

# STA304PS2

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### Abstract

The purpose of this article is to examine the probability of the female above 19-year-old will divorce and what is the influence factor for that in Canada by using 2017 GSS (General Social Survey) dataset. We apply setting up a multinomial logit model to analyze the main influence factor of divorcing. There are four main factors that influence the divorce rate emerged from the analysis. Only the total number of children have a positive relationship with the divorce rate. Family income level, partner's education level and income respondent has a negative relationship with the divorce rate. Associated with much of the common sense, divorce rates are always related to income, children and education.

### Introduction

The word "marriage" represents happiness in most people's lives, but in the modern era, it becomes closer to divorce than any time in the past. The rate of divorce has been increasing and the average marriage time only lasts seven years. Approximately, 38% of all Canadian marriages end in divorce, and there is a trend that newer marriages have a higher divorce rate (1). According to Statistics Canada, Divorce rates by year of marriage, Canadians getting married in 2001 have the highest divorce rate, which is 26.08 per 1,000 marriages (2). The potential reasons and underlying factors regarding this shocking but intriguing data is worth analyzing. As a result, the goal of this analysis is to find potential reasons for the trend of increasing in divorce rate in Canada and predict divorce rate in the future when taking account of those factors. The study will be focusing on statistical analysis of the dataset: Canadian General Social Survey (GSS), and models will be built for data to be analyzed.

### Data

Our data is based on the 2017 Canadian General Social Survey (GSS) including 19 years of age and older in Canada. The purpose of this data collection is to gather information for the specific social policy issues

at present or preparing for the future. And it is more convenient to observe how the living conditions and well-being change among Canadians over time. The sample data was collected by groups of provinces during 9.00 am. to 9.30 pm. Mondays to Fridays. And the sample size is 20,000. And there are many Census Metropolitan Areas (CMAs) that were divided into Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova scotia, Ontario, Prince Edward Island, Quebec and Saskatchewan. The method of collecting data uses a new frame by survey via telephone. The advantages of this methodology are that it is impossible to collect sample data by face-to face interview via ten provinces. And telephone calls save time to reach people who are 19 years of age and older separately in ten provinces. However, the drawbacks might be existing outliers that people might skip the questions or refusing to answer the call. In order to cover all households with telephone numbers, the non-response are also included in the frame.

## Model

We used logistic regression model to find whether there exsiting the correlation between once divorced women and several predictor variables ( $\beta_1 X_{tc,i}$ ,  $\beta_2 X_{if,i}$ ,  $\beta_3 X_{ir,i}$ ,  $\beta_4 X_{pe,i}$ ).  $p$  is the probability of the once divorced women occurring.

$$\log \frac{p_i}{1 - p_i} = \beta_0 + \beta_1 X_{tc,i} + \beta_2 X_{if,i} + \beta_3 X_{ir,i} + \beta_4 X_{pe,i} + \epsilon_i$$

$X_{tc,i}$  is a variable that the number of children women have.

$X_{if,i}$  is the family income. There are four levels including 125,000 and more, 25,000 to 49,999, 50,000 to 74,999, 75,000 to 99,999.

$X_{ir,i}$  is the income respondent. There are 125,000 and more, 25,000 to 49,999, 50,000 to 74,999, 75,000 to 99,999, Less than 25,000.

$X_{pe,i}$  is the level of partner education. There are five levels, college, CEGEP or other no-university certificate or diploma, High school diploma or high school equivalency certification, less than high school diploma or its equivalent, University certificate or diploma below bachelor's level, University certificate, diploma or degree above the bachelor's level.

## Code

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##   filter, lag

## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union

##   caseid  age age_first_child age_youngest_child_under_6 total_children
## 1      8 80.0           59                      NA           7
## 2     13 56.8           35                      NA           4
## 3     17 68.8           45                      NA           7
## 4     21 64.8           34                      NA           2
## 5     25 63.5           NA                      NA           0
## 6     44 68.9           37                      5           4
```

```

##   age_start_relationship age_at_first_marriage age_at_first_birth
## 1                      NA                    22.1                22.9
## 2                      NA                    23.8                  NA
## 3                      NA                    20.9                24.3
## 4                      NA                    23.3                31.0
## 5                      NA                    25.2                  NA
## 6                      NA                    25.8                32.8
##   distance_between_houses age_youngest_child_returned_work feelings_life   sex
## 1                      NA                                NA        10 Female
## 2                      NA                                NA         6 Female
## 3                      NA                                NA         9   Male
## 4                      NA                                NA        10   Male
## 5                      NA                                NA         8 Female
## 6                      NA                                11        10   Male
##   place_birth_canada place_birth_father place_birth_mother
## 1   Born in Canada   Born in Canada   Born in Canada
## 2   Born in Canada   Born in Canada   Born in Canada
## 3   Born in Canada Born outside Canada Born outside Canada
## 4   Born in Canada   Born in Canada   Born in Canada
## 5   Born in Canada   Born in Canada   Born in Canada
## 6   Born in Canada   Born in Canada   Born in Canada
##   place_birth_macro_region place_birth_province year_arrived_canada
## 1                      <NA>      New Brunswick      <NA>
## 2                      <NA> Prince Edward Island      <NA>
## 3                      <NA>              Ontario      <NA>
## 4                      <NA>              Ontario      <NA>
## 5                      <NA>              Quebec      <NA>
## 6                      <NA>              Quebec      <NA>
##           province           region
## 1           Quebec           Quebec
## 2 Prince Edward Island Atlantic region
## 3           Ontario           Ontario
## 4           Ontario           Ontario
## 5           Quebec           Quebec
## 6           Quebec           Quebec
##                                     pop_center marital_status
## 1   Larger urban population centres (CMA/CA)   Divorced
## 2                                     Prince Edward Island   Married
## 3 Rural areas and small population centres (non CMA/CA)   Married
## 4   Larger urban population centres (CMA/CA)   Married
## 5   Larger urban population centres (CMA/CA)   Divorced
## 6   Larger urban population centres (CMA/CA)   Married
##   aboriginal      vis_minority age_immigration landed_immigrant
## 1   No Not a visible minority      <NA>      <NA>
## 2   No Not a visible minority      <NA>      <NA>
## 3   No Not a visible minority      <NA>      <NA>
## 4   No Not a visible minority      <NA>      <NA>
## 5   No Not a visible minority      <NA>      <NA>
## 6   No Not a visible minority      <NA>      <NA>
##   citizenship_status
## 1   By birth
## 2   By birth
## 3   By birth
## 4   By birth

```

```

## 5          By birth
## 6          By birth
##                                     education
## 1          Less than high school diploma or its equivalent
## 2 High school diploma or a high school equivalency certificate
## 3 High school diploma or a high school equivalency certificate
## 4 University certificate, diploma or degree above the bach...
## 5 College, CEGEP or other non-university certificate or di...
## 6          Bachelor's degree (e.g. B.A., B.Sc., LL.B.)
##                                     own_rent
## 1          Rented, even if no cash rent is paid
## 2 Owned by you or a member of this household, even if it i...
## 3 Owned by you or a member of this household, even if it i...
## 4 Owned by you or a member of this household, even if it i...
## 5          Rented, even if no cash rent is paid
## 6 Owned by you or a member of this household, even if it i...
##                                     living_arrangement
## 1          Alone
## 2          Spouse only
## 3 Spouse and single child 25 years of age or older
## 4          Spouse only
## 5          Alone
## 6          Other living arrangement
##                                     hh_type hh_size partner_birth_country
## 1 High-rise apartment (5 or more stories)          1          <NA>
## 2          Single detached house                    2          Canada
## 3          Single detached house                    3          Canada
## 4          Other                                     2          Canada
## 5 Low-rise apartment (less than 5 stories)          1          <NA>
## 6          Single detached house                    5 Country outside Canada
## partner_birth_province partner_vis_minority partner_sex
## 1          <NA>          <NA>          <NA>
## 2 Prince Edward Island Not a visible minority          <NA>
## 3          Ontario Not a visible minority          <NA>
## 4          Quebec Not a visible minority          <NA>
## 5          <NA>          <NA>          <NA>
## 6          Outside Canada Not a visible minority          <NA>
##                                     partner_education
## 1          <NA>
## 2 High school diploma or a high school equivalency certi...
## 3          <NA>
## 4          Bachelor's degree (e.g. B.A., B.Sc., LL.B.)
## 5          <NA>
## 6 University certificate, diploma or degree above the ba...
## average_hours_worked worked_last_week partner_main_activity
## 1          <NA>          No          <NA>
## 2          Don't know          No Working at a paid job or business
## 3 30.0 to 40.0 hours          Yes          Retired
## 4          <NA>          No          Retired
## 5          <NA>          No          <NA>
## 6 40.1 to 50.0 hours          Yes Working at a paid job or business
## selfRatedHealth selfRatedMentalHealth religionHasAffiliation
## 1          Good          Very good Has religious affiliation
## 2          Good          Very good Has religious affiliation

```

## 3	Excellent		Good	Has religious affiliation
## 4	Very good		Excellent	Has religious affiliation
## 5	Very good		Very good	Has religious affiliation
## 6	Excellent		Excellent	Has religious affiliation
##	regilion_importance	language_home		language_knowledge
## 1	Somewhat important	French	Both English and French	
## 2	Very important	English		English only
## 3	Somewhat important	English		English only
## 4	Not at all important	English		English only
## 5	Very important	French		French only
## 6	Not at all important	French	Both English and French	
##	income_family	income_respondent		
## 1	Less than \$25,000	Less than \$25,000		
## 2	\$75,000 to \$99,999	Less than \$25,000		
## 3	\$125,000 and more	\$125,000 and more		
## 4	\$125,000 and more	\$25,000 to \$49,999		
## 5	\$25,000 to \$49,999	\$25,000 to \$49,999		
## 6	\$100,000 to \$ 124,999	\$50,000 to \$74,999		
##			occupation	childcare_regular
## 1			<NA>	<NA>
## 2		Sales and service occupations		<NA>
## 3		Sales and service occupations		<NA>
## 4			<NA>	<NA>
## 5			<NA>	<NA>
## 6		Occupations in art, culture, recreation and sport		<NA>
##	childcare_type	childcare_monthly_cost	ever_fathered_child	ever_given_birth
## 1	<NA>	<NA>	<NA>	Yes
## 2	<NA>	<NA>	<NA>	Yes
## 3	<NA>	<NA>	Yes	<NA>
## 4	<NA>	<NA>	Yes	<NA>
## 5	<NA>	<NA>	<NA>	No
## 6	<NA>	<NA>	<NA>	<NA>
##	number_of_current_union	lives_with_partner	children_in_household	
## 1	<NA>	No	No child	
## 2	<NA>	No	No child	
## 3	<NA>	No	No child	
## 4	<NA>	No	No child	
## 5	<NA>	No	No child	
## 6	<NA>	No	Two children	
##	number_total_children_intention	has_grandchildren	grandparents_still_living	
## 1		NA	Yes	No
## 2		NA	Yes	No
## 3		NA	Yes	No
## 4		NA	Yes	No
## 5		NA	No	No
## 6		0	Yes	No
##	ever_married	current_marriage_is_first	number_marriages	
## 1	Yes	<NA>	1	
## 2	Yes	No	2	
## 3	Yes	No	3	
## 4	Yes	No	2	
## 5	Yes	<NA>	1	
## 6	Yes	No	3	
##	religion_participation	partner_location_residence	full_part_time_work	

```

## 1   At least once a month           <NA>           <NA>
## 2   At least once a week           <NA>           <NA>
## 3   At least 3 times a year         <NA>           <NA>
## 4   Not at all                     <NA>           <NA>
## 5   Not at all                     <NA>           <NA>
## 6   Not at all                     <NA>           Full-time
##   time_off_work_birth reason_no_time_off_birth returned_same_job
## 1   <NA>                <NA>                <NA>
## 2   <NA>                <NA>                <NA>
## 3   <NA>                <NA>                <NA>
## 4   <NA>                <NA>                <NA>
## 5   <NA>                <NA>                <NA>
## 6   Yes                 <NA>                Yes
##   satisfied_time_children provide_or_receive_fin_supp fin_supp_child_supp
## 1   <NA>                <NA>                NA
## 2   <NA>                <NA>                NA
## 3   <NA>                <NA>                NA
## 4   <NA>                <NA>                NA
## 5   <NA>                <NA>                NA
## 6   <NA>                <NA>                NA
##   fin_supp_child_exp fin_supp_lump fin_supp_other fin_supp_agreement
## 1   NA                NA            NA            <NA>
## 2   NA                NA            NA            <NA>
## 3   NA                NA            NA            <NA>
## 4   NA                NA            NA            <NA>
## 5   NA                NA            NA            <NA>
## 6   NA                NA            NA            <NA>
##   future_children_intention is_male main_activity
## 1   <NA>                    0            NA
## 2   <NA>                    0            NA
## 3   <NA>                    1            NA
## 4   <NA>                    1            NA
## 5   <NA>                    0            NA
## 6   No, definitely not      1            NA
##   age_diff number_total_children_known once_divorced
## 1   <NA>                0            TRUE
## 2   Respondent is 3 years older      0            TRUE
## 3   Respondent is 3 years younger     0            TRUE
## 4   Respondent is 1 year younger     0            TRUE
## 5   <NA>                0            TRUE
## 6   Respondent is 11 + years younger  1            TRUE
##   booleandivorced
## 1   1
## 2   1
## 3   1
## 4   1
## 5   1
## 6   1

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

##

```

```

## Call:
## glm(formula = booleandivorced ~ total_children + age_youngest_child_returned_work +
##      partner_education + income_family + income_respondent, family = "binomial",
##      data = once_divorced_f)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -0.8650  -0.2691  -0.2031  -0.1575   2.9603
##
## Coefficients:
##                                     Estimate
## (Intercept)                      -3.830e+00
## total_children                    3.748e-01
## age_youngest_child_returned_work  3.145e-03
## partner_educationCollege, CEGEP or other non-university certificate or d... -4.948e-01
## partner_educationHigh school diploma or a high school equivalency certi... -6.210e-01
## partner_educationLess than high school diploma or its equivalent          1.159e+00
## partner_educationTrade certificate or diploma                          -1.613e+01
## partner_educationUniversity certificate or diploma below the bachelor's level -3.297e-01
## partner_educationUniversity certificate, diploma or degree above the ba...  6.304e-01
## income_family$125,000 and more                                         3.546e-01
## income_family$25,000 to $49,999                                       4.214e-01
## income_family$50,000 to $74,999                                       5.257e-01
## income_family$75,000 to $99,999                                       8.134e-02
## income_familyLess than $25,000                                       -1.616e+01
## income_respondent$125,000 and more                                    -9.654e-01
## income_respondent$25,000 to $49,999                                  -7.142e-01
## income_respondent$50,000 to $74,999                                  -8.253e-01
## income_respondent$75,000 to $99,999                                  -8.261e-01
## income_respondentLess than $25,000                                   -1.817e-01
##                                     Std. Error
## (Intercept)                      9.243e-01
## total_children                    1.698e-01
## age_youngest_child_returned_work  3.407e-02
## partner_educationCollege, CEGEP or other non-university certificate or d...  5.655e-01
## partner_educationHigh school diploma or a high school equivalency certi...  6.991e-01
## partner_educationLess than high school diploma or its equivalent          6.934e-01
## partner_educationTrade certificate or diploma                          1.156e+03
## partner_educationUniversity certificate or diploma below the bachelor's level 1.090e+00
## partner_educationUniversity certificate, diploma or degree above the ba...  5.212e-01
## income_family$125,000 and more                                         6.247e-01
## income_family$25,000 to $49,999                                       8.983e-01
## income_family$50,000 to $74,999                                       7.295e-01
## income_family$75,000 to $99,999                                       7.404e-01
## income_familyLess than $25,000                                       2.581e+03
## income_respondent$125,000 and more                                    9.587e-01
## income_respondent$25,000 to $49,999                                  8.267e-01
## income_respondent$50,000 to $74,999                                  7.478e-01
## income_respondent$75,000 to $99,999                                  7.621e-01
## income_respondentLess than $25,000                                   8.963e-01
##                                     z value
## (Intercept)                      -4.144
## total_children                    2.207
## age_youngest_child_returned_work  0.092

```

```

## partner_educationCollege, CEGEP or other non-university certificate or d... -0.875
## partner_educationHigh school diploma or a high school equivalency certi... -0.888
## partner_educationLess than high school diploma or its equivalent 1.671
## partner_educationTrade certificate or diploma -0.014
## partner_educationUniversity certificate or diploma below the bachelor's level -0.302
## partner_educationUniversity certificate, diploma or degree above the ba... 1.209
## income_family$125,000 and more 0.568
## income_family$25,000 to $49,999 0.469
## income_family$50,000 to $74,999 0.721
## income_family$75,000 to $99,999 0.110
## income_familyLess than $25,000 -0.006
## income_respondent$125,000 and more -1.007
## income_respondent$25,000 to $49,999 -0.864
## income_respondent$50,000 to $74,999 -1.104
## income_respondent$75,000 to $99,999 -1.084
## income_respondentLess than $25,000 -0.203
## Pr(>|z|)
## (Intercept) 3.41e-05
## total_children 0.0273
## age_youngest_child_returned_work 0.9264
## partner_educationCollege, CEGEP or other non-university certificate or d... 0.3816
## partner_educationHigh school diploma or a high school equivalency certi... 0.3743
## partner_educationLess than high school diploma or its equivalent 0.0947
## partner_educationTrade certificate or diploma 0.9889
## partner_educationUniversity certificate or diploma below the bachelor's level 0.7623
## partner_educationUniversity certificate, diploma or degree above the ba... 0.2265
## income_family$125,000 and more 0.5703
## income_family$25,000 to $49,999 0.6390
## income_family$50,000 to $74,999 0.4711
## income_family$75,000 to $99,999 0.9125
## income_familyLess than $25,000 0.9950
## income_respondent$125,000 and more 0.3139
## income_respondent$25,000 to $49,999 0.3877
## income_respondent$50,000 to $74,999 0.2698
## income_respondent$75,000 to $99,999 0.2784
## income_respondentLess than $25,000 0.8394
##
## (Intercept) ***
## total_children *
## age_youngest_child_returned_work
## partner_educationCollege, CEGEP or other non-university certificate or d...
## partner_educationHigh school diploma or a high school equivalency certi...
## partner_educationLess than high school diploma or its equivalent .
## partner_educationTrade certificate or diploma
## partner_educationUniversity certificate or diploma below the bachelor's level
## partner_educationUniversity certificate, diploma or degree above the ba...
## income_family$125,000 and more
## income_family$25,000 to $49,999
## income_family$50,000 to $74,999
## income_family$75,000 to $99,999
## income_familyLess than $25,000
## income_respondent$125,000 and more
## income_respondent$25,000 to $49,999
## income_respondent$50,000 to $74,999

```



```

## income_respondent$75,000 to $99,999
## income_respondentLess than $25,000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 270.93  on 1023  degrees of freedom
## Residual deviance: 247.56  on 1005  degrees of freedom
##   (19578 observations deleted due to missingness)
## AIC: 285.56
##
## Number of Fisher Scoring iterations: 18

##
## Call:
## glm(formula = booleandivorced ~ total_children + partner_education +
##      income_family + income_respondent, family = "binomial", data = once_divorced_f)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.0622  -0.4948  -0.4265  -0.3516   2.6094
##
## Coefficients:
##
##                                     Estimate
## (Intercept)                        -2.66875
## total_children                      0.30915
## partner_educationCollege, CEGEP or other non-university certificate or d... 0.25410
## partner_educationHigh school diploma or a high school equivalency certi... 0.34334
## partner_educationLess than high school diploma or its equivalent          0.09049
## partner_educationTrade certificate or diploma                            0.22366
## partner_educationUniversity certificate or diploma below the bachelor's level 0.31642
## partner_educationUniversity certificate, diploma or degree above the ba... 0.15909
## income_family$125,000 and more                                           -0.06477
## income_family$25,000 to $49,999                                         0.37661
## income_family$50,000 to $74,999                                         0.29651
## income_family$75,000 to $99,999                                         0.09191
## income_familyLess than $25,000                                           0.46906
## income_respondent$125,000 and more                                       -0.06185
## income_respondent$25,000 to $49,999                                     -0.63720
## income_respondent$50,000 to $74,999                                     -0.39167
## income_respondent$75,000 to $99,999                                     -0.20763
## income_respondentLess than $25,000                                       -0.73660
##
##                                     Std. Error
## (Intercept)                        0.16499
## total_children                      0.02074
## partner_educationCollege, CEGEP or other non-university certificate or d... 0.09852
## partner_educationHigh school diploma or a high school equivalency certi... 0.09454
## partner_educationLess than high school diploma or its equivalent          0.12261
## partner_educationTrade certificate or diploma                            0.13406
## partner_educationUniversity certificate or diploma below the bachelor's level 0.15926
## partner_educationUniversity certificate, diploma or degree above the ba... 0.12191
## income_family$125,000 and more                                           0.10496
## income_family$25,000 to $49,999                                         0.12684

```

```

## income_family$50,000 to $74,999 0.11404
## income_family$75,000 to $99,999 0.11306
## income_familyLess than $25,000 0.18657
## income_respondent$125,000 and more 0.16928
## income_respondent$25,000 to $49,999 0.14803
## income_respondent$50,000 to $74,999 0.14211
## income_respondent$75,000 to $99,999 0.14703
## income_respondentLess than $25,000 0.15544
## z value
## (Intercept) -16.175
## total_children 14.907
## partner_educationCollege, CEGEP or other non-university certificate or d... 2.579
## partner_educationHigh school diploma or a high school equivalency certi... 3.632
## partner_educationLess than high school diploma or its equivalent 0.738
## partner_educationTrade certificate or diploma 1.668
## partner_educationUniversity certificate or diploma below the bachelor's level 1.987
## partner_educationUniversity certificate, diploma or degree above the ba... 1.305
## income_family$125,000 and more -0.617
## income_family$25,000 to $49,999 2.969
## income_family$50,000 to $74,999 2.600
## income_family$75,000 to $99,999 0.813
## income_familyLess than $25,000 2.514
## income_respondent$125,000 and more -0.365
## income_respondent$25,000 to $49,999 -4.305
## income_respondent$50,000 to $74,999 -2.756
## income_respondent$75,000 to $99,999 -1.412
## income_respondentLess than $25,000 -4.739
## Pr(>|z|)
## (Intercept) < 2e-16
## total_children < 2e-16
## partner_educationCollege, CEGEP or other non-university certificate or d... 0.009901
## partner_educationHigh school diploma or a high school equivalency certi... 0.000282
## partner_educationLess than high school diploma or its equivalent 0.460500
## partner_educationTrade certificate or diploma 0.095237
## partner_educationUniversity certificate or diploma below the bachelor's level 0.046945
## partner_educationUniversity certificate, diploma or degree above the ba... 0.191900
## income_family$125,000 and more 0.537181
## income_family$25,000 to $49,999 0.002986
## income_family$50,000 to $74,999 0.009324
## income_family$75,000 to $99,999 0.416259
## income_familyLess than $25,000 0.011933
## income_respondent$125,000 and more 0.714824
## income_respondent$25,000 to $49,999 1.67e-05
## income_respondent$50,000 to $74,999 0.005848
## income_respondent$75,000 to $99,999 0.157914
## income_respondentLess than $25,000 2.15e-06
## ***
## (Intercept) ***
## total_children ***
## partner_educationCollege, CEGEP or other non-university certificate or d... **
## partner_educationHigh school diploma or a high school equivalency certi... ***
## partner_educationLess than high school diploma or its equivalent .
## partner_educationTrade certificate or diploma .
## partner_educationUniversity certificate or diploma below the bachelor's level *

```

```

## partner_educationUniversity certificate, diploma or degree above the ba...
## income_family$125,000 and more
## income_family$25,000 to $49,999 **
## income_family$50,000 to $74,999 **
## income_family$75,000 to $99,999
## income_familyLess than $25,000 *
## income_respondent$125,000 and more
## income_respondent$25,000 to $49,999 ***
## income_respondent$50,000 to $74,999 **
## income_respondent$75,000 to $99,999
## income_respondentLess than $25,000 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
## Null deviance: 8160.4 on 12328 degrees of freedom
## Residual deviance: 7881.2 on 12311 degrees of freedom
## (8273 observations deleted due to missingness)
## AIC: 7917.2
##
## Number of Fisher Scoring iterations: 5

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

##
## Call:
## glm(formula = booleandivorced ~ total_children + age_youngest_child_returned_work +
## partner_education + income_family + income_respondent, family = "binomial",
## data = once_divorced_f_future_us)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -0.7834  -0.2619  -0.1975  -0.1462   3.0261
##
## Coefficients:
##                                     Estimate
## (Intercept)                        -3.72939
## total_children                      0.37618
## age_youngest_child_returned_work   -0.01806
## partner_educationCollege, CEGEP or other non-university certificate or d... -0.68046
## partner_educationHigh school diploma or a high school equivalency certi... -0.51493
## partner_educationLess than high school diploma or its equivalent           0.93004
## partner_educationTrade certificate or diploma                          -16.01947
## partner_educationUniversity certificate or diploma below the bachelor's level -0.37956
## partner_educationUniversity certificate, diploma or degree above the ba...  0.65861
## income_family$125,000 and more      0.36334
## income_family$25,000 to $49,999     0.01711
## income_family$50,000 to $74,999     0.56472
## income_family$75,000 to $99,999    -0.21055
## income_familyLess than $25,000     -16.08905
## income_respondent$125,000 and more  -1.00188
## income_respondent$25,000 to $49,999 -0.66673
## income_respondent$50,000 to $74,999 -0.73036

```

## income_respondent\$75,000 to \$99,999	-0.78018
## income_respondentLess than \$25,000	-0.16302
##	Std. Error
## (Intercept)	0.92882
## total_children	0.17170
## age_youngest_child_returned_work	0.03656
## partner_educationCollege, CEGEP or other non-university certificate or d...	0.60788
## partner_educationHigh school diploma or a high school equivalency certi...	0.69937
## partner_educationLess than high school diploma or its equivalent	0.76244
## partner_educationTrade certificate or diploma	1155.17616
## partner_educationUniversity certificate or diploma below the bachelor's level	1.09455
## partner_educationUniversity certificate, diploma or degree above the ba...	0.52371
## income_family\$125,000 and more	0.62622
## income_family\$25,000 to \$49,999	0.99792
## income_family\$50,000 to \$74,999	0.73202
## income_family\$75,000 to \$99,999	0.79328
## income_familyLess than \$25,000	2585.57935
## income_respondent\$125,000 and more	0.96037
## income_respondent\$25,000 to \$49,999	0.84453
## income_respondent\$50,000 to \$74,999	0.74893
## income_respondent\$75,000 to \$99,999	0.76226
## income_respondentLess than \$25,000	0.92594
##	z value
## (Intercept)	-4.015
## total_children	2.191
## age_youngest_child_returned_work	-0.494
## partner_educationCollege, CEGEP or other non-university certificate or d...	-1.119
## partner_educationHigh school diploma or a high school equivalency certi...	-0.736
## partner_educationLess than high school diploma or its equivalent	1.220
## partner_educationTrade certificate or diploma	-0.014
## partner_educationUniversity certificate or diploma below the bachelor's level	-0.347
## partner_educationUniversity certificate, diploma or degree above the ba...	1.258
## income_family\$125,000 and more	0.580
## income_family\$25,000 to \$49,999	0.017
## income_family\$50,000 to \$74,999	0.771
## income_family\$75,000 to \$99,999	-0.265
## income_familyLess than \$25,000	-0.006
## income_respondent\$125,000 and more	-1.043
## income_respondent\$25,000 to \$49,999	-0.789
## income_respondent\$50,000 to \$74,999	-0.975
## income_respondent\$75,000 to \$99,999	-1.023
## income_respondentLess than \$25,000	-0.176
##	Pr(> z )
## (Intercept)	5.94e-05
## total_children	0.0285
## age_youngest_child_returned_work	0.6213
## partner_educationCollege, CEGEP or other non-university certificate or d...	0.2630
## partner_educationHigh school diploma or a high school equivalency certi...	0.4616
## partner_educationLess than high school diploma or its equivalent	0.2225
## partner_educationTrade certificate or diploma	0.9889
## partner_educationUniversity certificate or diploma below the bachelor's level	0.7288
## partner_educationUniversity certificate, diploma or degree above the ba...	0.2085
## income_family\$125,000 and more	0.5618
## income_family\$25,000 to \$49,999	0.9863

```

## income_family$50,000 to $74,999 0.4404
## income_family$75,000 to $99,999 0.7907
## income_familyLess than $25,000 0.9950
## income_respondent$125,000 and more 0.2968
## income_respondent$25,000 to $49,999 0.4298
## income_respondent$50,000 to $74,999 0.3295
## income_respondent$75,000 to $99,999 0.3061
## income_respondentLess than $25,000 0.8602
##
## (Intercept) ***
## total_children *
## age_youngest_child_returned_work
## partner_educationCollege, CEGEP or other non-university certificate or d...
## partner_educationHigh school diploma or a high school equivalency certi...
## partner_educationLess than high school diploma or its equivalent
## partner_educationTrade certificate or diploma
## partner_educationUniversity certificate or diploma below the bachelor's level
## partner_educationUniversity certificate, diploma or degree above the ba...
## income_family$125,000 and more
## income_family$25,000 to $49,999
## income_family$50,000 to $74,999
## income_family$75,000 to $99,999
## income_familyLess than $25,000
## income_respondent$125,000 and more
## income_respondent$25,000 to $49,999
## income_respondent$50,000 to $74,999
## income_respondent$75,000 to $99,999
## income_respondentLess than $25,000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
## Null deviance: 256.79 on 1023 degrees of freedom
## Residual deviance: 234.57 on 1005 degrees of freedom
## (19578 observations deleted due to missingness)
## AIC: 272.57
##
## Number of Fisher Scoring iterations: 18
##
## Call:
## glm(formula = booleandivorced ~ total_children + age_youngest_child_returned_work +
## partner_education + income_family + income_respondent, family = "binomial",
## data = once_divorced_f_future_us)
##
## Deviance Residuals:
## Min 1Q Median 3Q Max
## -0.7834 -0.2686 -0.2096 -0.1583 3.0261
##
## Coefficients:
## (Intercept) Estimate
## total_children 0.37618

```

## age_youngest_child_returned_work	-0.01806
## partner_educationCollege, CEGEP or other non-university certificate or d...	-0.68046
## partner_educationHigh school diploma or a high school equivalency certi...	-0.51493
## partner_educationLess than high school diploma or its equivalent	0.93004
## partner_educationUniversity certificate or diploma below the bachelor's level	-0.37956
## partner_educationUniversity certificate, diploma or degree above the ba...	0.65861
## income_family\$125,000 and more	0.36334
## income_family\$25,000 to \$49,999	0.01711
## income_family\$50,000 to \$74,999	0.56472
## income_family\$75,000 to \$99,999	-0.21055
## income_respondent\$125,000 and more	-1.00188
## income_respondent\$25,000 to \$49,999	-0.66673
## income_respondent\$50,000 to \$74,999	-0.73036
## income_respondent\$75,000 to \$99,999	-0.78018
## income_respondentLess than \$25,000	-0.16302
##	Std. Error
## (Intercept)	0.92882
## total_children	0.17170
## age_youngest_child_returned_work	0.03656
## partner_educationCollege, CEGEP or other non-university certificate or d...	0.60788
## partner_educationHigh school diploma or a high school equivalency certi...	0.69937
## partner_educationLess than high school diploma or its equivalent	0.76244
## partner_educationUniversity certificate or diploma below the bachelor's level	1.09455
## partner_educationUniversity certificate, diploma or degree above the ba...	0.52371
## income_family\$125,000 and more	0.62622
## income_family\$25,000 to \$49,999	0.99792
## income_family\$50,000 to \$74,999	0.73202
## income_family\$75,000 to \$99,999	0.79328
## income_respondent\$125,000 and more	0.96037
## income_respondent\$25,000 to \$49,999	0.84453
## income_respondent\$50,000 to \$74,999	0.74893
## income_respondent\$75,000 to \$99,999	0.76226
## income_respondentLess than \$25,000	0.92594
##	z value
## (Intercept)	-4.015
## total_children	2.191
## age_youngest_child_returned_work	-0.494
## partner_educationCollege, CEGEP or other non-university certificate or d...	-1.119
## partner_educationHigh school diploma or a high school equivalency certi...	-0.736
## partner_educationLess than high school diploma or its equivalent	1.220
## partner_educationUniversity certificate or diploma below the bachelor's level	-0.347
## partner_educationUniversity certificate, diploma or degree above the ba...	1.258
## income_family\$125,000 and more	0.580
## income_family\$25,000 to \$49,999	0.017
## income_family\$50,000 to \$74,999	0.771
## income_family\$75,000 to \$99,999	-0.265
## income_respondent\$125,000 and more	-1.043
## income_respondent\$25,000 to \$49,999	-0.789
## income_respondent\$50,000 to \$74,999	-0.975
## income_respondent\$75,000 to \$99,999	-1.023
## income_respondentLess than \$25,000	-0.176
##	Pr(> z )
## (Intercept)	5.94e-05
## total_children	0.0285

```

## age_youngest_child_returned_work 0.6213
## partner_educationCollege, CEGEP or other non-university certificate or d... 0.2630
## partner_educationHigh school diploma or a high school equivalency certi... 0.4616
## partner_educationLess than high school diploma or its equivalent 0.2225
## partner_educationUniversity certificate or diploma below the bachelor's level 0.7288
## partner_educationUniversity certificate, diploma or degree above the ba... 0.2085
## income_family$125,000 and more 0.5618
## income_family$25,000 to $49,999 0.9863
## income_family$50,000 to $74,999 0.4404
## income_family$75,000 to $99,999 0.7907
## income_respondent$125,000 and more 0.2968
## income_respondent$25,000 to $49,999 0.4298
## income_respondent$50,000 to $74,999 0.3295
## income_respondent$75,000 to $99,999 0.3061
## income_respondentLess than $25,000 0.8602
##
## (Intercept) ***
## total_children *
## age_youngest_child_returned_work
## partner_educationCollege, CEGEP or other non-university certificate or d...
## partner_educationHigh school diploma or a high school equivalency certi...
## partner_educationLess than high school diploma or its equivalent
## partner_educationUniversity certificate or diploma below the bachelor's level
## partner_educationUniversity certificate, diploma or degree above the ba...
## income_family$125,000 and more
## income_family$25,000 to $49,999
## income_family$50,000 to $74,999
## income_family$75,000 to $99,999
## income_respondent$125,000 and more
## income_respondent$25,000 to $49,999
## income_respondent$50,000 to $74,999
## income_respondent$75,000 to $99,999
## income_respondentLess than $25,000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
## Null deviance: 251.07 on 925 degrees of freedom
## Residual deviance: 234.57 on 909 degrees of freedom
## (10009 observations deleted due to missingness)
## AIC: 268.57
##
## Number of Fisher Scoring iterations: 7

```

## Results

Figure 1

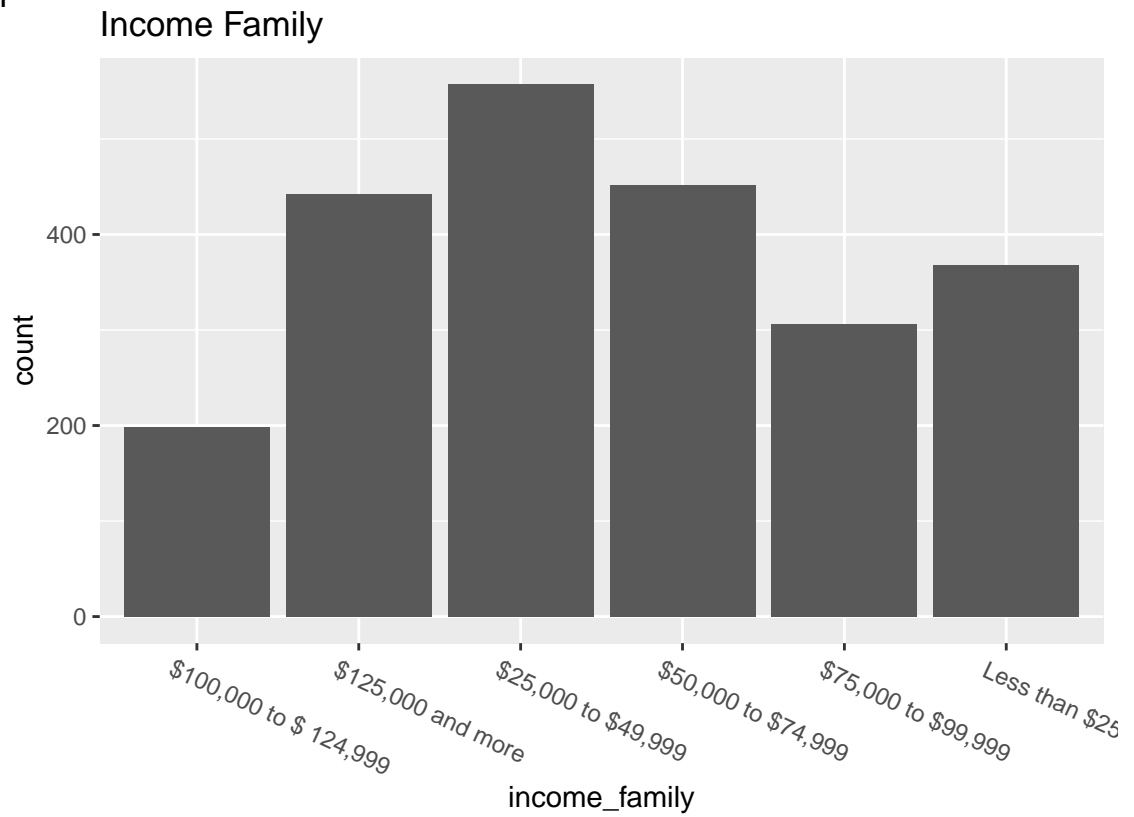


Figure 2

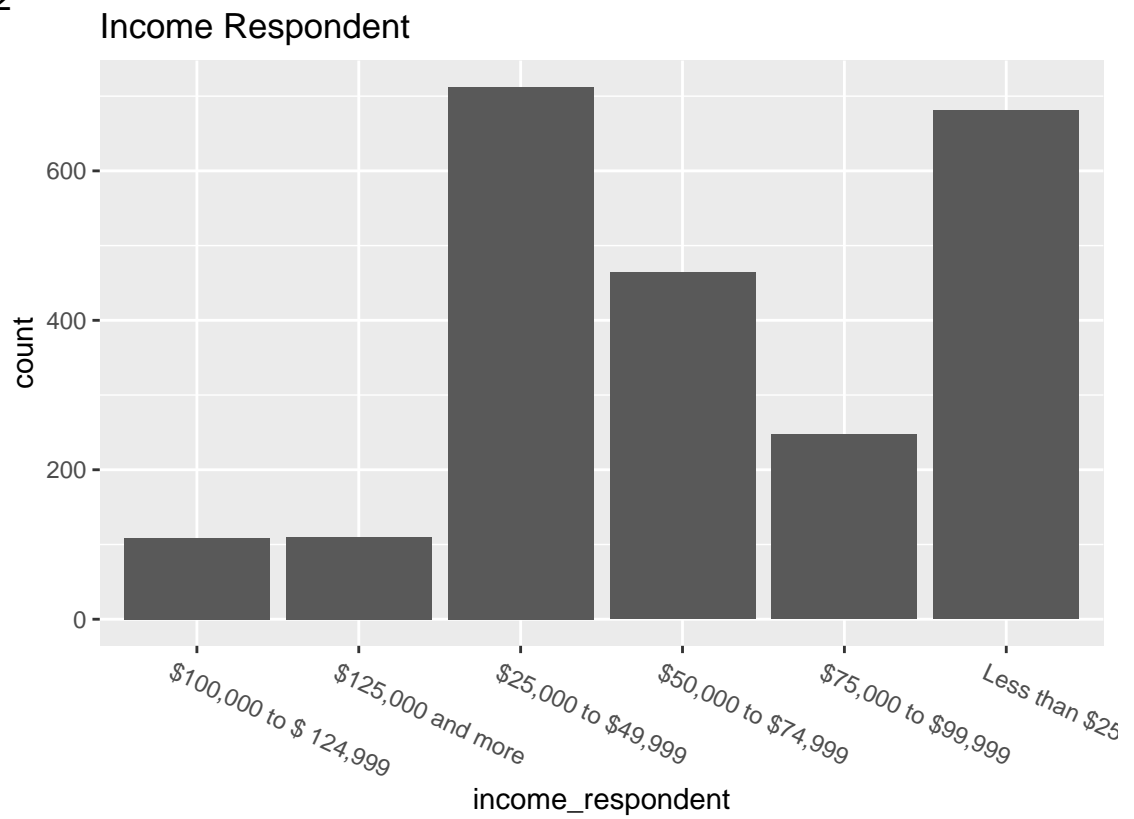




Figure 3

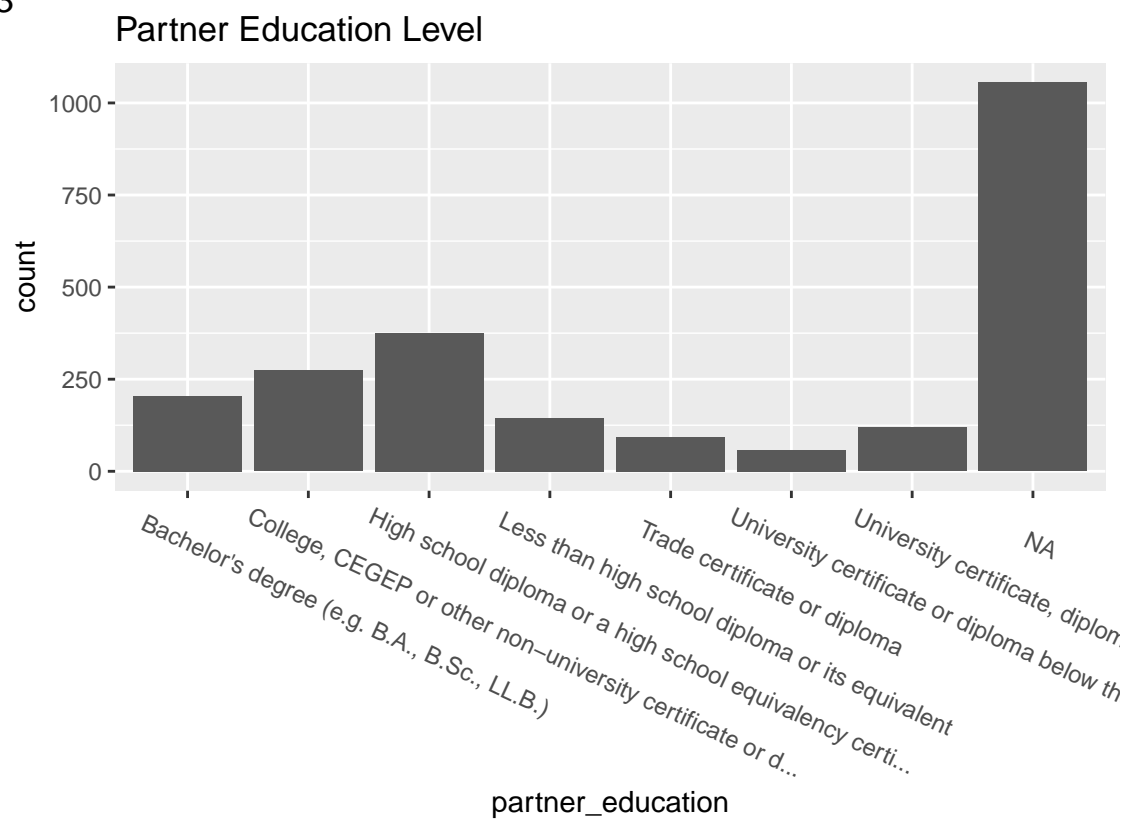
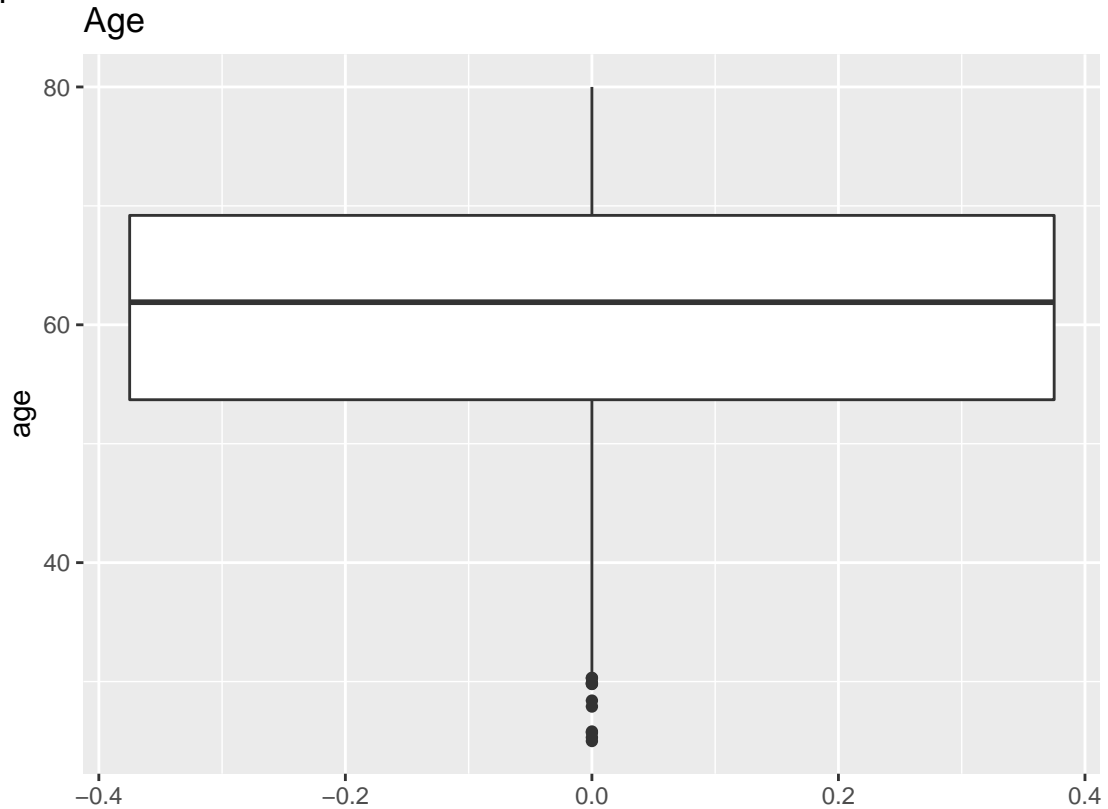


Figure 4



Based on the summary of generalized linear models, we can find the relationship between `once_divorced` and other predictor variables. The coefficients of a logistic regression analysis represent the change in log odds. From the summary, the probability of women who were divorced has a positive relationship with the number of children women had, which means every additional unit increase in `total_children` we expect the log odds of being divorced to increase 0.37618. In addition, from summary, it shows there is positive correlation between the divorced rate and the partner educational level. And it was shown in Figure 3 as well, there is smallest count number in the level of university certificate or diploma and above. In addition, it shows positive correlation between family income and divorced rate. And there is a negative correlation between divorced rate and family income from 75,000 to 99,999. Moreover, in Figure shown, there is a negative relationship between income respondent and divorced rate.

## Discussion

The investigation of potential factors that would contribute to the increasing divorce rate remains critical for people to face this social phenomenon. From the results of our study, there is a positive correlation between the number of total children and the probability of women getting divorced. The study in 1991 has shown that having children is not always a beneficial factor for the stability of the marriage (3). One empirical study had data evidence proved that, the greater the number of children, the more stable is the marriage. However, the greater number of children would also diminish marginal effects, which has limitations and beyond the limitation, the stability of marriage would decrease (4). This conclusion generally fits our analysis between the probability of women divorced and the factor of number of total children.

Our study also showed that, with the increase in the partner's education level, the probability that the couple getting divorced would decrease, with the exception of education level less than high school diploma. One's education level can somewhat determine his or her choice of occupation and social surroundings, which also specifically include how he or she would treat a marriage. Additionally, there are studies indicating that

the gender gap in education was associated with changes in relative divorce risks, and larger that gap, the greater risks of divorce (5). Those revealed that education level plays a key role in the stability of a marriage.

Family income is also positively related to the probability of women getting divorced. The exception that families with income greater than \$125,000 do not need to worry about divorce considering income as a factor. This indicates that these marriages exist for more complex reasons, so if this part of data are to be analyzed, additional factors need to be taken into account.

## Weaknesses

The purpose of this study is to analyze the influence factor of the divorce rate of the female whose age is between 19 and 45. However we have eliminated two of the factors, trade certification in partner education and household income under 25,000. Since, the standard deviation of these two factors are too large that may cause by outliers. Although this step excludes the potential unrelated factors, it reduces this report's reference value. Also, this study of female divorce rate are only using the dataset from 2017, so it may leads to the results inaccurate. For example, the COVID-19 attacks the income of average people violently this year.

## Next Steps

To improve the report result, we may add the factor of trade certification in partner education and household income under 25,000. First, by grouping a boxplot, we could find the standard deviation of these factors. If outliers exist, we should exclude the data of these outliers, then these two factors can be analyzed with divorced rate. Also, we should not only use the data from one year. Instead of current work, there should be data from other years engaged in the report, or we may release a survey that could ask people if there is any influence sector that makes this year's data different from other years.

## References

1. NetNewsLedger. "Highest and Lowest Canadian Divorce Rates By Profession." NetNewsLedger, 6 Sept. 2020, [www.netnewsledger.com/2019/06/20/highest-and-lowest-canadian-divorce-rates-by-profession/](http://www.netnewsledger.com/2019/06/20/highest-and-lowest-canadian-divorce-rates-by-profession/).
2. Statistics Canada. "Divorce Rates, by Year of Marriage." Statistics Canada, 17 Oct. 2020, [www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3910002801&pickMembers%5B0%5D=1.1](http://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3910002801&pickMembers%5B0%5D=1.1).
3. Waite, Linda J., and Lee A. Lillard. "Children and Marital Disruption." *American Journal of Sociology*, vol. 96, no. 4, 1991, pp. 930–953. JSTOR, [www.jstor.org/stable/2780736](http://www.jstor.org/stable/2780736). Accessed 19 Oct. 2020.
4. Xu, Qi, Jianning Yu, and Zeqi Qiu. "The Impact of Children on Divorce Risk." *The Journal of Chinese Sociology*, vol. 2, no. 1, 2015, pp. 1-20. ProQuest, <http://myaccess.library.utoronto.ca/login?url=https%3A%2F%2Fwww.proquest.com%2Fdocview%2F1987973988%3Faccountid%3D14771>, doi: <http://dx.doi.org/myaccess.library.utoronto.ca/10.1186/s40711-015-0003-0>.
5. Grow, André, Christine Schnor, and Jan Van Bavel. "The Reversal of the Gender Gap in Education and Relative Divorce Risks: A Matter of Alternatives in Partner Choice?" *Population Studies*, vol. 71, 2017, pp. 15-34. ProQuest, <http://myaccess.library.utoronto.ca/login?url=https%3A%2F%2Fwww.proquest.com%2Fdocview%2F1954947522%3Faccountid%3D14771>, doi: <http://dx.doi.org/myaccess.library.utoronto.ca/10.1080/00324728.2017.1371477>.