GPI Atlantic

MEASURING SUSTAINABLE DEVELOPMENT

APPLICATION OF THE GENUINE PROGRESS INDEX TO NOVA SCOTIA

CIGARETTE SMOKING
AN INTRODUCTORY
COMPARISON OF
GLACE BAY & KINGS COUNTY

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. Introduction

In 2001, Genuine Progress Index (GPI) surveys were randomly sent to residents of the town Glace Bay and the region of Kings County, Nova Scotia. The purpose was to measure quality of life and overall well-being. 1708 surveys were returned from Glace Bay, and 1898 surveys were returned from Kings County. Overall, an extremely high response rate was achieved even though the surveys were very lengthy.

Glace Bay is a community on Cape Breton Island. It is home to approximately 19,000 people and is the fourth largest urban area in Atlantic Canada. Kings County is somewhat different. The region is about one hour away from the city of Halifax and is residence to approximately 50,000 people. This report examines the similarities and differences between Glace Bay and Kings County with regard to cigarette smoking. We pay particular attention to the relationship between cigarette smoking and variables such as employment, income and education levels.

The two areas in our study represent contrasting profiles of rural communities. Glace Bay is heavily invested in the mining industry. The area has recently suffered a major economic setback with the closing of area coal mining operations. Kings County is one of the more affluent rural areas in Nova Scotia with a strong agricultural base, as well as active logging, fishing, manufacturing and service industries.

Between 2001 and 2003, these two communities were involved in the design and implementation of a comprehensive community survey in partnership with GPI Atlantic and several other partners. The purpose of the survey was to collect baseline data for the monitoring of community well being and progress. The questionnaire survey was comprehensive, examining a variety of topics including:

- Household demographics
- Labour Force Activity
- Health
- Core Values
- Care giving
- Voluntary Activity and Community Service
- Personal Security and Crime
- Ecological Footprint
- Time Use

This paper will first examine some simple demographics and descriptive statistics. Then a more concentrated examination of smoking habits is as well as a more detailed analysis of several variables is completed. Finally we suggest new areas of potential research and some readings for interested readers.

We note that despite the breadth of this overview a few very important and precise bits of information are obtained. We note a significant difference in the incidence of cigarette smoking between respondents in Glace Bay and Kings County. This was also the case for cigarette smoking in the house. This analysis suggests employment status is significantly correlated with cigarette smoking. We also found that higher levels of education are correlated with lower smoking rates.

Of particular interest is the relationship between employment status and cigarette smoking. Respondents who are unemployed are much more likely to be daily smokers than respondents who were employed, students, homemakers or retired. Although the relative magnitude is greater in Glace Bay, we noted that this is true for both regions in our study when each is examined independently.

When we controlled for further issues, such as location, gender, age, household earnings and education we still noted a significant relationship between employment status and cigarette smoking. A strong positive and significant correlation exists between being unemployed and cigarette smoking.

We remind readers to be cautious in interpreting a significant relationship with causation. In particular, we suggest it may be possible that another external factor links and indeed joins, cigarette smoking, employment status and life stress measures.

2. Demographics and Descriptive Statistics

We begin our examination of the data with brief overview of some of the more general and stylized statistics. Tables 1 through 6 examine variable such as gender, age, household earnings, education levels and employment status. We did not note a significance difference in the gender distribution of respondents in the two locations is present. (Table and Figure 1)

We did note a significance difference in the age distribution of respondents in the two locations. The Kings County sample contained a larger proportion in their late thirties, early forties and a smaller proportion in their early twenties. (Table and Figure 2)

There was also a significant difference in the income distribution of the two sets of respondents, with a substantially larger proportion of Glace Bay residents in the lower income brackets. We note especially the percentage of residents with household incomes $50,000 or greater. (Table and Figure 3)

Table 1. Gender of Respondents (in percentage)

Gender	Glace Bay	Kings County
Male	42.6	44.6
Female	57.1	54.6
No response	0.2	0.8
Pearson Chi-Square = 1.739		$p<0.187$

Figure 1. Gender of Respondents (in percentage)

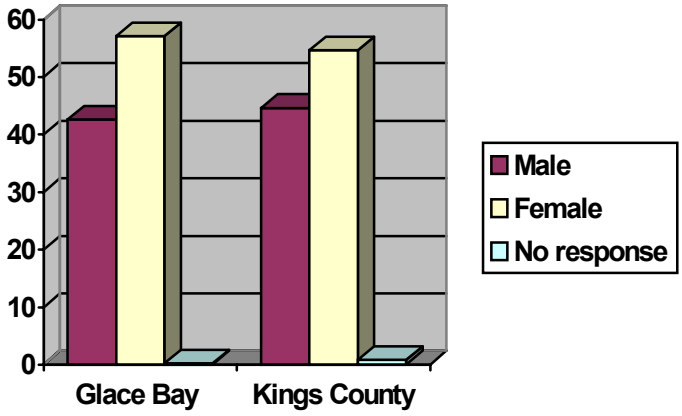


Table 2. Age Groups of Respondents (in percentage)

Age	Glace Bay	Kings County
15-19	3.5	5.5
20-24	5.5	2.5
25-34	10.6	10.0
35-44	19.4	24.6
45-54	24.4	22.7
55-64	16.2	15.9
65+	19.7	17.8
No response	0.5	1.0

Pearson Chi-Square = 42.494 $p<0.000$

Figure 2. Age Groups of Respondents (in percentage)

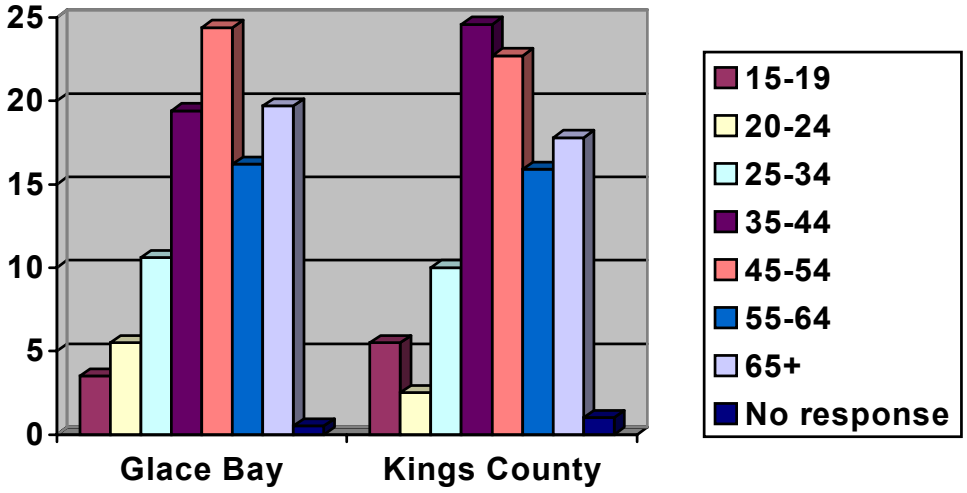
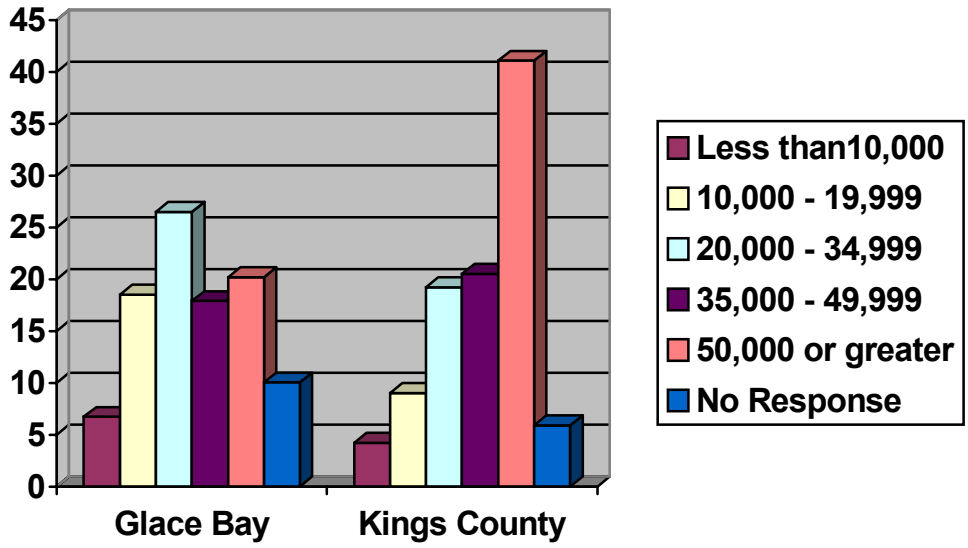


Table 3. Total Household Income Brackets of Respondents (in percentage)

Income Group	Glace Bay	Kings County
Less than10,000	6.7	4.2
10,000 - 19,999	18.5	9.0
20,000 - 34,999	26.5	19.2
35,000 - 49,999	17.9	20.5
50,000 or greater	20.2	41.1
No Response	10.01	5.9

Pearson Chi-Square = 255.064 p<0.000

Figure 3. Total Household Income Brackets of Respondents (in percentage)



For education levels we observe that Glace Bay respondents also had a substantially lower proportion of respondents with higher levels of educational attainment. In Glace Bay almost sixty percent of the respondents did not have more than a high school education. For Kings County this figure is just over forty percent. (Table and Figure 4)

Employment status for respondents in Glace Bay was also significantly different than in Kings County. Glace Bay had a substantially lower proportion of respondents employed and a substantially higher level of respondents that were retired. We note a key difference in the percentage of respondent reporting "unemployed" in Glace Bay and Kings County. (Table and Figure 5)

Kings County respondents also had a substantially higher proportion of respondents that were married or living common law and a significantly lower proportion of respondents that have never been married. This may be linked to the age distribution. (Table and Figure 6)

Table 4. Highest Level of Education Attained by Respondents (in percentage)

Education Level	Glace Bay	Kings County
Primary to Eight	10.2	5.3
Grade Nine to Twelve	49.6	36.7
Community College	18.8	21.1
University Degree	10.5	17.3
Other	9.5	9.1
No response	1.3	10.5

Pearson Chi-Square = 86.312 p<0.000

Figure 4. Highest Level of Education Attained by Respondents (in percentage)

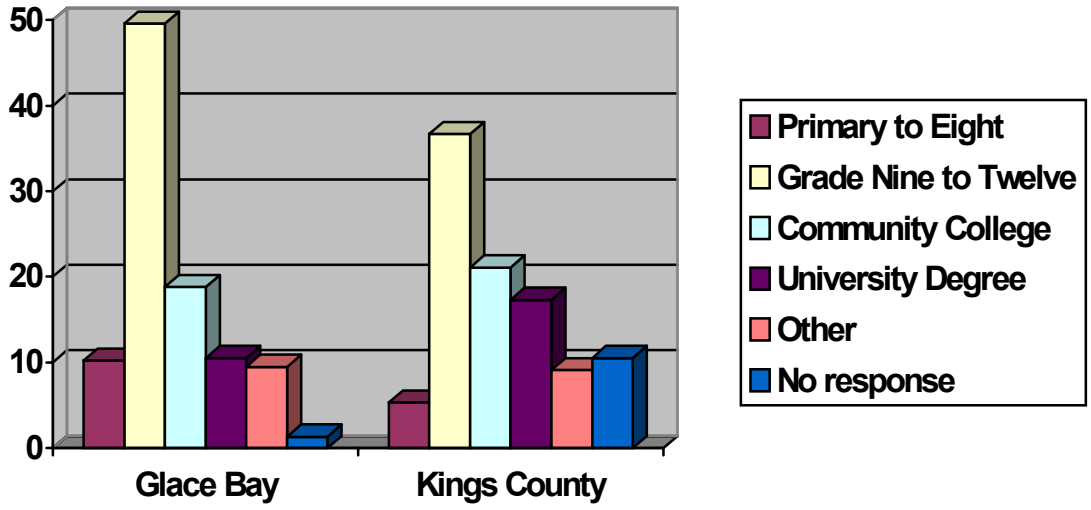


Table 5. Employment Status of Respondents (in percentage)

Employment Status	Glace Bay	Kings County
Employed	34.3	49.7
Unemployed	10.9	3.7
Student	6.5	6.6
Homemaker	14.1	12.4
Retired	29.7	23.3
Other	4.0	3.3
No response	0.5	1.0

Pearson Chi-Square = 132.094 p<0.000

Figure 5. Employment Status of Respondents (in percentage)

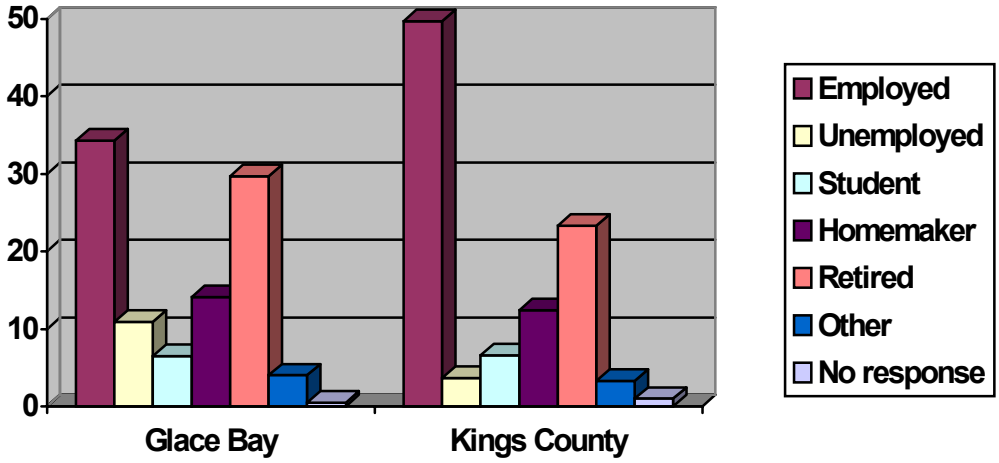
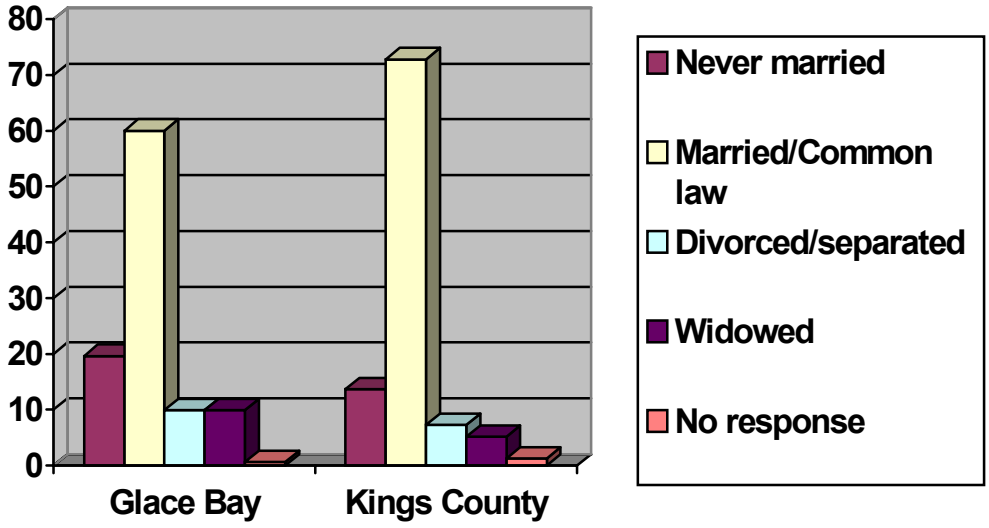


Table 6. Marital Status of Respondents (in percentage)

Marital Status	Glace Bay	Kings County
Never married	19.6	13.7
Married/Common law	60.0	72.8
Divorced/separated	9.9	7.3
Widowed	9.9	5.1
No response	0.6	1.2

Pearson Chi-Square = 76.360 $p<0.000$

Figure 6. Marital Status of Respondents (in percentage)



3. Incidence of Smoking

We turn our attention now to a more detailed analysis of cigarette smoking. To start, we examine some comparisons between Glace Bay and Kings County. For current "participation" there is a clear distinction between Glace Bay and Kings County with Glace Bay respondents reporting a significantly higher cigarette-smoking rate. (Table and Figure 7)

For cigarette smoking by a member of the household while actually in the physical house structure we noted a significant difference between Glace Bay and Kings County. The percentage of respondents in Glace Bay that have cigarette smokers in the house is more than double then that of Kings County. (Table and Figure 8)

Table 7. Currently a Cigarette Smoker

Frequency of Cigarette Smoking	Glace Bay	Kings County
Daily	29.2	17.7
Occasionally	4.3	4.6
Not at all	66.6	77.6

Pearson Chi-Square = 65.875 p<0.000
Number of Valid Cases = 3572

Figure 7. Currently a Cigarette Smoker

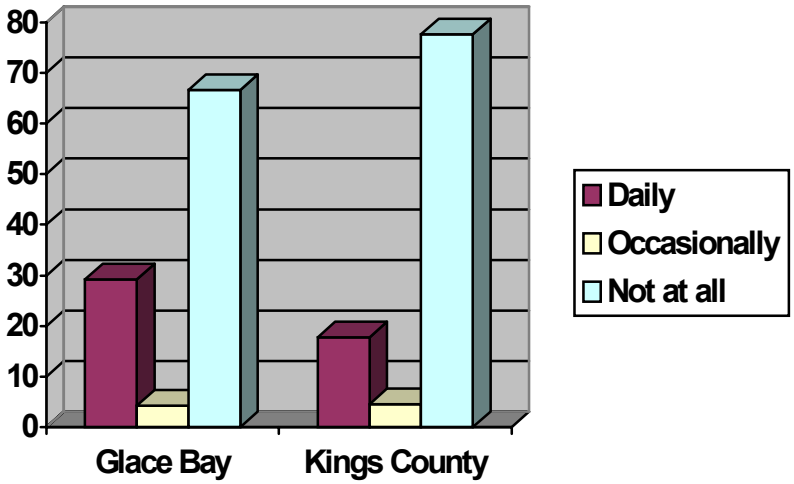
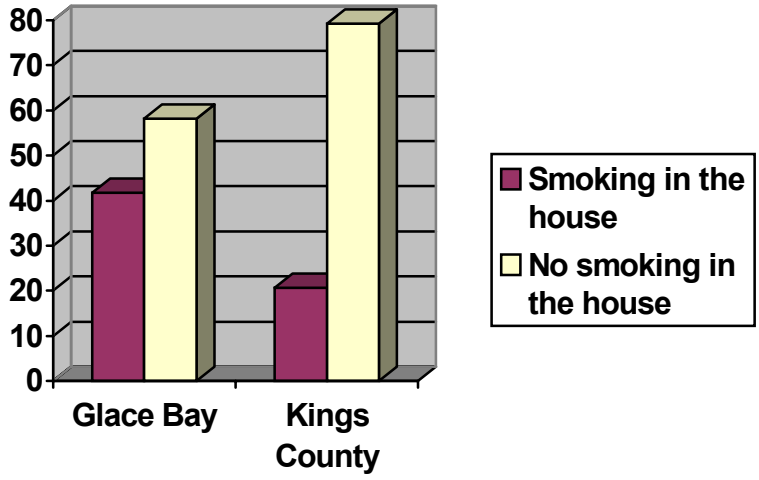


Table 8. Cigarette Smoking in the House

Smoking in the House	Glace Bay	Kings County
Smoking in the house	41.8	20.7
No smoking in the house	58.2	79.3

Pearson Chi-Square = 186.902 p<0.000
Number of Valid Cases = 3579

Figure 8. Cigarette Smoking in the House



The data in Table and Figure 9 somewhat surprisingly illustrate that the percentage of respondents that reported ever smoking cigarettes is significantly lower in Glace Bay. One might infer that cigarette smokers of Glace Bay are more "serious" or "hardcore" smokers. Perhaps respondents in Kings County smoked at one time but never formed a serious habit.

Somewhat more inline with what might be expected from the information in Table 8, and in line with comments made above is that a significantly higher number of respondents reported smoking their first cigarette with in five minutes of waking up. Lending again to the notion that there are more "serious" smokers in Glace Bay than in Kings County. (Table and Figure 10)

Of particular interest in this introductory study are also some of the characteristics of those individuals who smoke cigarettes and what correlation cigarette smoking might have with education and employment related issues. To start we observe that gender does not seem to play a significant role in cigarette smoking habits for the respondents in this study. (Table and Figure 11)

Table 9. Ever Smoked Cigarettes

Ever Smoked Cigarettes	Glace Bay	Kings County
Yes	44.6	49.6
No	55.4	50.4

Pearson Chi-Square = 6.393 $p<0.011$
Number of Valid Cases = 2661

Figure 9. Ever Smoked Cigarettes

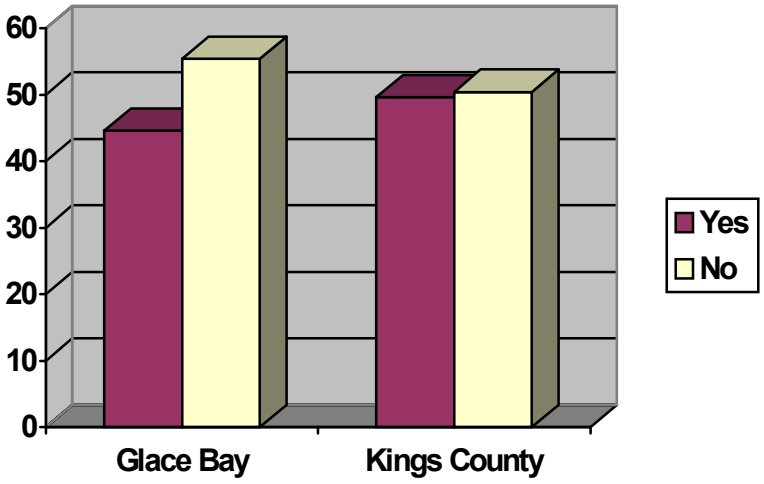


Table 10. Time Until First Cigarette

Time Until First Cigarette	Glace Bay	Kings County
< 5 minutes	34.2	20.4
Between 6 and 30 minutes	41.8	46.3
Between 31 and 60 minutes	12.2	21.8
> 61 minutes	11.8	11.6

Pearson Chi-Square = 27.397 p<0.000
Number of Valid Cases = 887

Figure 10. Time Until First Cigarette

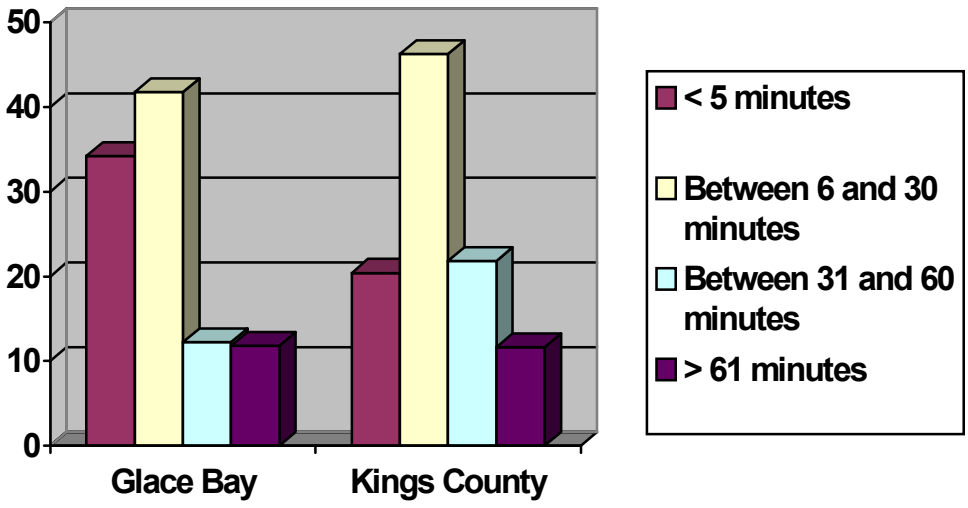
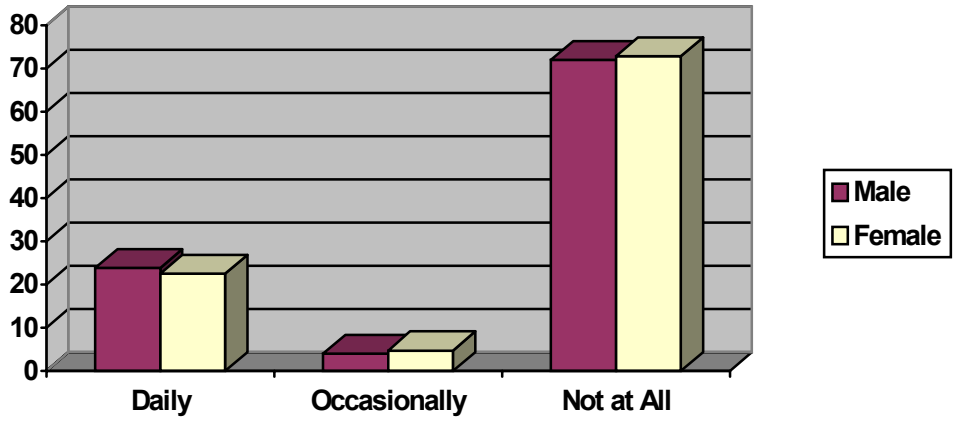


Table 11. Smoking Cigarettes and Gender

	Do you smoke cigarettes		
	Daily	Occasionally	Not at All
Male	23.9	4.1	72.0
Female	22.5	4.8	72.8

Number of Valid Cases = 3564
Pearson Chi-square = 1.759 p-value < 0.415

Figure 11. Smoking Cigarettes and Gender



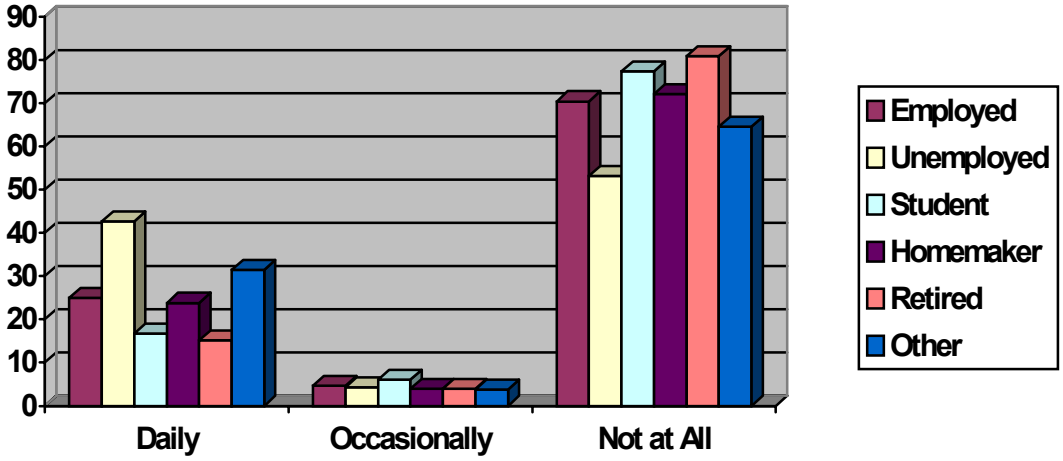
However when we examine employment status, we see that a significant difference exists amongst different employment statuses. In particular is the rate of daily smoking for unemployed respondents. We noted a significant increase in the rate of daily cigarette smoking for unemployed respondents as compared to the other employment statuses. (Table and Figure 12)

Table 12. Smoking Cigarettes and Employment Status

	Do you smoke cigarettes		
	Daily	Occasionally	Not at All
Employed	24.9	4.7	70.4
Unemployed	42.6	4.3	53.1
Student	16.7	6.0	77.3
Homemaker	23.8	4.0	72.1
Retired	15.2	4.0	80.8
Other	31.5	3.8	64.6

Number of Valid Cases = 3556
Pearson Chi-square = 105.082 p-value < 0.000

Figure 12. Smoking Cigarettes and Employment Status



Recognizing the difference in employment status between the two regions we also want to examine each region independently. We note a change in the aggregate numbers but note a continued significant difference for each region.

Clearly employment status seems to be significantly correlated with cigarette smoking habits. This relationship is more closely examined later in regression analysis below.

Along with employment status, the highest level of education also seems to play a significant role in the whether a respondent reports to smoking cigarettes "Daily" or "Not at All". The most significant difference occurs with "University". A significant drop in the rate of daily smoking is evident when compared to other levels of education.

Table 13. Smoking Cigarettes and Employment Status

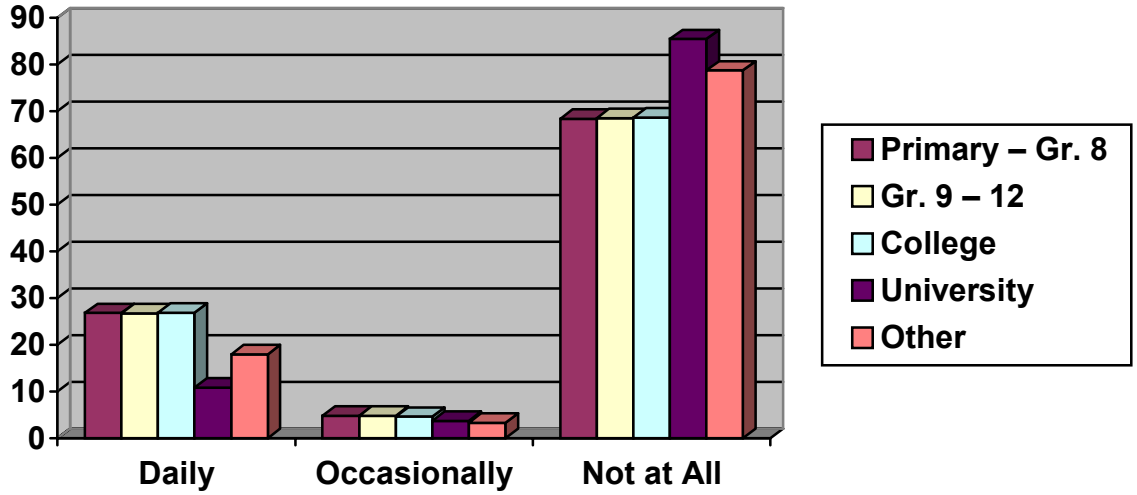
	Glace Bay			Kings County		
	Daily	Occasionally	Not at all	Daily	Occasionally	Not at all
Employed	30.5	4.3	65.2	21.3	5.0	73.7
Unemployed	47.8	5.4	46.8	28.6	1.4	70.0
Student	21.1	5.4	46.8	12.9	7.3	79.8
Homemaker	32.2	4.2	63.6	15.4	3.8	80.8
Retired	19.7	3.8	76.5	10.0	4.3	85.7
Other	39.7	4.4	55.9	22.6	3.2	74.2
Number of Valid Cases		1688			1868	
Pearson Chi-square		65.823			40.469	

Table 14. Smoking Cigarettes and Education Level

	Do you smoke cigarettes		
	Daily	Occasionally	Not at All
Primary – Gr. 8	26.8	4.8	68.4
Gr. 9 – 12	26.7	4.8	68.5
College	26.9	4.6	68.6
University	10.8	3.7	85.4
Other	18.0	3.3	78.7

Number of Valid Cases = 3363
Pearson Chi-square = 71.359 p-value < 0.000

Figure 13. Smoking Cigarettes and Education Level



4. Predictors of Smoking

In an attempt to further uncover some of the relationships and correlations that exist between smoking cigarettes and other variables we turn our attention to regression analysis. For our purposes here, we will use binary logistic regression analysis. All dependent variables have been transformed into binary data.

For the Tables 15 through 20 cigarette smoking "daily" or "occasionally" are recorded with a "0" and cigarette smoking "not at all" is recorded with a "1". For location Glace Bay is recorded with a "1" and Kings County with a "2". For Gender, being male is recorded with a "1" and female with a "2". For the variables Age, Household Earning, Education, Employment Status and Stressful Life, values are recorded with a "1", "2" and so on depending on how many options each variable had. For example, for the variable Education, a response of Primary to Grade 8 was recorded with a "1", a response of Grade 9 –12 was recorded with a "2",

Community College with a "3', University Degree with a "4" and Other with a "5". For the variable Stressful Life the responses are; "very stressful" recorded as a "1", "somewhat stressful" recorded as a "2", "somewhat not stressful" recorded as a "3" and "not very stressful" recorded as a "4". For our first binary logistic regression we are interested in examining some potential predictors for the smoking of cigarettes.

Table 15. Predictors for current cigarette smoking

Variable	Estimated Coefficient	Standard Deviation	p-value
Location	0.250	0.079	0.002
Gender	-0.260	0.073	0.000
Age	-0.025	0.026	0.334
Education	0.102	0.039	0.008
Household Earnings	0.048	0.011	0.000
Stressful Life	0.071	0.048	0.143
Employment Status	0.111	0.028	0.000

Number of Observations:	3606	Cox & Snell R-square:	0.213
Nagelkerke R-square:	0.283	-2 Log Likelihood:	3524.638

We note that only Age and Stressful Life are not significant in predicting the smoking of cigarettes. To examine this in more detail we begin by explicitly breaking our regression analysis into two separate regions. Indeed we find more key differences, but interesting similarities.

Table 16. Predictors for smoking cigarettes (Glace Bay)

Variable	Estimated Coefficient	Standard Deviation	p-value
Gender	-0.211	0.098	0.032
Age	0.008	0.034	0.821
Education	-0.010	0.052	0.849
Household Earnings	0.074	0.016	0.000
Stressful Life	0.082	0.064	0.197
Employment Status	0.087	0.038	0.022

Number of Observations:	1486	Cox & Snell R-square:	0.125
Nagelkerke R-square:	0.167	-2 Log Likelihood:	1861.221

In Glace Bay, Gender, Household Earnings and Employment Status remain significant predictors of cigarette smoking. Age, Education and Stressful Life are not. When we contrast this to Kings County we see a slightly different picture.

Table 17. Predictors for smoking cigarettes (Kings County)

Variable	Estimated Coefficient	Standard Deviation	p-value
Gender	-0.136	0.107	0.206
Age	-0.045	0.038	0.246
Education	0.276	0.059	0.000
Household Earnings	0.022	0.015	0.151
Stressful Life	0.152	0.075	0.044
Employment Status	0.155	0.041	0.000

Number of Observations:	1586	Cox & Snell R-square:	0.306
Nagelkerke R-square:	0.408	-2 Log Likelihood:	1619.228

Here Education and Employment Status are the only significant predictors of cigarette smoking. From the information in Table 14, we might expect a difference in the role various levels of education might have on the decision to smoke cigarettes. To examine this closer we categorize the Education variable. Our reference for the Education variable is Primary – Gr. 8.

Table 18. The Role of Education on for smoking cigarettes

Variable	Estimated Coefficient	Standard Deviation	p-value
Location	0.321	0.081	0.000
Gender	-0.137	0.077	0.074
Age	-0.011	0.026	0.680
Grade 9 –12	-0.418	0.149	0.005
College	-0.353	0.167	0.034
University	0.455	0.201	0.024
Other	0.058	0.202	0.773
Household Income	0.047	0.012	0.000
Stressful Life	0.126	0.050	0.011
Employment Status	0.102	0.028	0.000

Number of Observations:	3606	Cox & Snell R-square:	0.224
Nagelkerke R-square:	0.298	-2 Log Likelihood:	3481.577

We note the sign and the significance of the various Education categories. As expected, a University education is a significant factor in predicting cigarette smoking. In a similar fashion we would like to break up the variable Employment Status. Our reference for the Employment Status variable will be “Employed”.

Table 19. Employment Status and Smoking Cigarettes

Variable	Estimated Coefficient	Standard Deviation	p-value
Location	0.283	0.082	0.001
Gender	-0.202	0.081	0.012
Age	-0.044	0.032	0.165
Education	0.142	0.040	0.000
Household Income	0.045	0.012	0.000
Stressful Life	0.068	0.051	0.178
Unemployed	-0.444	0.149	0.003
Student	0.400	0.209	0.055
Homemaker	0.314	0.142	0.027
Retired	0.754	0.141	0.000
Other	-0.195	0.212	0.355

Included in Analysis:	3072	Cox & Snell R-square:	0.225
Nagelkerke R-square:	0.299	-2 Log Likelihood:	3477.235

We observe all, except Other, categories of Employment Status are significant in predicting the smoking of cigarettes. Respondents who were unemployed were more likely to be daily or occasional smokers as compared to employed respondents. Respondents who were students, homemakers or retired were less likely to be daily smokers. This accounts for location, gender, and age issues.

Another categorization of interest is the role of stress in predicting the smoking of cigarettes. One might assume that smoking is associated with stress or feeling stressed and that smoking "calms the nerves".

Table 20. Life Stress and Smoking Cigarettes

Variable	Estimated Coefficient	Standard Deviation	p-value
Location	0.364	0.082	0.000
Gender	-0.121	0.076	0.112
Age	-0.009	0.025	0.726
Education	0.155	0.040	0.000
Household Income	0.054	0.011	0.000
Very Stressful	-0.739	0.182	0.000
Somewhat Stressful	-0.743	0.129	0.000
Somewhat Not Stressful	-0.197	0.132	0.135
Employment Status	0.097	0.027	0.000

Included in Analysis:	3072	Cox & Snell R-square:	0.226
Nagelkerke R-square:	0.301	-2 Log Likelihood:	3472.974

We note that respondents reporting a very or somewhat stressful life have a significantly higher correlation with the smoking of cigarettes as compared to those individuals reported a Not Very Stressful life.

Finally, we are also interested in what correlation might exist between cigarette smoking and various health care demand measures. More specifically we want to know what role smoking frequency plays in visiting a physician or other health care professional in the previous 12 months. Here visiting a physician or other health care professional is recorded as a "1.0" and not visiting a physician or other health care professional is denoted as "0.0". Again we use a binary logistic regression analysis and we have categorized the Current Cigarette Smoker variable leaving "Not at All" as the reference.

Table 21. Visits to Health Care Providers

Variable	Estimated Coefficient	Standard Deviation	Significance
Location	0.307	0.076	0.000
Gender	0.483	0.021	0.000
Age	0.056	0.076	0.008
Daily	-0.075	0.107	0.480
Occasionally	-0.098	0.218	0.665

Included in Analysis:	3204	Cox & Snell R-square:	0.363
Nagelkerke R-square:	0.484	-2 Log Likelihood:	2998.814

The information in Table 21 indicates that being a daily or occasional cigarette smoker is not a significant factor in the number of visits to a health care provider in the past twelve months. This is somewhat surprising and certainly would be just one of many ways this data set could be further explored.

5. Conclusions and Extensions

Despite the breadth of this overview we do come away with a few very precise bits of information. There is a significant difference in the incidence of cigarette smoking between respondents in Glace Bay and Kings County. This was also the case for cigarette smoking in the house. Despite a smaller percentage of respondents who reported ever being a cigarette smoker in Glace Bay, respondents there reported a significantly shorter period of time between waking up and having their first cigarette when compared to respondents from Kings County. It would seem that a higher percentage of respondents have "tried" smoking in Kings County, but that respondents in Glace Bay face higher addiction rates. Although we are not able to analysis the addiction aspect of cigarette smoking, the information gleaned from the time elapsed from waking up until the first cigarette might be viewed as a proxy for addiction level. This would be a very interesting area for future research.

Of particular interest in this study was the relationship between employment status and cigarette smoking. Respondents who were unemployed were much more likely to be daily smokers than respondents who were employed, students, homemakers or retired. This remained true for both regions in our study when each was examined independently, although the relative magnitude was greater in Glace Bay.

When we controlled for further issues, such as location, gender, age, household earnings and education we still noted a significant relationship between employment status and cigarette smoking. A significant correlation exists between being unemployed and cigarette smoking.

Another interesting issue that was brought to light was the relationship between education levels and cigarette smoking. After controlling for location, gender, age, household income, and employment status we noted a significant negative relationship between highest education level and cigarette smoking. The higher the education level, the less likely a respondent was to report being a cigarette smoker.

Respondents recording their lives as very stressful or somewhat stressful were significantly more likely to be daily or occasional cigarette smokers. This was recorded after accounting for location, gender, age, household income, education level and employment status.

Again, we remind readers to be cautious in interpreting a significant relationship with causation. In particular, we suggest that another external factor might be linked and indeed join, cigarette smoking, employment status and life stress measures. For example, one issue that we are not able to address is the "culture of smoking". Does one smoke because "everyone" around them smokes? We are not able to address whether or not an individual knows smoking is an unhealthy life choice. One might also argue that being informed and choosing to ignore or discount that information is a valid choice. These are all excellent avenues for deeper analysis.

Another avenue for future work would be an analysis of health care costs for cigarette smokers and non-smokers. Our simple analysis here indicates that no significant relationship exists between cigarette smoking and the number of visits to a health care provider in the previous twelve months. Visiting a health care provider in the last twelve months was significantly correlated with location, age and gender. The lack of significance for cigarette smoking was somewhat surprising. Further analysis might pursue the various medications respondents where currently taking or the health of the respondents' children who are living in the same household.

Indeed, the data provided by the 2001 Genuine Progress Index (GPI) surveys is simply outstanding. Such a rich database can and should be studied for years. Such extensions might include:

- Health care expenditures and cigarette smoking
- Long-term health issues and cigarette smoking; addiction
- The role of "core values"
- Medication and smoking; pregnancy

- Children's health and smoking in the house
- Cigarette smoking and the work place

6. Other Suggested Readings

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