPP}}) \cdot 1,000 \qquad (6)$$

where P represents the total placements occuring during the month among referrals for households with no previous placement ($I_{R_{NPP}}$).

1.4. Maltreatment in Foster Care

1.4.1. Foster Care Finding Rate ($_{FC}FR$)

The final safety measurement concerns the rate of findings per day of foster care. This is the first "care-day" measurement proposed in this document - measurements in which the denominator is a count of days of out-of-home care for some population as opposed to a count of some type of person. The Foster-Care Finding Rate ($_{FC}FR$) follows the similarly named proposed CFSR measurement where $_{FC}FR$ is defined as

$$_{FC}FR = \frac{_{FC}I_F}{c} \cdot 100,000 \qquad (7)$$

where c represents the total number of care days provided by CA in a given year and $_{FC}I_F$ represents the number of maltreatment findings for children in out-of-home care over that period. This measurement excludes children in foster care for less than 8 days and also excludes reports made within the first 7 days of the referral.

2. Permanency

2.1. Time to Permanence

2.1.1. Percentage of Children Remaining in Care After 1 Year ($_P\hat{S}(365)$)

This measurement is similar to the proposed CFSR measurement requiring exit to permanency within 12 months. However, instead of calculating a specific percentage, we propose that a Kaplan-Meier estimator be used to better account for right censoring of children who either age-out of the system or exit to a form of permanency other than adoption, reunification, or some form of guardianship.

The Kaplan-Meier estimator for a federally recognized form of permanency P is given as

$$_P\hat{S}(t) = \prod_{t_i < t} \frac{n_i - p_i}{n_i} \tag{8}$$

where n_i is the number of children entering out-of-home care in a given fiscal year who are still in care just prior to time t_i, and p_i is the number of permanency events at t_i. Thus, the probability of exit within 1 year is given as $_P\hat{S}(365)$. A reasonable approximation of the new CFSR measurement is given as $(1 - _P\hat{S}(365)) \cdot 100$. For the sake of simplicity, we propose simply reporting annual calculations of $_P\hat{S}(365)$ for this measure. All children who stay in care for less than 8 days will be excluded from this measurement. Children aging out of care or experiencing a permanency outcome other than reunification, adoption, or some form of guardianship will be treated as right-censored to observation.

2.1.2. Percentage of Legally Free Children Awaiting Adoption After 1 Year ($_A\hat{S}(365)$)

This measurement will also make use of a Kaplan-Meier estimator. Specifically, the Kaplan-Meier estimator for adoption A is given as

$$_A\hat{S}(t) = \prod_{t_i < t} \frac{n_i - a_i}{n_i} \tag{9}$$

where n_i is the number of children entering legally-free status in a given fiscal year who have not yet been adopted just prior to time t_i, and a_i is the number of adoption events at t_i. Thus, the probability of adoption within 1 year is given as $_A\hat{S}(365)$. Children aging out of care or experiencing a permanency outcome other than adoption will be treated as right-censored to observation.

2.2. Duration of Permanence

2.2.1. Percentage of Children Reentering Care Within 1 Year ($_R\hat{S}(365)$)

This measurement will also make use of a Kaplan-Meier estimator. Specifically, the Kaplan-Meier estimator for reentry R is given as

$$_R\hat{S}(t) = \prod_{t_i < t} \frac{n_i - r_i}{n_i} \tag{10}$$

where n_i is the number of children entering permanency in a given fiscal year who have not yet reentered care just prior to time t_i, and r_i is the number of reentry events at t_i. Thus, the probability of reentry within 1 year is given as $_R\hat{S}(365)$. Children aging out of care or experiencing a permanency outcome other than adoption will be treated as right-censored to observation. Children who stay in care for less than 8 days will be excluded from this measurement.

2.3. Placement Mobility

2.3.1. Duration-specific mobility rate (M^d)

This measurement will adopt the basic approach of the analagous proposed CFSR measurement in which total placements are measured against the number of care days experienced for children during their first year of care. In this measurement, we propose that we

extend this basic logic to a duration-specific mobility measurement in which a care-day mobility rate is calculated for the first through tenth duration periods (d) of care such that M^d is given as

$$M^d = (m^d \div C^d) \cdot 100,000 \qquad (11)$$

where m^d is the count of placement moves during the dth year and C^d is the number of care days associated with the dth year. Children who stay in care for less than 8 days in their original placement episode will be excluded from this measurement.

2.3.2. Transition-Duration-Specific mobility rate ($_tM^d$)

In order to get a sense of the *types* of transitions that are experienced by children, M^d shall be extended to also measure the type of transition that children are moving toward (t) (i.e. foster care (f), relative placement (r), and group care (g.). The $_tM^d$ measurement shall be calculated identically to M_d above. However, $_tM^d$ shall be calculated seperately for $t = f$, $t = r$, and $t = g$.

2.3.3. Age-order-specific AWOL rate (A_d^i)

This measurement will adopt the basic approach of the analagous proposed CFSR measurement in which total placements are measured against the number of care days experienced for children during their first year of care. In this measurement, we propose that we extend this basic logic to a duration-specific mobility measurement in which a care-day mobility rate is calculated for the first through tenth duration periods (d) of care such that M^d is given as

$$M^d = (m^d \div C^d) \cdot 100,000 \qquad (12)$$

where m^d is the count of placement moves during the dth year and C^d is the number of care days associated with the dth year. Children who stay in care for less than 8 days in their original placement episode will be excluded from this measurement.

3. Well-Being

3.1. Maintenance of Family Relationships

3.2. Educational Readiness

3.3. Adult Functioning

3.3.1. Incidence of reports of safety concerns

The incidence of reports of household safety concerns

Definition The incidence of reports of household safety concerns (IR_R) shall be defined as the total number of first referrals to Children's Administration (CA) per month, per 1,000 households with own children under the age of 18 as defined by the US Census.

This measure will focus only on those referrals aledging child maltreatment or an eminent risk of serious harm to the child. This rate shall be calculated simply by

$$IR_R = (I_R \div P_{H<18}) \cdot 1,000 \tag{13}$$

where I_R represents the total number of first referrals occuring during the month and $P_{H<18}$ the number of households with own children under the age of 18 as defined by the US census. To the extent that estimates are available, values of $P_{H<18}$ shall be calculated from the following sources in order of priority:

1. US Census,
2. American Community Survey (ACS),
3. Office of Financial Management (OFM), and
4. Linear interpolation taking the above estimates as "True" values.

SQL Code   The SQL code used to obtain data for this measurement is as follows:

```
declare @fystart int
declare @fystop int

set @fystart = 2010
set @fystop = 2013;

select
  count(*) I_R
  ,P_H
  ,count(*)*1000.0/P_H IR_R
  ,month calendar_month
from ca_ods.dbo.calendar_dim cd
  join ca_ods.base.tbl_intakes  ti
    on ti.inv_ass_start = cd.calendar_date
  join (select
        measurement_year
       ,sum(pop_cnt) P_H
      from ca_ods.dbo.ref_lookup_census_population_poc2
      where cd_race < 8
      group by
        measurement_year) pop
    on pop.measurement_year = year(cd.calendar_date)
where state_fiscal_yyyy between @fystart and @fystop
    and cd_access_type in (1, 4)
    and intake_rank = 1
group by
  month
  ,P_H
```

As can be seen, we make use of a previously calculated base table named tbl_intakes. This table is based on a select FROM the the CA reporting layer table named rptIntakes

and a `LEFT JOIN` to `INTAKE_FACT` from FLDW. As such, the initial universe of referrals is identical to those referrals (i.e. intakes) utilized by CA for reporting purposes.

In addition to `tbl_intakes`, we use a previously calculated table of interpolated values P_H (`ref_lookup_census_population_poc2`) and the (`calendar_dim`) from FLDW. All code is included here for the sake of transparency.

R Code　The first chunk of code simply clears our memory, sets the working directory, loads the `RODBC` library (an R library which enables an analyst to connect R to an ODBC database), and loads the `ggplot2` library (an R library for plotting). We also assign a vector of visually pleasing colors (`poc_colors`) and define a custom function (`read.sql`) which will allow us to read the text of our SQL scripts into `RODBC` functions.

```r
rm(list = ls())  ###Clear Memory
setwd("C:/Users/mienkoja/Dropbox/repos/1774")
require(RODBC)  ###Load library

## Loading required package:  RODBC

require(ggplot2)

## Loading required package:  ggplot2

poc_colors <- c("#3B6E8F", "#A2B69A", "#A3DCE6", "#A784B4")

# function to read in sql files
read.sql <- function(filename, silent = TRUE) {
    q <- readLines(filename, warn = !silent)
    # remove full-line comments
    q <- q[!grepl(pattern = "^\\s*--", x = q)]
    # remove midline comments
    q <- sub(pattern = "--.*", replacement = "", x = q)
    q <- paste(q, collapse = " ")
    return(q)
}

# Assign database connection
cn <- odbcConnect("POC")
```

In this next chunk of code, I read the sql script outlined above into a dataframe named (`dat.IR_R`). We then plot the monthly time series of I_R as shown in the figure below.

```r
dat.IR_R <- sqlQuery(cn, read.sql("IR_R.sql"))
dat.IR_R$calendar_month <- as.Date(dat.IR_R$calendar_month)

#plot time series
ggplot(dat.IR_R, aes(y=IR_R, x=calendar_month)) +
  geom_line(colour=poc_colors[1], size=2) +
  labs(y = expression(IR[R]), x = "") +
```

```
theme_bw()
```
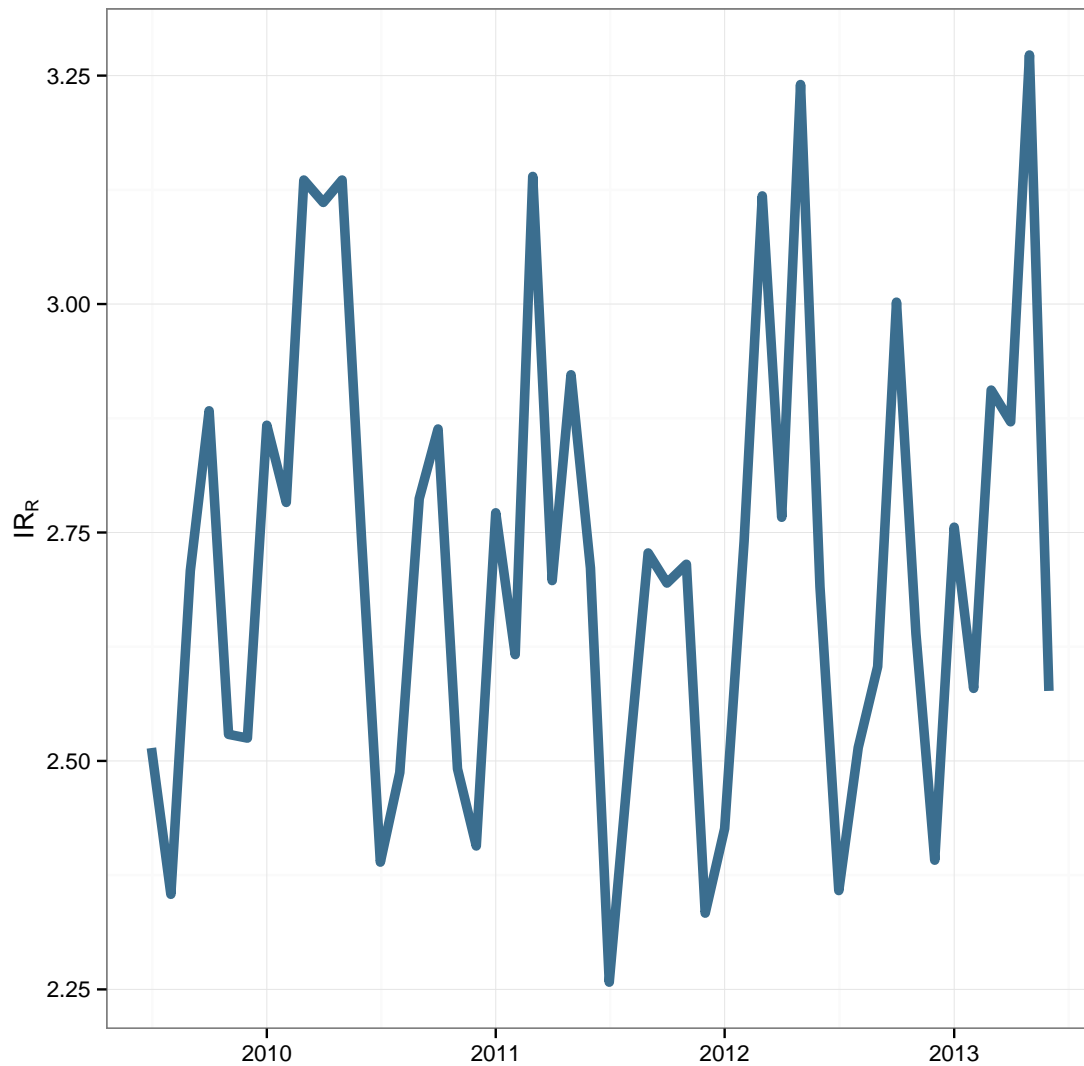

The incidence of placement into out-of-home care

Definition The incidence of placement into out-of-home care (IR_P) shall be defined as the monthly total number of referrals to Children's Administration per 1,000 persons under the age of 18. This rate shall be calculated simply by

$$IR_P = (I_P \div P_C) \cdot 1,000 \tag{14}$$

where I_P represents the total number of placements occuring during the month and P_C the number of children under the age of 18 in the general population. To the extent that estimates are available, values of P_C shall be calculated from the same sources and order of priority as in P_H above.

SQL Code   In this section I use a previously calculated table of interpolated values P_C (ref_lookup_census_population), a CA "reporting layer" table of placements into out-of-home care (rptPlacement), and the aforementioned (calendar_dim) table.

```sql
declare @fystart int
declare @fystop int

set @fystart = 2010
set @fystop = 2013;

select
  count(*) I_P
  ,P_C
  ,count(*)*100000.00/P_C IR_P
  ,month
from ca_ods.dbo.calendar_dim cd
  join ca_ods.base.rptPlacement rp
    on rp.removal_dt = cd.calendar_date
  join (select
         measurement_year
         ,sum(pop_cnt) P_C
       from ca_ods.dbo.ref_lookup_census_population
       where cd_race < 8
       group by
         measurement_year) pop
    on pop.measurement_year = year(cd.month)
where state_fiscal_yyyy between @fystart and @fystop
group by
  month
  ,P_C
order by
  month
```
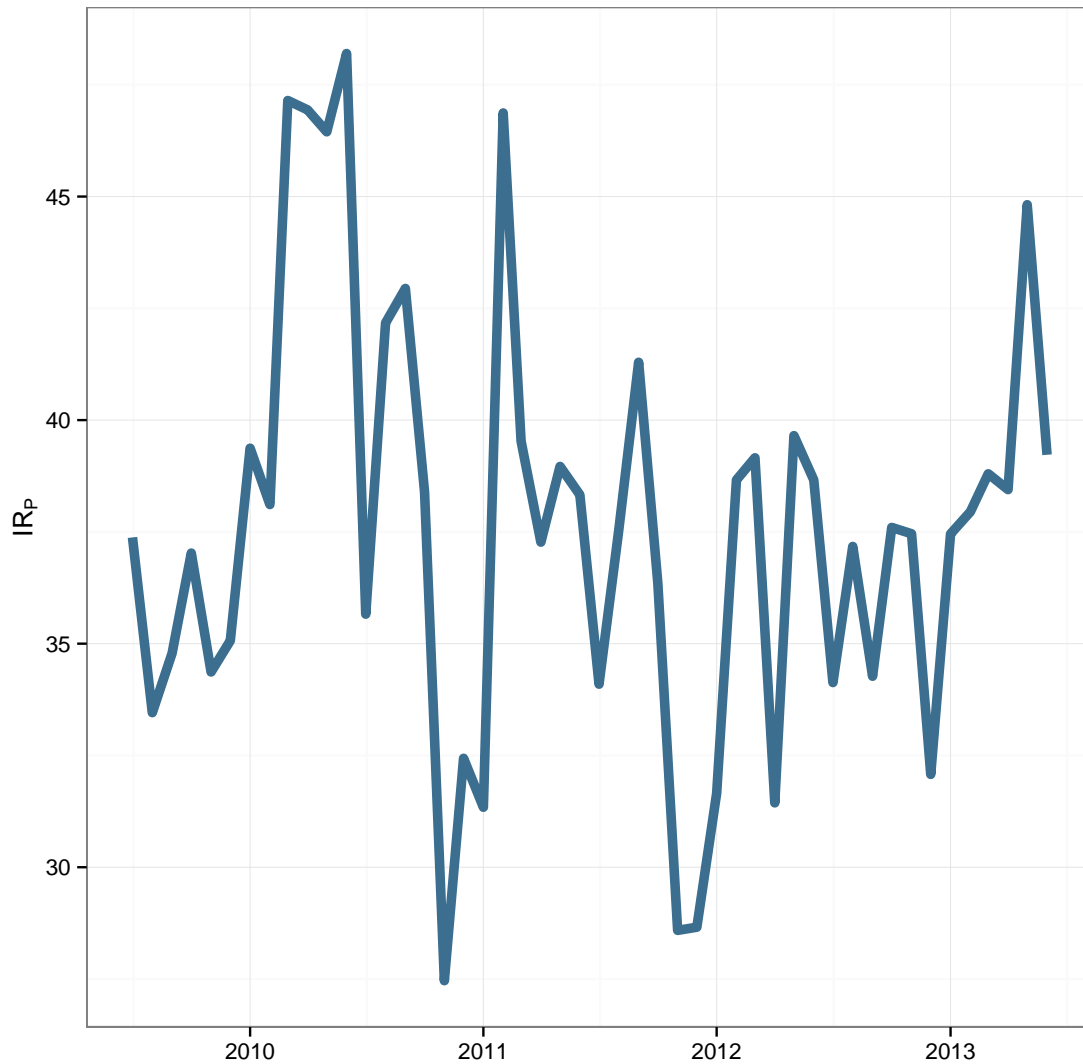
R Code   We plot the monthly time-series in a manner similar to what we did with IR_R.

```r
dat.IR_P <- sqlQuery(cn, read.sql("IR_P.sql"))

#plot time series
ggplot(dat.IR_P, aes(y=IR_P, x=month)) +
  geom_line(colour=poc_colors[1], size=2) +
  labs(y = expression(IR[P]), x = "") +
  theme_bw()
```

9

Placement rate

Definition   The rate of placement (PR) shall be defined as the monthly total number of first placements per 1,000 referrals to CA with no prior history of a placement in the household. For consistency with previous measurements, this measure will focus only on those referrals aledging child maltreatment or an eminent risk of serious harm to the child and will be calculated at the household level. A household is considered to have a placement if any child associated with the home on a given referral is placed into out-of-home care. This rate shall be calculated as

$$PR = (P \div I_{R_{NPP}}) \cdot 1,000 \tag{15}$$

where P represents the total placements occuring during the month among referrals for households with no previous placement ($I_{R_{NPP}}$).

SQL Code The following SQL code outlines the continued use of (tbl_intakes). We make use of additional fields beyond the reporting layer fields which have been calculated according to code reveved previously by CA.

```sql
declare @fystart int
declare @fystop int

set @fystart = 2010
set @fystop = 2013;

select
  count(inf.id_intake_fact) I_R1
  ,sum(iif(inf.fl_ooh_after_this_referral=1, 1, 0)) P
  ,sum(iif(inf.fl_ooh_after_this_referral=1, 1, 0))*1.0/
  count(inf.id_intake_fact) PR
  ,cd.month
  ,cd.state_fiscal_yyyy fiscal_yr
from ca_ods.dbo.calendar_dim cd
  left join dbCoreAdministrativeTables.dbo.tbl_intakes inf
    on cd.id_calendar_dim between
      convert(int, convert(varchar, inf.inv_ass_stop, 112))
      and convert(int, convert(varchar, inf.inv_ass_stop, 112))
where
  cd.state_fiscal_yyyy between @fystart and @fystop
    and cd_access_type in (1, 4)
    and (inf.intake_rank = 1 or fl_ooh_prior_this_referral = 0)
group by
  cd.month
  ,cd.state_fiscal_yyyy
order by
  month
```
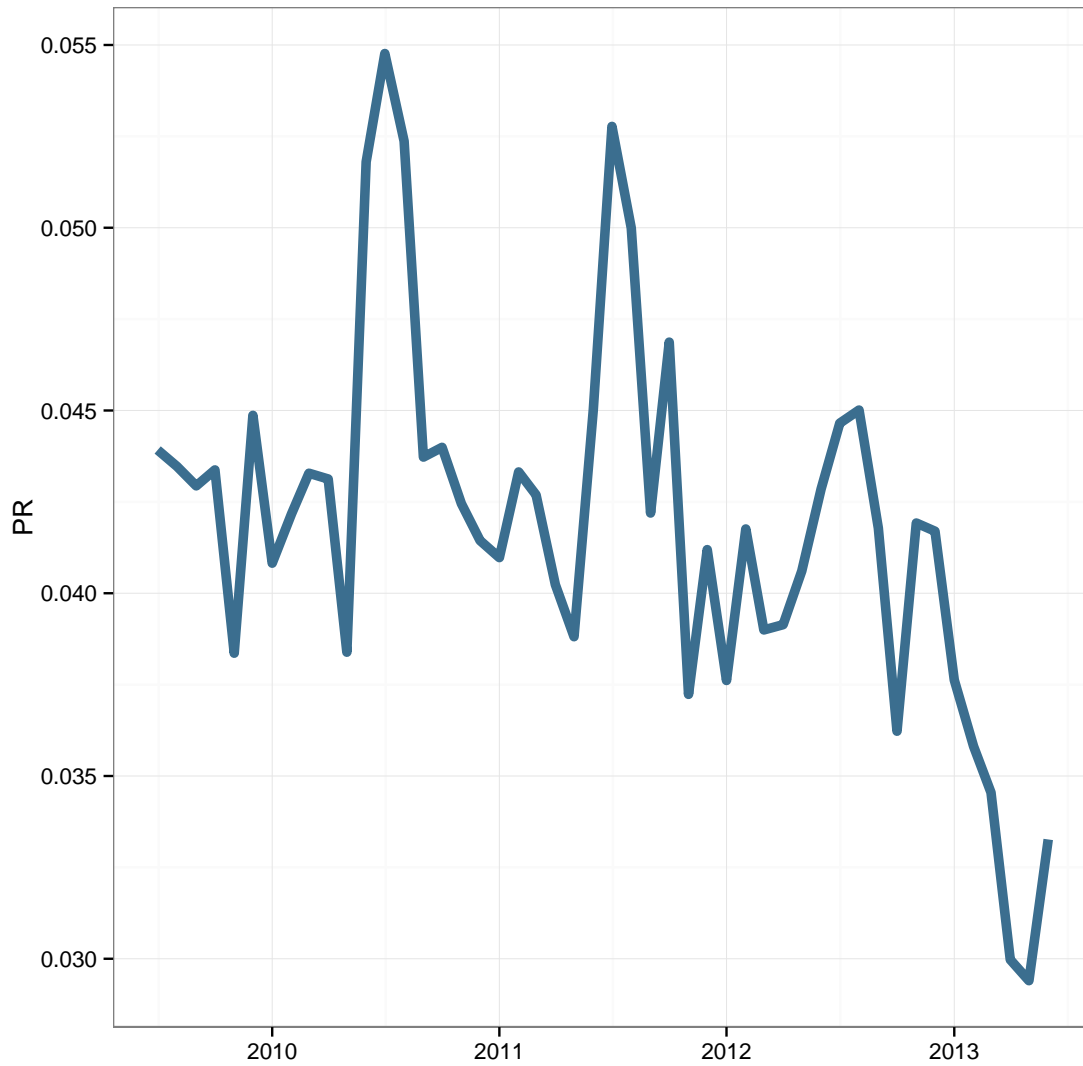
Again, we plot the monthly time-series using R.

```r
dat.PR <- sqlQuery(cn, read.sql("PR.sql"))

#plot time series
ggplot(dat.PR, aes(y=PR, x=month)) +
  geom_line(colour=poc_colors[1], size=2) +
  labs(y = expression(PR), x = "") +
  theme_bw()
```

R Code

11

Finding rate

Definition The rate of household findings (FR) shall be defined as the monthly total number of first findings of child-abuse or neglect per 1,000 referrals to CA with no prior history of a founded allegation of child abuse or neglect. This measure will focus only on those referrals aledging child maltreatment or an eminent risk of serious harm to the child and will be calculated at the household level. A household is considered to have a finding if any allegation from a given referral is founded. This rate shall be calculated as

$$FR = (F \div I_{R_{NPF}}) \cdot 1,000 \tag{16}$$

where F represents the total findings occuring during the month among referrals for households with no previous finding ($I_{R_{NPF}}$).

SQL Code The following SQL code outlines the continued use of (tbl_intakes). Here, we make use of additional fields beyond the reporting layer fields which have been calculated according to code revewed previously by CA.

```sql
declare @fystart int
declare @fystop int

set @fystart = 2010
set @fystop = 2013;

select
  count(inf.id_intake_fact) I_RNPF
  ,sum(inf.fl_founded_any_legal) F
  ,sum(inf.fl_founded_any_legal)*1000.0/
  count(inf.id_intake_fact) FR
  ,cd.month
  ,cd.state_fiscal_yyyy fiscal_yr
from ca_ods.dbo.calendar_dim cd
  left join ca_ods.base.tbl_intakes inf
    on cd.id_calendar_dim between
      convert(int, convert(varchar, inf.inv_ass_stop, 112))
      and convert(int, convert(varchar, inf.inv_ass_stop, 112))
where cd.state_fiscal_yyyy between @fystart and @fystop
  and cd_access_type in (1, 4)
  and (inf.intake_rank = 1 or fl_founded_prior_any_legal = 0)
group by
  cd.month
  ,cd.state_fiscal_yyyy
order by
  month
```
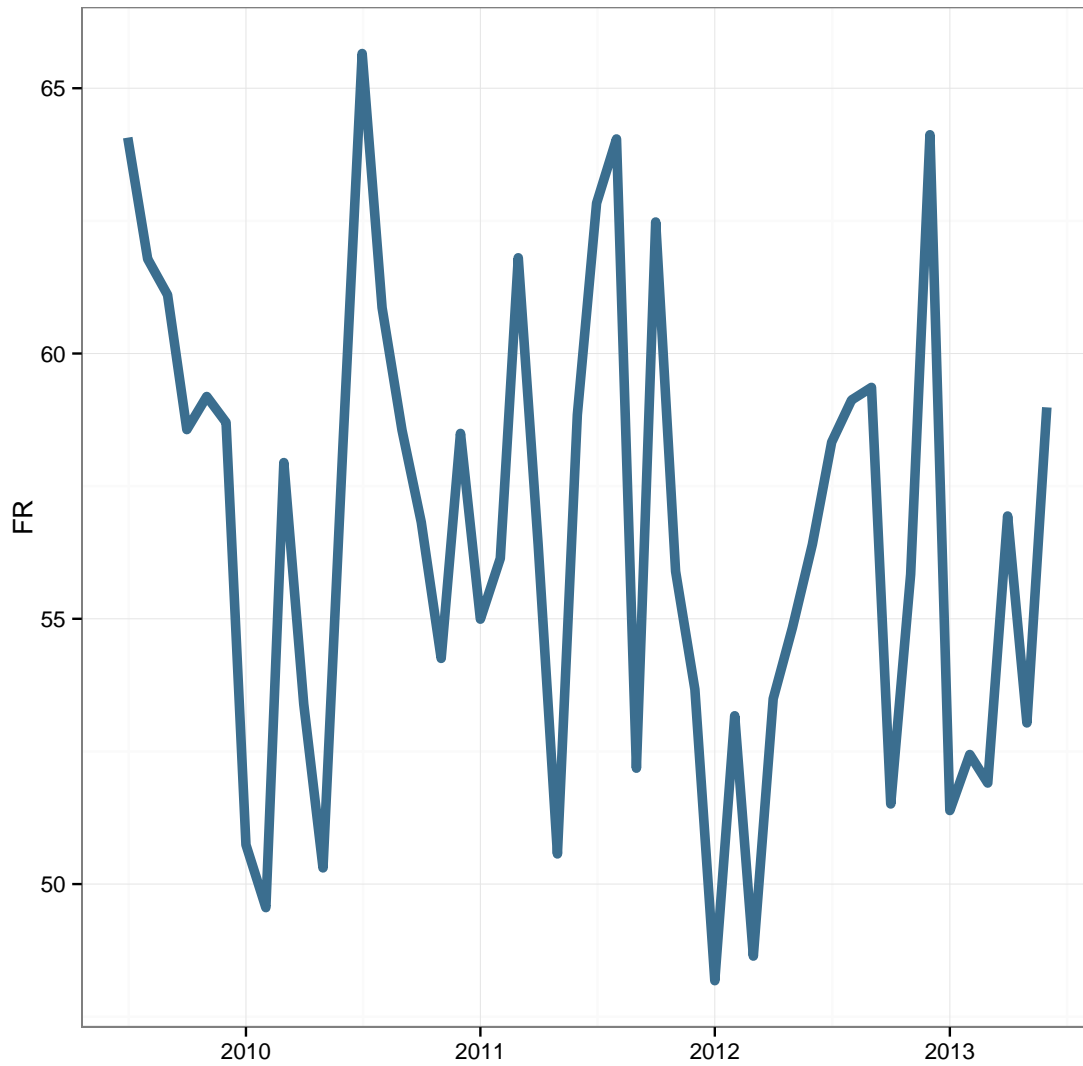
Again, we plot the monthly time-series using R.

```r
dat.FR <- sqlQuery(cn, read.sql("FR.sql"))

#plot time series
ggplot(dat.FR, aes(y=FR, x=month)) +
  geom_line(colour=poc_colors[1], size=2) +
  labs(y = expression(FR), x = "") +
  theme_bw()
```

R Code

13

3.3.2. Recurrence of safety concerns

Order-Specific Rereferral rate   In measuring rereferrals, it is important to distinguish between first referrals (IR_S) and rereferrals. In general, those households that experience at least one referral to the child welfare system are at an increased risk of rereferral. As such, there is interest in distinguishing between first and higher order referrals (e.g. second referrals, third referrals, etc.).

Definition   The order-specific rereferral rate is defined as the number of referrals of a given order during a month per 1,000 households with own children under the age of 18. The formula for the first referral is given in formula 13. The formula for ith order rereferral rates is

$$RRR_i = \frac{I_{R_i}}{P_{i-1PR<18}} \cdot 1,000 \tag{17}$$

where I_{R_i} represents the total number of ith order rereferrals and $P_{i-1PR<18}$ represents the number of $ith-1$ order referrals in which all children in the household are still under the age of 18.

SQL Code In the following two sections of code we demonstrate the calculation of RRR_2 or second-order re-referrals. At this time, it is proposed that only second-order re-referrals be used as measures under 1774. Future reports may include higher-order re-referrals. In order to perform this calculation we make use of our base working table of intakes (tbl_intakes), the (calendar_dim), and a table of all children who appear to be associated with a given intake (tbl_household_children). For the sake of transparency, we use four seperate queries to complete this measurement:

1. A simple count of open intakes on the first day of 2010 (RRR_i_start.sql),

```
declare @fystart int

set @fystart = 2010;

with hh_w_ch as
(
select
  ti.id_intake_fact
  ,isnull(max(dateadd(yy, 18, thc.dt_birth))
      ,dateadd(yy
        ,18
        ,ti.inv_ass_start)) mx_dt_18
  ,isnull(min(thc.dt_birth)
      ,ti.inv_ass_start) mn_dt_br
from ca_ods.base.tbl_intakes ti
  left join ca_ods.base.tbl_household_children thc
    on ti.id_intake_fact = thc.id_intake_fact
      and ti.id_case = thc.id_case
where
  cd_access_type in (1, 4)
    and intake_rank = 1
group by
  ti.id_intake_fact
  ,ti.inv_ass_start
)
select
  count(distinct id_intake_fact) pop_start
from hh_w_ch
where isnull(mx_dt_18,'3999-01-01') >=
    datefromparts(@fystart-1, 07, 01)
  and mn_dt_br < datefromparts(@fystart-1, 07, 01)
```

2. Two seperate selections give us new first intakes from 2010 to present (RRR_i_entry3.sql and RRR_i_entry2.sql), and

```
declare @fystart int
```

```
declare @fystop int

set @fystart = 2010
set @fystop = 2013;

select
    count(*) pop_enter
    ,month
from
    ca_ods.base.tbl_intakes ti
    left join ca_ods.dbo.calendar_dim cd
        on ti.inv_ass_start = calendar_date
where intake_rank = 1
    and cd_access_type in (1,4)
    and inv_ass_start
    between datefromparts(@fystart-1, 07, 01)
    and datefromparts(@fystart, 06, 30)
group by
    month
order by
    month
```

```
declare @fystart int
declare @fystop int

set @fystart = 2010
set @fystop = 2013;

select
    count(*) pop_enter
    ,month
from ca_ods.base.tbl_intakes ti
    left join ca_ods.dbo.calendar_dim cd
        on ti.inv_ass_start = calendar_date
where intake_rank = 2
    and cd_access_type in (1,4)
    and inv_ass_start
    between datefromparts(@fystart-1, 07, 01)
      and datefromparts(@fystop, 06, 30)
group by
    month
order by
    month
```

3. A selection of families who are "aging-out" of $P_{1PR<18}$ (RRR_i_exit.sql)

```
declare @fystart int
declare @fystop int
set @fystart = 2010
set @fystop = 2013;
with max_dt_18 as
```

```sql
(select
    ti.id_intake_fact
    ,isnull(max(dateadd(yy, 18, thc.dt_birth))
            ,dateadd(yy
                ,18
                ,ti.inv_ass_start)) mx_dt_18
from ca_ods.base.tbl_intakes ti
    left join ca_ods.base.tbl_household_children thc
        on ti.id_intake_fact = thc.id_intake_fact
            and ti.id_case = thc.id_case
where
    cd_access_type in (1,4)
    and intake_rank = 1
group by
    ti.id_intake_fact
    ,ti.inv_ass_start
having isnull(max(dateadd(yy, 18, thc.dt_birth))
            ,dateadd(yy
                ,18
                ,ti.inv_ass_start)) <=
        datefromparts(@fystop, 06, 30))
select
    count(distinct id_intake_fact) pop_exit
    ,month
from ca_ods.dbo.calendar_dim cd
    left join max_dt_18 m18
        on mx_dt_18
        between dateadd(mm, -1, month) and month
where month
  between datefromparts(@fystart-1, 07, 01)
    and datefromparts(@fystop, 06, 30)
group by
    month
order by
    month
```

R Code The following code demonstrated how we can load these four seperate queries into R for further calculation:

```r
dat.RRR_i.s <- sqlQuery(cn, read.sql("RRR_i_start.sql"))

dat.RRR_i.e1 <- sqlQuery(cn, read.sql("RRR_i_entry1.sql"))

dat.RRR_i.e2 <- sqlQuery(cn, read.sql("RRR_i_entry2.sql"))

dat.RRR_i.ex <- sqlQuery(cn, read.sql("RRR_i_exit.sql"))

P_1PRlt18 <- dat.RRR_i.s$pop_start +
```
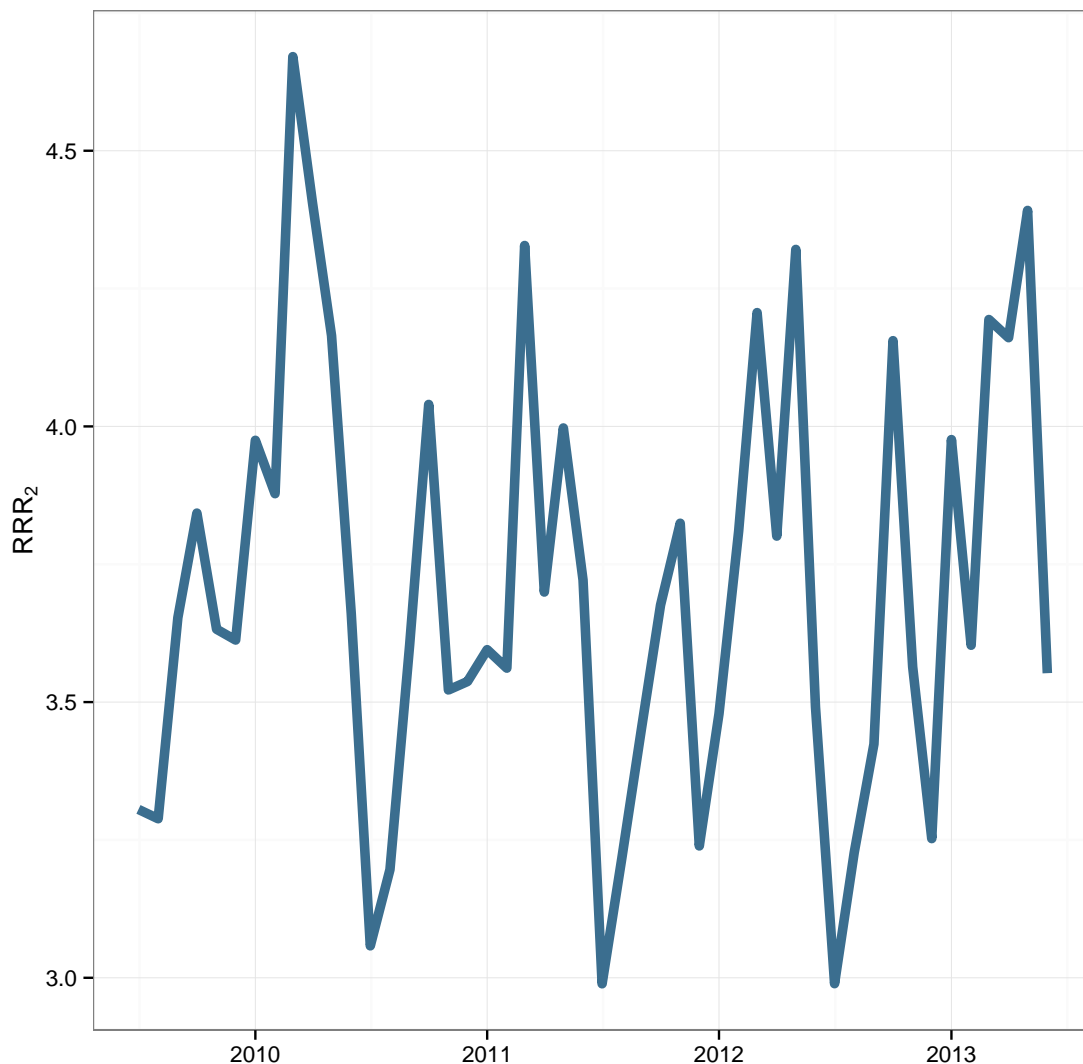
```
  dat.RRR_i.e1$pop_enter -
  dat.RRR_i.ex$pop_exit
I_R2 <- dat.RRR_i.e2$pop_enter
dat.RRR_i.e2$RRR2 <- (I_R2/P_1PRlt18)*1000


#plot time series
ggplot(dat.RRR_i.e2, aes(y=RRR2, x=month)) +
  geom_line(colour=poc_colors[1], size=2) +
  labs(y = expression(RRR[2]), x = "") +
  theme_bw()
```


Order-Specific Refinding rate   Similarly to re-referrals, those households that experience at least one finding (FR) to the child welfare system are at an increased risk of refinding. As such, there is interest in distinguishing between first and higher order refer-

rals (e.g. second referrals, third referrals, etc.).

Definition The order-specific refinding rate is defined as the number of findings of a given order during a month per 1,000 households with own children under the age of 18 who have received $i - 1$ prior referrals. The formula for the first referral is given in formula 16. The formula for ith order rereferral rates is

$$RFR_i = \frac{I_{F_i}}{P_{i-1PF<18}} \cdot 1,000 \tag{18}$$

where I_{F_i} represents the total number of ith order refindings and $P_{i-1PF<18}$ represents the number of $ith - 1$ order findings in which all children in the household are still under the age of 18.

SQL Code In the following two sections of code we demonstrate the calculation of RFR_2 or second-order re-finding rate. At this time, it is proposed that only second-order re-findings be used as measures under 1774. Future reports may include higher-order re-findings. Similar to RRR_i, we perform this calculation using our base working table of intakes (`tbl_intakes`), (`calendar_dim`), and a table of all children who appear to be associated with a given intake (`tbl_household_children`). For the sake of transparency, we again use four seperate queries to complete this measurement:

1. A simple count of open intakes on the first day of 2010 with a finding indicated (`RFR_i_start.sql`),

```
declare @fystart int

set @fystart = 2010;

with hh_w_ch as
(
select
  ti.id_intake_fact
  ,isnull(max(dateadd(yy, 18, thc.dt_birth))
     ,dateadd(yy
       ,18
       ,ti.inv_ass_start)) mx_dt_18
  ,isnull(min(thc.dt_birth)
     ,ti.inv_ass_start) mn_dt_br
from ca_ods.base.tbl_intakes ti
  left join ca_ods.base.tbl_household_children thc
    on ti.id_intake_fact = thc.id_intake_fact
      and ti.id_case = thc.id_case
where
  cd_access_type in (1, 4)
    and (intake_rank = 1 or fl_founded_prior_any_legal = 0)
    and fl_founded_any_legal = 1
group by
  ti.id_intake_fact
```

```
  ,ti.inv_ass_start
)
select
  count(distinct id_intake_fact) pop_start
from hh_w_ch
where isnull(mx_dt_18,'3999-01-01') >=
  datefromparts(@fystart-1, 07, 01)
  and mn_dt_br < datefromparts(@fystart-1, 07, 01)
```

2. Two seperate selections give us new first findings from 2010 to present (RFR_i_entry1.sql and RFR_i_entry2.sql), and

```
declare @fystart int
declare @fystop int

set @fystart = 2010
set @fystop = 2013;

select
    count(*) pop_enter
    ,month
from
    ca_ods.base.tbl_intakes ti
    left join ca_ods.dbo.calendar_dim cd
        on ti.inv_ass_start = calendar_date
where
  cd_access_type in (1, 4)
  and (intake_rank = 1 or fl_founded_prior_any_legal = 0)
  and fl_founded_any_legal = 1
    and inv_ass_start
    between datefromparts(@fystart-1, 07, 01)
      and datefromparts(@fystart, 06, 30)
group by
    month
order by
    month
```

```
declare @fystart int
declare @fystop int

set @fystart = 2010
set @fystop = 2013;

with ranked_subsequent_findings as
(
select *
    ,rank() over
    (partition by id_case order by intake_rank desc) rank
from ca_ods.base.tbl_intakes ti
where
  cd_access_type in (1, 4)
```

```sql
    and fl_founded_prior_any_legal = 1
    and fl_founded_any_legal = 1
      and inv_ass_start
      between datefromparts(@fystart-1, 07, 01)
        and datefromparts(@fystop, 06, 30)
)
select
    count(*) pop_enter
    ,month
from ranked_subsequent_findings ti
    left join ca_ods.dbo.calendar_dim cd
        on ti.inv_ass_start = calendar_date
where
  rank = 1
group by
    month
order by
    month
```

3. A selection of families who are "aging-out" of $P_{1PF<18}$ (RFR_i_exit.sql)

```sql
declare @fystart int
declare @fystop int

set @fystart = 2010
set @fystop = 2013;

with max_dt_18 as
(
select
    ti.id_intake_fact
    ,isnull(max(dateadd(yy, 18, thc.dt_birth))
            ,dateadd(yy
                ,18
                ,ti.inv_ass_start)) mx_dt_18
from ca_ods.base.tbl_intakes ti
    left join ca_ods.base.tbl_household_children thc
        on ti.id_intake_fact = thc.id_intake_fact
            and ti.id_case = thc.id_case
where
  cd_access_type in (1, 4)
    and (intake_rank = 1 or fl_founded_prior_any_legal = 0)
    and fl_founded_any_legal = 1
group by
    ti.id_intake_fact
    ,ti.inv_ass_start
having isnull(max(dateadd(yy, 18, thc.dt_birth))
            ,dateadd(yy
                ,18
                ,ti.inv_ass_start)) <=
        datefromparts(@fystop, 06, 30)
```

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```sql
)
select
    count(distinct id_intake_fact) pop_exit
    ,month
from ca_ods.dbo.calendar_dim cd
    left join max_dt_18 m18
        on mx_dt_18
        between dateadd(mm, -1, month) and month
where month between datefromparts(@fystart-1, 07, 01)
  and datefromparts(@fystop, 06, 30)
group by
    month
order by
    month
```

R Code   We again load the four seperate queries into R for further calculation:

```r
dat.RFR_i.s <- sqlQuery(cn, read.sql("RFR_i_start.sql"))

dat.RFR_i.e1 <- sqlQuery(cn, read.sql("RFR_i_entry1.sql"))

dat.RFR_i.e2 <- sqlQuery(cn, read.sql("RFR_i_entry2.sql"))

dat.RFR_i.ex <- sqlQuery(cn, read.sql("RFR_i_exit.sql"))

P_1PFlt18 <- dat.RFR_i.s$pop_start +
  dat.RFR_i.e1$pop_enter -
  dat.RFR_i.ex$pop_exit
I_F2 <- dat.RFR_i.e2$pop_enter
dat.RFR_i.e2$RFR2 <- (I_F2/P_1PFlt18)*1000


#plot time series
ggplot(dat.RFR_i.e2, aes(y=RFR2, x=month)) +
  geom_line(colour=poc_colors[1], size=2) +
  labs(y = expression(RFR[2]), x = "") +
  theme_bw()
```
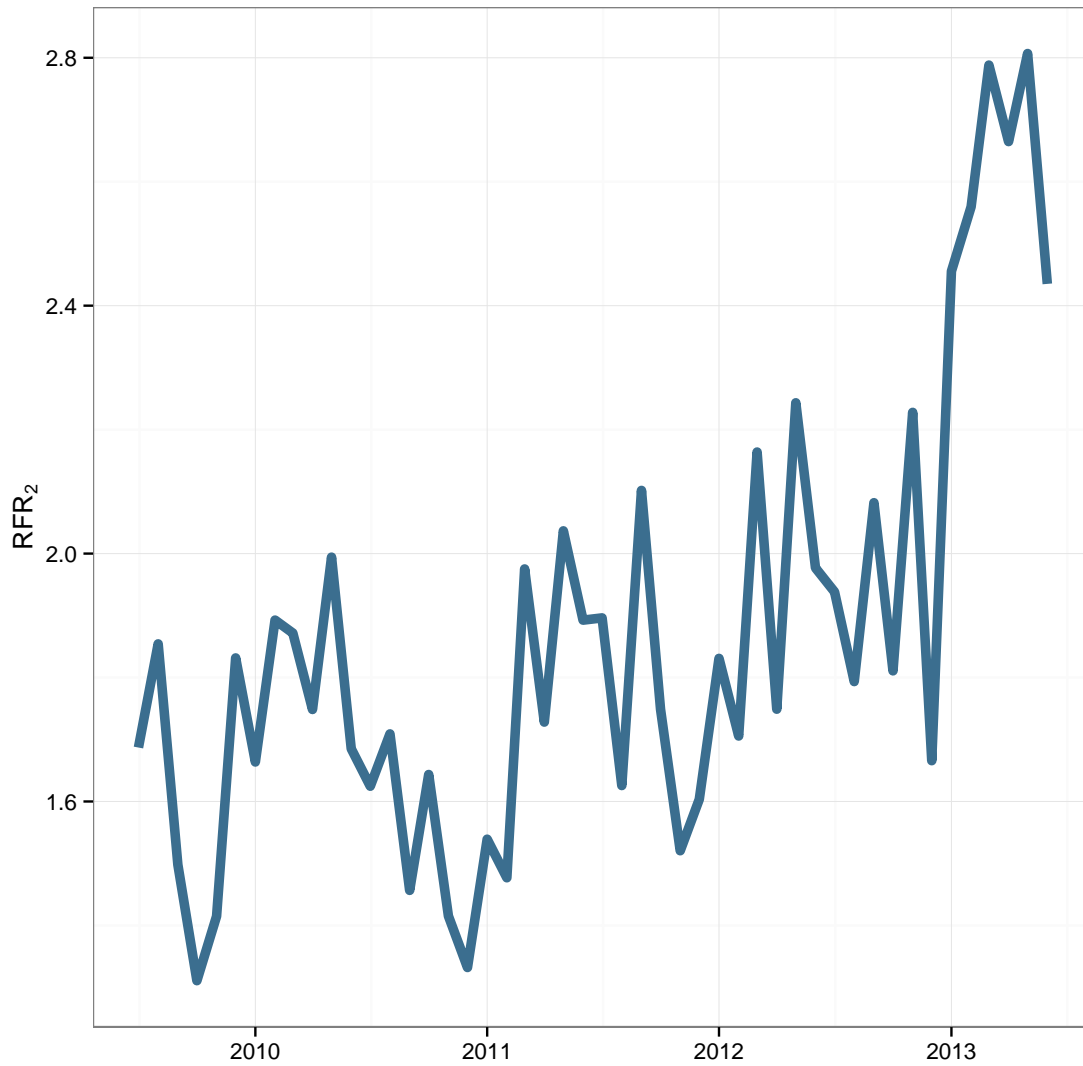
Foster-Care Finding Rate   The final safety measurement concerns the rate of findings per day of foster care. This is the first "care-day" measurement proposed in this document - measurements in which the denominator is a count of days of out-of-home care for some population as opposed to a count of some type of person.

Definition   The Foster-Care Finding Rate ($_{FC}FR$) follows the newly proposed CFSR measurements where $_{FC}FR$ is defined as

$$_{FC}FR = \frac{_{FC}I_F}{c} \cdot 100,000 \tag{19}$$

where c represents the total number of care days provided by CA in a given year and $_{FC}I_F$ represents the number of maltreatment findings for children in out-of-home care over that period. This measurement excludes children in foster care for less than 8 days and also excludes reports made within the first 7 days of the referral.

SQL Code In the following two sections of code we demonstrate the calculation of RRR_2 or second-order re-referrals. For the sake of transparency and efficiency, we first load relevant data into a series of "global" temporary tables and then select from these tables. We plot a yearly time-series here as opposed to a monthly time-series for consistency with the CFSR measurements.

```sql
declare @fystart int
declare @fystop int

set @fystart = 2000
set @fystop = 2013;

if object_id('tempdb..##calendar_dim_sub') is not null
  drop table ##calendar_dim_sub

select distinct
  id_calendar_dim
  ,state_fiscal_yyyy
into ##calendar_dim_sub
from ca_ods.dbo.calendar_dim
where
  state_fiscal_yyyy between @fystart and @fystop;

if object_id('tempdb..##placement_prep') is not null
  drop table ##placement_prep

select distinct
  dbo.IntDate_to_CalDate(af.id_calendar_dim_incident)
    as incident_date
  ,af.id_calendar_dim_incident
  ,rp.removal_dt
  ,convert(int, convert(varchar, rp.removal_dt, 112))
    as removal_dt_int
  ,convert
  (
  int
  ,convert
    (varchar
      ,case
        when iif(rp.[18bday] < rp.discharge_dt
          ,rp.[18bday]
          ,rp.discharge_dt) = '9999-12-31'
        then datefromparts(@fystop, 06, 30)
        else iif(rp.[18bday] < rp.discharge_dt
          ,rp.[18bday]
          ,rp.discharge_dt)
      end
      ,112
    )
  ) discharg_frc_18_int
```

```sql
  ,rp.id_removal_episode_fact as care_days_cntr
  ,af.id_abuse_fact as substantiated_allegation_cntr
into ##placement_prep
from ca_ods.base.rptPlacement rp
left join ca_ods.dbo.abuse_fact af
  on af.id_prsn_vctm = rp.child
  and datediff(dd, removal_dt
        ,dbo.IntDate_to_CalDate(af.id_calendar_dim_incident)) > 7
  and case
      when iif(rp.[18bday] < rp.discharge_dt
          ,rp.[18bday], rp.discharge_dt) = '9999-12-31'
      then datediff(dd, rp.removal_dt
             ,datefromparts(@fystop, 06, 30))
      else datediff(dd,rp.removal_dt
             ,iif(rp.[18bday] < rp.discharge_dt
             ,rp.[18bday]
             ,rp.discharge_dt))
    end + 1 > 7

if object_id('tempdb..##care_days') is not null
  drop table ##care_days

select
  cd.id_calendar_dim
  ,cd.state_fiscal_yyyy fiscal_yr
  ,count(rp1.care_days_cntr) care_days
into ##care_days
from ##calendar_dim_sub cd
  left join ##placement_prep rp1
    on cd.id_calendar_dim between removal_dt_int
         and discharg_frc_18_int
where
  cd.state_fiscal_yyyy between @fystart and @fystop
group by
  cd.id_calendar_dim
  ,cd.state_fiscal_yyyy

if object_id('tempdb..##substantiations') is not null
  drop table ##substantiations

select
  cd.id_calendar_dim
  ,cd.state_fiscal_yyyy fiscal_yr
  ,count(rp2.substantiated_allegation_cntr)
  as substantiated_allegations
into ##substantiations
from ##calendar_dim_sub cd
  left join ##placement_prep rp2
    on cd.id_calendar_dim = rp2.id_calendar_dim_incident
```

```sql
where
  cd.state_fiscal_yyyy between @fystart and @fystop
group by
  cd.id_calendar_dim
  ,cd.state_fiscal_yyyy
```

```sql
select
  sum(care_days) c
  ,sum(substantiated_allegations) FCI_F
  ,sum(substantiated_allegations)*100000.0/sum(care_days) FCFR
  ,cd.fiscal_yr
from ##care_days cd
  join ##substantiations s
    on cd.id_calendar_dim = s.id_calendar_dim
group by
  cd.fiscal_yr
order by
  cd.fiscal_yr
```

R Code   In this chunk of code, we first execute the temporary table script (hence we need not assign the results of our first query to an object) and then select from our temporary tables with the select script. We then plot the data using `ggplot2` as shown previously.
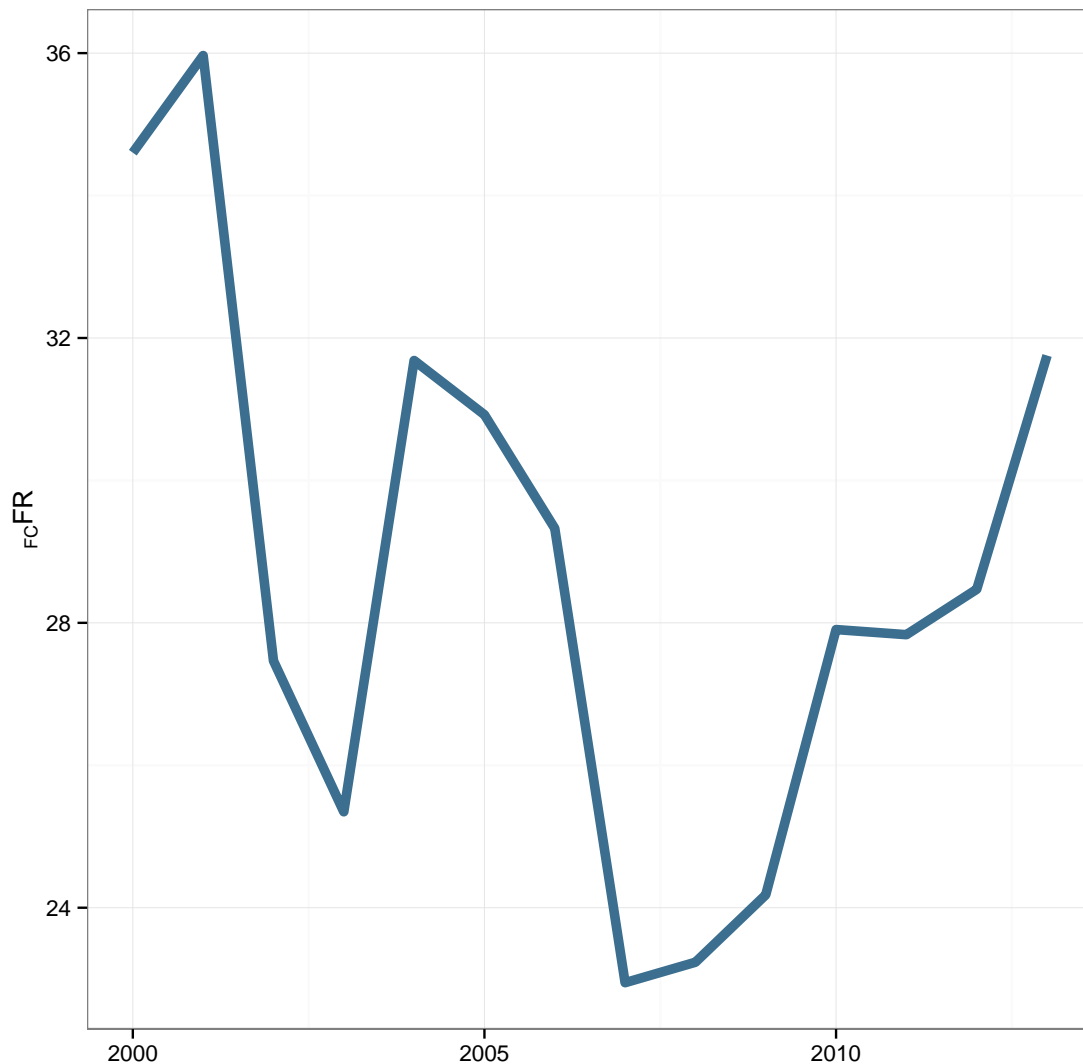
```r
sqlQuery(cn, read.sql("FCFR_temp.sql"))

## character(0)

dat.FCFR <- sqlQuery(cn, read.sql("FCFR_select.sql"))

#plot time series
ggplot(dat.FCFR, aes(y=FCFR, x=fiscal_yr)) +
  geom_line(colour=poc_colors[1], size=2) +
  labs(y = expression(paste({}[FC], "FR")), x = "") +
  theme_bw()
```

3.4. Measurements Related to Permanency

3.4.1. Placement stability for children placed in out-of-home care

Order-specific mobility rates according to length of stay

Order-transition-specific mobility rates according to length of stay

3.4.2. Length of time to permanence for children in out-of-home care

Probability of Remaining in Care for 1 Year   This measurement is similar to the proposed CFSR measurement requiring exit to permanency within 12 months. However, instead of calculating a specific percentage, we propose that a Kaplan-Meier estimator be used to better account for right censoring of children who either age-out of the system or exit to a form of permanency other than adoption, reunification, or some form of guardianship.

Definition The Kaplan-Meier estimator for a federally recognized form of permanency P is given as

$$_P\hat{S}(t) = \prod_{t_i < t} \frac{n_i - p_i}{n_i} \tag{20}$$

where n_i is the number still in care just prior to time t_i, and p_i is the number of permanency events at t_i. Thus, the probability of exit within 1 year is given as $_P\hat{S}(365)$. A reasonable approximation of the new CFSR measurement is given as

$$(1 - {}_P\hat{S}(365)) \cdot 100. \tag{21}$$

SQL Code POC is currently working on an implementation of a Kaplan-Meier estimator in SQL server. For our present purposes, however, we will select the relevant data with SQL code and calculate $_P\hat{S}(365)$ using `survival` package in R. The releveant SQL code is as follows:

```sql
declare @fystart int
declare @fystop int
declare @last_obs datetime
set @fystart = 2000
set @fystop = 2013;

select
  child id_prsn_child
  ,case
    when rp.discharge_dt = '9999-12-31'
    then datediff(dd
          ,rp.removal_dt
          ,datefromparts(@fystop, 06, 30))
    when rp.[18bday] < rp.discharge_dt
    then datediff(dd
          ,rp.removal_dt
          , rp.[18bday])
    else datediff(dd
          ,rp.removal_dt
          ,rp.discharge_dt)
  end t
  ,case
    when rp.discharge_dt <> '9999-12-31'
      and rp.[18bday] > rp.discharge_dt
      and toe.discharge_type in ('Reunification'
                  ,'Adoption'
                  ,'Guardianship')
    then 1
    else 0
  end p
  ,cd1.state_fiscal_yyyy fiscal_yr
```

```sql
from ca_ods.base.rptPlacement rp
  left join dbo.ref_lookup_cd_discharge_type_exits toe
    on toe.cd_discharge_type=rp.cd_discharge_type
  join ca_ods.dbo.calendar_dim cd1
    on rp.removal_dt = cd1.calendar_date
where
  cd1.state_fiscal_yyyy between @fystart and @fystop
    and case
        when rp.discharge_dt = '9999-12-31'
        then datediff(dd
                ,rp.removal_dt
                ,datefromparts(@fystop, 06, 30))
        when rp.[18bday] < rp.discharge_dt
        then datediff(dd
                ,rp.removal_dt
                , rp.[18bday])
        else datediff(dd
                ,rp.removal_dt
                ,rp.discharge_dt)
        end + 1 > 7
order by t
```

R Code   The following code allows us to load the data using the aforementioned SQL script as we have done previously. We then set our model using the R syntax for event history models. This model statement indicates our time variable `t` and our permanency variable `p`. We set the model "equal to" `fiscal_yr` which tells R that we want to calculate seperate survival functions for each entry-year. The fitted survival functions are assigned to an object named `fit`. We then create a new dataframe called `dat` which we initialize with a `fiscal_yr` column indicating the fiscal year in question and a `P_hat_S365` colum into which we will loop values of $_P\hat{S}(365)$ for each fiscal year.

```r
require(survival)

## Loading required package:  survival
## Loading required package:  splines

dat.P_hat_S <- sqlQuery(cn, read.sql("p_hat_S.sql"))

model <- Surv(t,p) ~ fiscal_yr
fit <- survfit(model, dat=dat.P_hat_S)

dat <- data.frame(fiscal_yr = 2000:2013
                  ,P_hat_S365 = rep(NA,length(fit$strata)))
for(i in 1:length(fit$strata)){
  sum_i <- summary(fit[i])
  idx <- which.min(abs(summary(fit[i])$time-365))
  dat$P_hat_S365[i] <- sum_i$surv[idx]
}
```
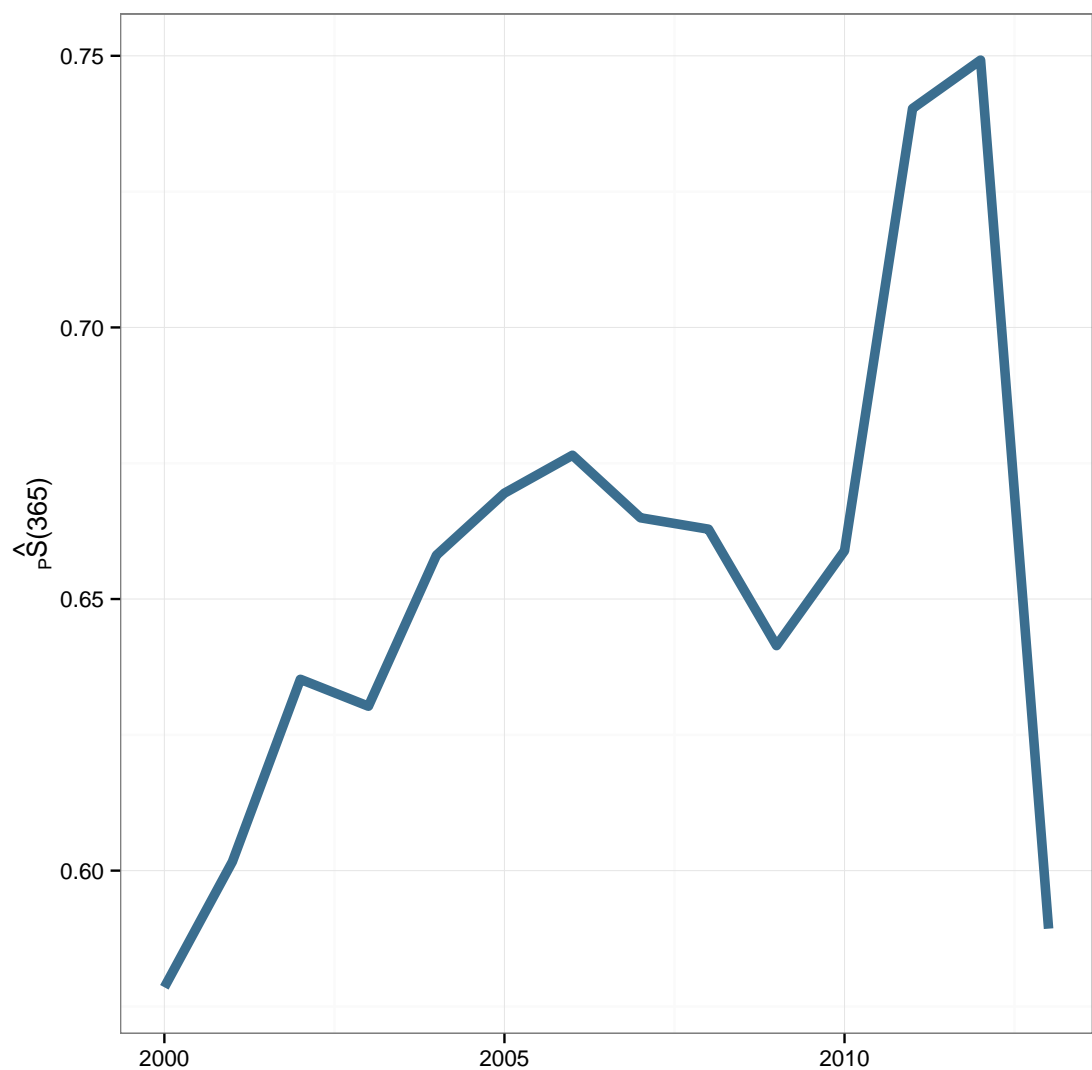
```r
#plot time series
ggplot(dat, aes(y=P_hat_S365, x=fiscal_yr)) +
  geom_line(colour=poc_colors[1], size=2) +
  labs(y = expression(paste({}[P]
                            ,hat(S)
                            ,"("
                            ,365
                            ,")"))
       ,x = "") +
  theme_bw()
```



```r
require(survival)
dat.A_hat_S <- sqlQuery(cn, read.sql("A_hat_S.sql"))

model <- Surv(t,a) ~ fiscal_yr
fit <- survfit(model, dat=dat.A_hat_S)
```
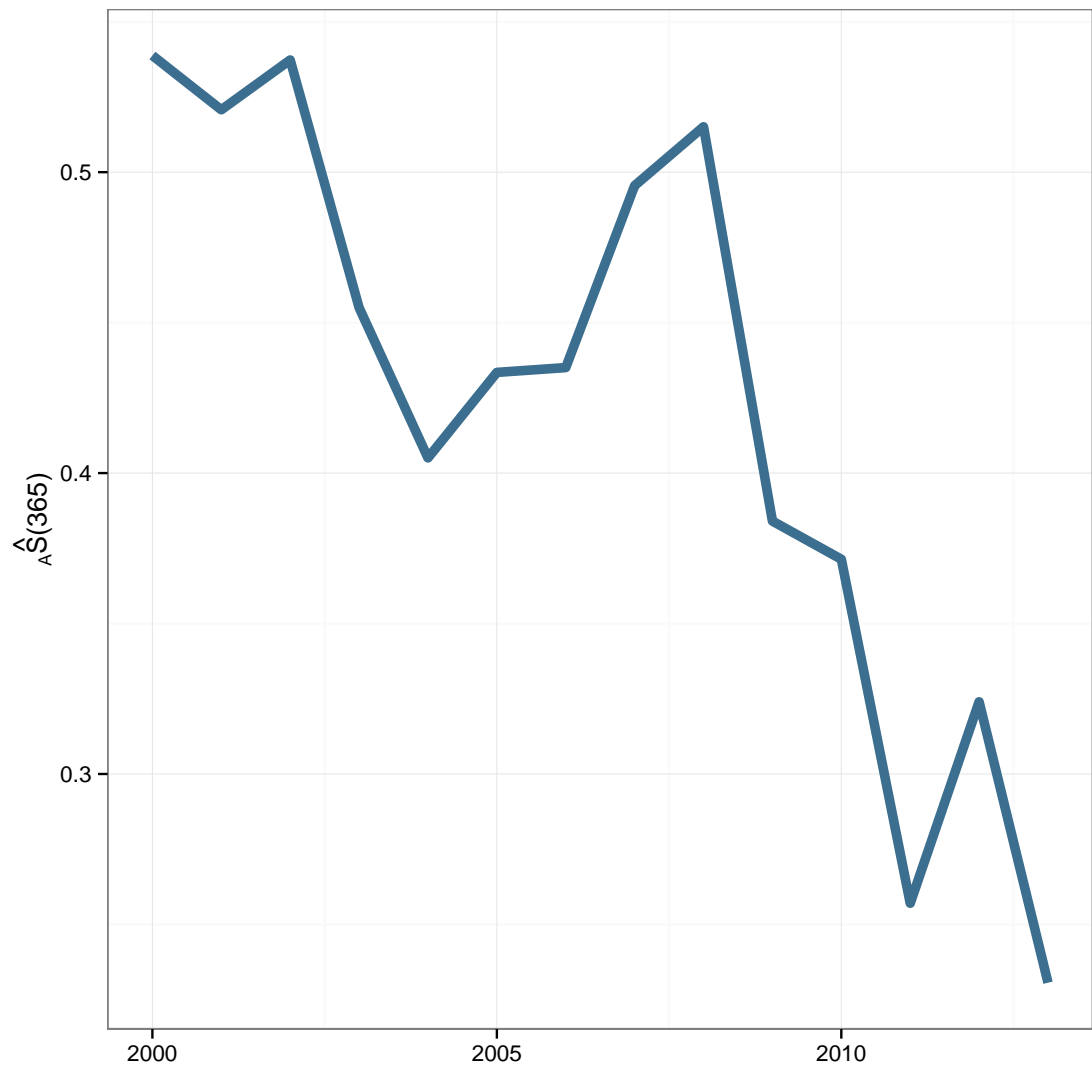
```r
dat <- data.frame(fiscal_yr = 2000:2013
                  ,A_hat_S365 = rep(NA,length(fit$strata)))
for(i in 1:length(fit$strata)){
  sum_i <- summary(fit[i])
  idx <- which.min(abs(summary(fit[i])$time-365))
  dat$A_hat_S365[i] <- sum_i$surv[idx]
}

#plot time series
ggplot(dat, aes(y=A_hat_S365, x=fiscal_yr)) +
  geom_line(colour=poc_colors[1], size=2) +
  labs(y = expression(paste({}[A]
                            ,hat(S)
                            ,"("
                            ,365
                            ,")"))
       ,x = "") +
  theme_bw()
```

3.4.3. Safe reunification of children placed in out-of-home care

Reentry rate according to permanency duration

Probability of Permanency for 1 Year   This measurement is similar to the proposed CFSR measurement examining reentry within 12 months. However, instead of calculating a specific percentage, we propose that a Kaplan-Meier estimator be used to better account for right censoring of children who either age-out of the system or exit to a form of permanency other than adoption, reunification, or some form of guardianship.

Definition The Kaplan-Meier estimator for reentry R from a federally recognized form of permanency is given as

$$_R\hat{S}(t) = \prod_{t_i < t} \frac{n_i - r_i}{n_i} \tag{22}$$

where n_i is the number still in permanency just prior to time t_i, and r_i is the number of reentry events at t_i. Thus, the probability of exit within 1 year is given as $_R\hat{S}(365)$. A reasonable approximation of the new CFSR measurement is given as

$$(1 - {}_P\hat{S}(365)) \cdot 100. \tag{23}$$

SQL Code As mentioned, POC is currently working on an implementation of a Kaplan-Meier estimator in SQL server. For our present purposes, however, we will select the relevant data with SQL code and calculate $_R\hat{S}(365)$ as we did for $_P\hat{S}(365)$. The releveant SQL code is as follows:

```
declare @fystart int
declare @fystop int
set @fystart = 2000
set @fystop = 2013;


select
  child id_prsn_child
  ,case
    when rp.[18bday] < next_reentry_date
    then datediff(dd, rp.discharge_dt, rp.[18bday]) + 1
    else datediff(dd, rp.discharge_dt, isnull(rp.next_reentry_date, datefrompar
  end t
  ,case
    when rp.next_reentry_date is null and rp.[18bday] < datefromparts(@fystop,
    then 0
    else iif(rp.next_reentry_date is not null, 1, 0)
  end r
  ,cd1.state_fiscal_yyyy fiscal_yr
from ca_ods.base.rptPlacement rp
  left join dbo.ref_lookup_cd_discharge_type_exits toe
    on toe.cd_discharge_type=rp.cd_discharge_type
  join ca_ods.dbo.calendar_dim cd1
    on convert(int
        ,convert(
          varchar
            ,case
              when rp.discharge_dt = '9999-12-31'
              then datefromparts(@fystop, 06, 30)
              when rp.[18bday] < rp.discharge_dt
              then rp.[18bday]
              else rp.discharge_dt
```

```sql
            end
            ,112
            )
        ) = cd1.id_calendar_dim
where
  cd1.state_fiscal_yyyy between @fystart and @fystop
    and rp.discharge_dt <> '9999-12-31'
    and case
        when rp.[18bday] < next_reentry_date
        then datediff(dd, rp.discharge_dt, rp.[18bday]) + 1
        else datediff(dd, rp.discharge_dt, isnull(rp.next_reentry_date, datefro
      end >= 0
    and case
    when rp.discharge_dt <> '9999-12-31'
        and rp.[18bday] > rp.discharge_dt
        and toe.discharge_type in ('Reunification'
                        ,'Adoption'
                        ,'Guardianship')
        then 1
        else 0
      end = 1
    and case
        when rp.discharge_dt = '9999-12-31'
        then datediff(dd
                ,rp.removal_dt
                ,datefromparts(@fystop, 06, 30))
        when rp.[18bday] < rp.discharge_dt
        then datediff(dd
                ,rp.removal_dt
                , rp.[18bday])
        else datediff(dd
                ,rp.removal_dt
                ,rp.discharge_dt)
      end + 1 > 7
order by t
```

R Code The following code allows us to load the data using the aformentioned SQL script as we have done previously. We then set our model using the R syntax for event history models. This model statement indicates our time variable t and our reentry variable r. Similar to the above, We set the model "equal to" fiscal_yr which tells R that we want to calculate seperate survival functions for each entry-year. The fitted survival functions are assigned to an object named fit. We then create a new dataframe called dat which we initialize with a fiscal_yr column indicating the fiscal year in question and a R_hat_S365 colum into which we will loop values of $_R\hat{S}(365)$ for each fiscal year.

```r
require(survival)
dat.R_hat_S <- sqlQuery(cn, read.sql("R_hat_S.sql"))
```

```r
model <- Surv(t,r) ~ fiscal_yr
fit <- survfit(model, dat=dat.R_hat_S)

dat <- data.frame(fiscal_yr = 2000:2013
                  ,R_hat_S365 = rep(NA,length(fit$strata)))
for(i in 1:length(fit$strata)){
  sum_i <- summary(fit[i])
  idx <- which.min(abs(summary(fit[i])$time-365))
  dat$R_hat_S365[i] <- sum_i$surv[idx]
}

#plot time series
ggplot(dat, aes(y=R_hat_S365, x=fiscal_yr)) +
  geom_line(colour=poc_colors[1], size=2) +
  labs(y = expression(paste({}[R]
                            ,hat(S)
                            ,"("
                            ,365
                            ,")"))
       ,x = "") +
  theme_bw()
```