PRICEWATERHOUSECOOPERS

TransLink

Fare Evasion Internal Audit

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1 Executive Summary

Public transit organizations everywhere experience a loss of revenue due to fare evasion. At the Greater Vancouver Transportation Authority (the “GVTA” or "TransLink") a fare evasion strategy is in place to minimize the magnitude of fare loss. The fare evasion strategy includes fare checking and enforcement processes.

TransLink has a process in place to quantify the amount of fare evasion and a report is produced three times a year by TransLink staff. Total fare revenue in 2006 was approximately $300 million, and the amount of fare revenue loss due to fare evasion was estimated by TransLink staff to be $7.1 million, or 2.4%, for that year. This is an amount which could be readily used by TransLink in other higher-need areas. However, efforts to reduce this lost revenue must also be balanced with the associated costs of new or modified processes and infrastructure.

TransLink retained PricewaterhouseCoopers LLP (“PwC”) to conduct a fare evasion internal audit of its bus, SeaBus, SkyTrain, and West Coast Express transit systems and to provide an estimate of the amount of fare evasion taking place on these systems. We were also asked to review and comment on TransLink’s methodology for estimating the amount of fare evasion on these systems, as well as its processes and procedures with respect to fare checking, fare enforcement, and to provide recommendations for improvement thereto.

PwC’s Fare Evasion Estimates

The annual revenue loss based on revenue ridership statistics for 2007 is estimated by PwC to be $6.4 million. This is down slightly from the estimated $6.7 million in 2002. Since that time the evasion rate has declined from the prior average of 3.9%. However, with increasing fares, the estimated average loss per ride increases, resulting in the net reduction of approximately $300,000.

Mode	Annual Revenue Ridership	Estimated Fare Evasion Rate[1]	Estimated Annual Evaded Rides	Estimated Average Loss per Ride	Total Estimated Loss
Bus	119,915,000	1.6%	1,871,899	$ 1.43	$ 2,676,816
SkyTrain	40,369,000	5.4%	2,163,983	1.58	3,419,093
SeaBus	2,732,000	4.2%	113,925	1.49	169,748
West Coast Express	2,058,000	1.1%	21,668	5.49	118,957
Total	165,074,000	2.5%	4,171,475	$ 1.53	**$6,384,614**

The revenue loss associated with a fare evasion rate of 2.5% thus equates to 2.1% of total fare revenue based on 2006 financial amounts. We note in 2002 management had set a fare loss target of 2% of revenue.

[1] For this table, Evasion Rates are rounded to one decimal place. The calculation of Estimated Annual Evaded Rides uses Evasion Rates accurate to several decimal places.

As TransLink is believed to be very close to the fare evasion target set by management, we see less need for significant change to the fare checking and fare enforcement processes. That said, we have provided comments on ways to enhance the current fare checking and fare enforcement practices.

TransLink's Methodology for Estimating Losses from Fare Evasion

During the conduct of this review we noted the following:

- TransLink's survey process serves several purposes related to ridership and fare estimation. Because these ridership and fare estimation processes have different sampling requirements, it is difficult to find a single sampling scheme that will work well in achieving TransLink's diverse goals.
- The measurement of fare evasion is required at the transit mode level (e.g. SkyTrain, Bus, SeaBus, West Coast Express), whereas ridership figures are required at the trip segment level (e.g., for each SkyTrain station and for each bus operating depot). TransLink has combined the collection of data for purposes of estimating fare evasion with the collection process for estimating transit ridership. As the sample size is determined based on the survey requiring the greatest degree of precision, in this case the ridership survey, fare evasion sample sizes are considerably largely than they might otherwise be.
- It is often useful for management to determine the desired level of statistical precision required in support of decision-making. By understanding at what point the estimated revenue loss results in a decision to fundamentally change the infrastructure for fare collection or the enforcement model employed, management may be more efficient in determining sample size. Depending on the desire of the reasons for undertaking the survey, the resolution of these factors can significantly affect the sample size. To-date this level of precision has not been specified.
- TransLink uses relative precision goals in determining sample size (e.g. the precision is set at +/- 10% of the evasion rate). As a result, the sample approach calls for increasingly larger sample sizes as the amount of fare evasion becomes smaller. This may not be the most appropriate for estimating fare evasion. Rather, an absolute precision level may be more appropriate. Such a level could be specified as requiring the estimate to be accurate to within a specified number of percentage points or, alternatively, to be accurate to within a specified amount of dollars. Doing so may allow TransLink to significantly reduce its current fare evasion sample size – perhaps by as much as one half.

Accordingly, we recommend that management:

- Set an amount, or range, above which the estimated lost revenue is likely to result in a decision or decisions regarding the way that fare evasion is managed;
- Shift from using relative precision goals to absolute precision goals; and
- Review its ridership survey sizes[2]; and
- Shift to a risk-based allocation of fare checking, focusing its efforts on those stations and routes with higher revenue losses.

We believe that TransLink can continue to obtain reasonable precision for its fare evasion surveys with lower sample sizes.

[2] As the scope of this review did not extend to considering suitable sample sizes for the ridership surveys, we have not provided specific suggestions related to the sample size of those surveys.

TransLink's Fare Checking and Enforcement Practices

During our review of TransLink's fare checking and enforcement practices we noted that:

- There are significant opportunities to evade fares. Much of the TransLink system is an open system which employs a self assessment or "proof of payment" system for the purchase and collection of fares. As a result, the perceived opportunity to evade fares is higher than is the case within a closed or "gated" transit system;
- On most modes, the incentive to evade fares is relatively low, although this incentive is more moderate on West Coast Express;
- The presence of Greater Vancouver Transit Police related to fare enforcement on the various transit modes has appeared to be diminished over the past several years, reducing the perceived level of fare enforcement;
- Recent media releases indicate that evasion in the system is wide spread although no specific rates of evasion are released in support of these assertions. These reports have a great ability to affect public perception in this regard and have the ability to affect an individual's rationalization to evade fares;
- There is a low likelihood of being caught by Transit Police – it is estimated that less than 1% of rides involving fare evasion result in a ticket to the rider; and
- Even when caught, there is little pressure to pay, with less than 10% of tickets issued by Transit Police currently being paid, in part as there is little meaningful subsequent consequence to evading riders.

Accordingly:

- We recommend that management explore the ability to tie Transit fines to some form of desired benefit available through other government organizations. Many that we talked to as part of this review noted that implementing new and significant consequences to ticketed evaders is likely to have the single greatest impact on fare evasion.
- We also recommend that management Implement more significant consequences to ride evaders, including removal from the property. An increased focus on non-monetary inconveniences for individuals who attempt to evade fares will serve to increase the consequence of fare evasion.
- Further, most of the current fare enforcement checking and fare enforcement focus in on detecting and penalizing evaders for attempting to evade fares. We encourage TransLink to consider alternative measures aimed at reducing the desire of riders to evade in the first place. This may occur by reducing riders' ability to rationalize evasion as acceptable practice.

2 Introduction

Fare Evasion at TransLink

Public transit organizations everywhere experience a loss of revenue due to fare evasion. At the Greater Vancouver Transportation Authority (the “GVTA” or "TransLink") a fare evasion strategy is in place to minimize the magnitude of fare loss. The fare evasion strategy includes fare checking and enforcement processes.

A process is in place to quantify the amount of fare evasion. This “audit” is planned by TransLink staff, and includes a survey of rider fares carried our by Coast Mountain Bus Company’s Transit Security Department (“Transit Security”). A report is produced three times a year. Total fare revenue in 2006 was approximately $300 million, and the amount of fare revenue loss due to fare evasion was estimated by TransLink staff to be $7.1 million, or 2.4%, for that year. This is an amount which could be readily used by TransLink in other higher-need areas. However, efforts to reduce this lost revenue must also be balanced with the associated costs of new or modified processes and infrastructure.

TransLink determined the need to assess current methodologies for estimating fare evasion levels, strategies for managing fare evasion, and to independently assess current fare evasion levels within the TransLink system. This report addresses those issues. Accordingly, the objectives of this review of fare evasion strategy are to:

- Review and assess the reasonableness of TransLink's methodology for estimating the amount of fare evasion and provide recommendations to improve the methodology;
- Review and assess the current process to assess fare evasion including fare checking, enforcement and fare evasion estimation processes and procedures, and provide recommendations to improve those processes and procedures; and
- Estimate the amount of fare evasion that takes place.

This report addresses potential fare evasion on buses, the SeaBus, SkyTrain, and West Coast Express (“WCE”).

Defining Fare Evasion

It is important to define fare evasion, the types of activities treated as fare evasion within this report, and, equally important, the types of activities considered beyond the scope of this type of review. For this review we categorized the following activities as fare evasion:

- Not possessing a valid fare ticket, transfer, or pass;
- Travelling outside the fair zone for which the fare ticket, transfer or pass is designated (except for the hours during which this is permitted);
- Using an unvalidated fare ticket or pass;
- Using a concession fare, ticket, or pass when not meeting the qualifications of using a concession fare;
- Using a counterfeit fare, ticket, or pass that Transit Police, Fare Inspection Officers, and transit attendants are trained to detect;
- Possessing a UPass, Employer Pass, or GoCard to which the user is not entitled;
- Possessing a Fast Trax Transit Strip to which the user is not entitled; and

- Using a fare ticket or transfer beyond the 90 minutes of travel permitted.

Conversely, we did not categorize the following activities as fare evasion:

- Possessing a valid fare ticket or transfer to which the passenger is not entitled, i.e. a ticket or transfer had been used by another individual earlier that day for travel on transit;
- Purchasing a FareCard, FareSaver tickets, or WCE pass from anyone other than a FareDealer or Ticket Vending Machine; and
- Purchasing a full fare for a fare ticket, transfer, or pass through a ticket vendor for less than full fare.

Scope of Internal Audit

Our review focused on fare collection efforts and enforcement practices conducted across the four transit modes. During the course of our engagement we

- Interviewed or had discussions with representatives from across TransLink, WCE, Coast Mountain Bus Company, and SkyTrain;
- Reviewed a number of documents including those relating to the current methodology, ridership, fare evasion, fare surveys, and revenue control;
- Attended properties associated with each of the four systems that were the subject of this review – e.g. in relation to fare evasion, we considered the physical characteristics in and around a number of SkyTrain, SeaBus, bus and WCE stations;
- Travelled on various occasions on the four systems as observers to gain an understanding of the fare systems and operating environment;
- Observed Fare Inspection Officers, Station Attendants, Marine Attendants, WCE Service Hosts, WCE security personnel, and other TransLink employees in the conduct of fare-checking / enforcement duties; and
- Monitored the Fare Inspection Officers as they gathered data for inclusion in our survey.

We did not reperform calculations of fare evasion as determined by TransLink or validate the accuracy of the data captured within Coast Mountain Bus's systems. We also did not assess the appropriateness of physical safeguards in place to minimize the occurrence of fare evasion.

Limitations

This report was prepared by PwC at the request of TransLink's Internal Audit Department. The material in it reflects PwC's best judgement in light of the information available at the time of its preparation. This report is intended solely for the information of TransLink management and TransLink's Audit Committee.

Our examination was planned and conducted to assess the design of controls, identify key risks, and make recommendations for improvement. It was not designed to identify, and cannot necessarily be expected to disclose defalcations, fraud or other irregularities. As a result, this report does not necessarily include all those matters which a more extensive or special examination might develop. The discovery of irregularities might, of course, result from our review and, if so, anything significant would be reported to you.

Any use that a third party makes of this report or reliance thereon, or any decision made based on it, is the responsibility of such third party. PwC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

3 TransLink's Current Approach to Estimating Fare Evasion

TransLink has in place a process that serves several purposes related to ridership and fare estimation, only one of which relates to the measurement of the rate of fare evasion. The process used by the Planning Department and the Security Departments are used to:

- Estimate transit ridership (both revenue and boarded riders);
- Determine the extent of use of various fare types and media; and
- Estimate the level of fare evasion (across all four modes of transit).

Estimating transit route ridership involves developing ratios of boardings by fare payment types that are used to develop estimates of fare ridership by category of fare. Ridership information is subsequently used for transit planning purposes (i.e., route development, resource planning, and budgeting) and the allocation of revenue across the respective modes.

Accomplishing multiple goals with one sampling scheme is difficult. The planning of TransLink's process takes into consideration the need for accurate statistics on fare evasion, though it must balance these with the other requirements. The Fare Inspection Officers ("FIO") who conduct their respective part of the process have other responsibilities as well (for example, fare checking) that also have to be considered. This complicates the conduct of this fare evasion process and the allocation of hours for data collection.

Developing Fare Evasion Samples

Because these goals have different sampling requirements, it is difficult to find a single sampling scheme that will work well in achieving all goals. TransLink has combined the collection of data for purposes of estimating fare evasion with the collection process for estimating transit route ridership. The measurement of fare evasion is required at the transit mode level (e.g. SkyTrain, bus, SeaBus, West Coast Express), whereas ridership figures are required at the trip segment level (e.g., for each SkyTrain station and for each bus operating depot). This approach requires Transit staff to board bus route and attend at all SkyTrain, SeaBus, and West Coast Express stations over the course of the year.

The sample plan is a type of stratified sampling plan, where sampling is allocated proportional to the number of service hours involved (this is a type of allocation referred to as sampling proportional to size, where "size" is the number of service hours involved). This is an acceptable sampling plan, and the plan is similar to a simple random sampling plan to enable the results to be calculated using formulas from simple random sampling.

The bus sample is allocated by time of day, and by depot and bus route. The SkyTrain sample is allocated with equal sampling effort between stations. This is done so that ridership estimates for each station can be made.

Fare Sample Sizes Used by TransLink

Typical statistical parameters used are precision and the level of confidence. Precision refers to the amount of potential variation while confidence refers to the frequency with which we believe that number to be within that range. For instance, a fare estimation process could be designed to provide results that are within a set range such as $^{+}$/- 5%, 19 times out of 20.

TransLink generally follows the guidelines established in the last external review, conducted in 2002. The key points of the general approach set out were that:

- TransLink should follow a survey methodology that provides a precision of plus or minus 10% around the estimate of fare evasion, with a 95% level of confidence; and
- To meet statistical requirements, minimum sample sizes were then determined for each mode, as follows:
  - Bus - 15,000;
  - SkyTrain - 20,000;
  - SeaBus - 7,500; and
  - West Coast Express - 6,500.

TransLink incurs a significant number of hours to capture this sample. For instance, in the May to August 2007 inspection period, over 300 audit hours were incurred requiring over 1,500 hours of staff time to collect ridership data and fare evasion details (each hour of time requires between two and eight staff).

Estimating Survey Errors

In general, there are two types of precision goals: absolute precision and relative precision. Absolute precision refers to the error in relation to a specific goal or objective and considers a range about the sample estimate measured in the units of the parameter being estimated. Relative precision measures the percentage deviation about the sample estimate itself.

To illustrate the differences between these two types of precision goals, consider a hypothetical survey for trip purpose, where 20% of respondents indicated a trip purpose of attending school. An absolute precision level of +/- 5%, at a 95% confidence level, would mean that with 95% certainty the proportion of trips made by all riders for purposes of attending school lies between 15% and 25% (in other words, within +/- 5 percentage points of the 20% estimate).

In contrast, a relative precision level of +/-5%, at a 95% confidence level, would mean that, with 95% certainty, the proportion of trips made by all riders for purposes of attending school lies within +/- 5 percent of the estimated value of 20% (since 5% of 20% equates to 1 percentage point, this means the relative precision level of +/- 5% equates to a range of 19% to 21%).

Generally speaking, relative precision levels require larger sample sizes since they provide a tighter margin of error. The following table contrasts the different sample sizes that would be needed for the trip purpose example given above.

	Absolute Precision	Relative Precision
Estimated Percentage	20%	20%
Confidence Level	95%	95%
Precision Goal	+/-5 percentage points	+/-5% of the estimated value (i.e. +/- 1 percentage point)
Sample Size Required	246	6,147

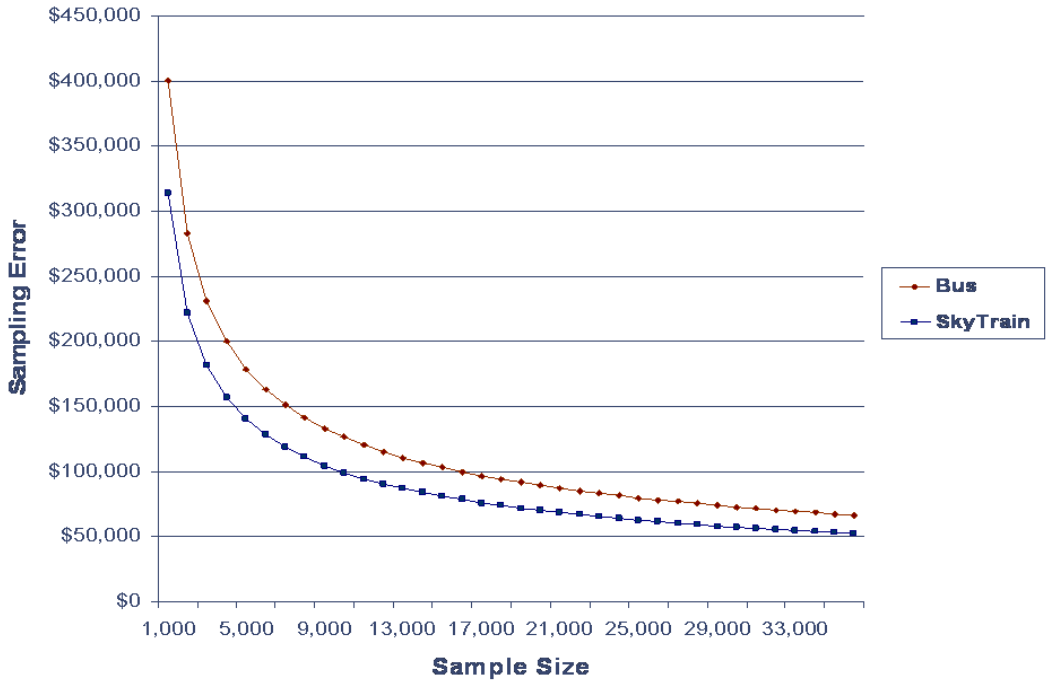
In the context of TransLink, absolute precision related to fare evasion might be stated in terms of a revenue dollar amount – e.g. the fare evasion is accurate to within +/- $500,000. A relative precision might be stated in terms of the percentage of fare evasion – e.g. the fare evasion is accurate to within +/- 10% of the fare evasion rate.

Estimated Precision used by TransLink

TransLink has described the precision in relative terms of plus or minus 10% around the estimate of fare evasion. As relative precision levels also have the feature that, as the proportion one wishes to estimate becomes progressively smaller, the sample size required becomes progressively larger. For instance, if the evasion rate is 5%, then the confidence interval would be 4.5% - 5.5%. However, if the evasion rate reduces to 1%, then the confidence internal would be within 0.9% - 1.1%.

This approach results in sample sizes increasing significantly as error rates reduce and as a result, greater testing is needed to obtain this precision. To illustrate, if the evasion rate was 6.0 % for SkyTrain, the resulting annual sample size might be around 24,000. However, should the SkyTrain evasion rate reduce to 2.0%, then the sample size might increase to 450,000. This concern was evident in the past, whereby the largest sample was determined for West Coast Express, even though it was viewed to have the lowest evasion rate. Consequently, relative precision goals are not well-suited to situations such as that faced by TransLink with respect to fare evasion.

Increasing this sample size also results in limited increases to the overall precision, as illustrated below, and therefore, TransLink may be able to reduce its sample size without significantly impacting the overall precision achieved by the survey. For instance, TransLink conducted approximately 36,000 surveys of SkyTrain passengers in its last review. Reducing this by half to 18,000 surveys would increase the potential error in the sample by only $22,000 and reducing the sample to one-third, or 12,000, would increase the sample error by $38,000 to approximately $91,000.



Similar benefits may also be available with regards to the bus survey. For instance, reducing the bus sample size of approximately 11,000 surveys by half would increase the potential error in that survey by approximately $50,000.

As noted earlier, TransLink has multiple goals for its survey process, including the estimation of ridership by station location. In the case of SkyTrain, TransLink currently surveys approximately 1,000 riders per station to determine fare payment methods for each station, and with 33 separate stations that results in a sample size of over 33,000. It is probable that TransLink can continue to obtain reasonable precision for each station with lower sample sizes, and recommend that management review its ridership survey sizes. However, as the scope of this review did not extend to considering suitable sample sizes for the ridership surveys, we have not provided specific suggestions related to the sample size of those surveys.

In conducting a survey such as that used by TransLink, it is often useful to determine the desired level of statistical precision required by TransLink management in support of decision making. For example, it might be useful to understand at what point the value of estimated revenue loss would result in a decision to fundamentally change the infrastructure for fare collection or the enforcement model employed. Depending on the desire of the reasons for undertaking the survey, the resolution of these factors can significantly affect the sample size.

The precision goals previously set out are relative precision goals. As a result, they call for increasingly larger sample sizes as the amount of fare evasion becomes smaller. This would not appear appropriate for the goal of estimating fare evasion. Rather, an absolute precision level would appear to be more appropriate. Such a level could be specified as requiring the estimate to be accurate to within a specified number of percentage points or, alternatively, to be accurate to within a specified dollar amount.

On the basis that management adopts a position of determining the level of precision in terms of revenue, the following table sets out several options for sample size for fare estimation purposes.

Precision as a percent of revenue and absolute amount	**0.05%, or $150,000**	**0.10%, or $300,000**	**0.25%, or $750,000**	**0.50%, or $1,500,000**
Mode				
Bus	66,000	16,650	2,660	660
SkyTrain	88,000	22,200	3,550	880
SeaBus	33,000	8,325	1,335	330
West Coast Express	28,600	7,225	1,155	286
Total	**215,600**	**54,400**	**8,700**	**2,156**

Recommendations

We recommend that management

- Set an amount, or range, above which the estimated lost revenue is likely to result in a decision or decisions regarding the way that fare evasion is managed
- Shift from using relative precision goals to absolute precision goals; and
- Set its survey size based on the level of precision chosen above.

4 Summary of Estimated Fare Evasion Rates and Revenue Losses

Approach

To estimate the proportion of evaded fares, we employed a sampling methodology that determined sample size, selected an appropriate sampling method, and allocated samples across the four service modes (Bus, SkyTrain, SeaBus, and West Cost Express). We set the sample size based on a level of precision of $^{+}$/- 5%.

In planning our approach, we also reviewed information provided by TransLink related to prior internal survey results which detailed fare evasion by type of service, location, and time of day (e.g. morning peak, midday, afternoon peak, evening, and weekend).

Sample Size and Sampling Methods

Noted below are our estimates of the required sample size for a precision of +/- 5% at a level of confidence of 95% for each of the respective transit modes. We expect that the evasion rate would be different between the four public transit services, requiring separate calculations for each mode. The sample size achieved on TransLink's latest internal fare audit (January – April 2007) is shown for comparative purposes.

Mode	Ridership[3]	Precision	Estimated Fare Evasion	PwC Sample Size	Recent TransLink Fare Sample Size
Bus	40,939,000	5%	2.5%	1,370	11,110
SkyTrain	13,716,000	5%	5.6%	1,800	35,872
SeaBus	856,000	5%	5.2%	1,200	5,606
West Coast Express	686,000	5%	2.0%	960	N/A

Using the above estimates, we determined the number of hours needed within each mode of transportation. For a variety of reasons, the actual sample obtained exceeded the required sample size by at least 50%.

Fare Evasion Data Collection

To collect fare data we:

- Boarded 50 buses across Burnaby, Coquitlam, North Vancouver, Richmond, Surrey, and Vancouver;
- Visited each of the two SeaBus terminals;
- Visited 12 of the 33 SkyTrain stations; and
- Visited 6 of the 8 West Coast Express stations, and boarded one morning and afternoon train.

[3] Ridership is for the audit period, not the full year. Each audit period normally covers 4 months of the year.

Fare checking was conducted by Fare Inspection Officers ("FIO") with PwC in attendance. FIOs used their standard field data collection forms for the audit. These allow for classification of the type of fare evasion as well as counting the number of passengers checked. At the end of each day the results of the fare checking were provided to PwC for aggregation and analysis.

We are aware that other forms of fare loss occur within the system and that those amounts are not considered to be fare evasion by the rider and captured within our data collection approach. For instance, we have seen instances where the electronic fare box had jammed on a route and as a result, the driver stopped collecting fares from passengers as he/she was unable to issue a transfer. In those instances, it was assumed that the passenger would pay at the point of transfer. However, some passengers did not plan to transfer and TransLink would not collect the fare in those instances.

Fare Evasion Rates

Noted below is a summary of fare evasion on the TransLink systems based on our testing:

	Bus	SkyTrain	SeaBus	West Coast Express	System Evasion Rate
Total Evasions	33	313	104	47	**497**
Total Checked	2,114	5,839	2,494	4,464	**14,911**
Evasion Rate	1.6%	5.4%	4.2%	1.1%	**2.5%**[4]

The weighted average rate of fare evasion across the system is 2.6%, but varies significantly by mode. Accordingly, fare evasion rates were reviewed at the mode level, not at an aggregate level.

- **Buses** – The bus system represents the single largest mode within the system. While the evasion rates are relatively low, and the system has seen improvement in this area, the mere size of this mode relative to other modes results in buses having the second highest level of fare revenue loss.
- **SkyTrain** – SkyTrain continues to have the highest fare evasion levels. This mode typically has the lowest level of visibility of station attendants and there is little direct contact between riders and those attendants prior to boarding the trains.
- **SeaBus** – SeaBus continues to have moderate evasion levels. We had expected this to be lower given the presence of station attendants at the foot of the terminal ramp (near the turnstiles) and as this mode typically has the highest level of passengers transferring from previous modes (e.g. buses in North Vancouver and buses and SkyTrain in Vancouver. However, while the evasion rates are high, this mode attracts fewer riders, and the resulting revenue loss on this mode is accordingly relatively low.
- **West Coast Express** – This mode has the lowest level of evasion. There likely are a number of reasons, including the profile of riders on this part of the system, the presence of station attendants, and the greater use of monthly passes on this part of the system.

[4] The System wide rate is weighted based on the number of passengers by mode. The weightings are Bus –72.0%, SkyTrain – 25.0%, SeaBus – 1.7%, and West Coast Express – 1.3%.

Summary Statistics by Mode

Noted below is a summary of evasion rates based on the time of day.

	AM[5]	Day	PM[6]	Total
Total Evasions	165	185	147	**497**
Total Checked	5,741	3,593	5,577	**14,911**
% Of Evasions	2.9%	5.1%	2.6%	**2.5%**

On buses and the SkyTrain, fare evasion is typically lower in the AM Peak period, rises through Midday, and then eases through the PM period. SeaBus tends to be lower in the AM period, rises through Midday and PM. West Coast Express evasion rates were largely the same in the AM and PM periods.

Evasion Rate Trend

Noted below is a summary of evasion rates over the past several years.

Evasion Rate	Bus	SeaBus	SkyTrain	West Coast Express	System Evasion Rate
September 2007	1.6%	4.2%	5.4%	1.1%	**2.5%**
January – April 2007[7]	2.8%	5.7%	6.0%	N/A	**3.7%**
September – December 2006[8]	3.3%	6.2%	6.4%	N/A	**4.1%**
March 2002[9]	2.6%	8.5%	8.7%	1.6%	**3.9%**

Over the past several years, TransLink has seen a progressive decline in fare evasion levels. Several recent initiatives undertaken by TransLink related to fare checking and enforcement practices are likely contributing to this reduction.

[5] AM includes morning peak periods from start of service until 9:30 am
[6] PM included afternoon peak periods from 3:30 to 6:30 pm
[7] Data obtain from TransLink internal fare evasion review
[8] Data obtain from TransLink internal fare evasion review
[9] Data from prior audit completed in 2002

Estimate of Revenue Loss from Fare Evasion

Evaded Rides

The estimation of revenue lost due to fare evasion incorporates estimates of the total number of evaded rides for each mode and an estimate of revenue lost per ride. The number or evaded rides is a product of the annual revenue ridership and the evasion rate estimated above.

Mode	Annual Revenue Ridership	Estimated Fare Evasion Rate[10]	Estimated Annual Evaded Rides
Bus	119,915,000	1.6%	1,871,899
SkyTrain	40,369,000	5.4%	2,163,983
SeaBus	2,732,000	4.2%	113,925
West Coast Express	2,058,000	1.1%	21,668
Total	165,074,000	2.5%	4,171,475

Based on this, we estimate that approximately 4.1 million rides are evaded each year.

Estimated Average Loss per Ride

Estimating the average loss per ride is a highly subjective process. In assigning values we were required to apply a certain level of judgment as in many instances little information on those evading is collected. For instance we could not determine from data collected if a passenger who refused to pay was intending to travel one, two, or three zones, or if the passenger was eligible for a concession fare. We further believe that it would be impractical to try and collect this type of information as part of TransLink's fare checking process. Accordingly, some level of estimation is needed to quantify the value of fares evaded.

The estimated cost per ride can be determined using numerous approaches, and we have set out three scenarios for comparison, as follows:

- Estimate the loss amount based on average ridership revenues;
- Estimate the amount of loss by applying a set dollar amount to each type of fare evasion, using the current single zone rate; and
- Estimate the worst case scenario loss amount by applying a set dollar amount to each type of fare evasion, using a blend of zone rates.

[10] For this table, Evasion Rates are rounded to one decimal place. The calculation of Estimated Annual Evaded Rides uses Evasion Rates accurate to several decimal places.

Scenario 1

The first approach is based on the average revenue earned per rider. Based on information provided by TransLink, the estimated average revenue per rider[11] is $1.75, up slightly from the $1.60 used in the last external review. This average fare reflects the overall profile of TransLink riders, including those that pay for multiple fare zones and those eligible for Concession Fares.

As not all evasions result in the loss of the full amount, pro-rata amounts are determined for each type of evasion. For example, a bus passenger refusing to pay was assigned 100% of this value and a bus passenger with a ticket for the wrong zone was assigned only 33% of this fare value. The estimated average loss per ride is calculated by applying this percentage to each type of fare evasion. This approach is currently being used internally by TransLink staff.

The merit of this approach is that as data is not collected by TransLink on the profile of evaders, it represents a fair reflection of the overall ridership population. Further, as there may not be reasons to believe that the profile of evaders differs from the overall rider profile, then basing the amount of the lost fare on average fare amounts is acceptable. The average fare lost calculated for buses using this approach was $1.07. The average lost revenue calculated for other modes is presented in the table below.

Scenario 2

The second approach is based on current fare rates. Similar to Scenario 1, as not all evasions result in the loss of the full amount, pro-rata amounts are determined for each type of evasion. However, for this scenario, the pro-rata amounts are based on specific fare values. For example, a bus passenger refusing to pay was assigned a value of the fare evasion of $2.25 and a bus passenger with a ticket for the wrong zone was assigned a fare value of $1.00. For this scenario, we typically used the one zone rate in estimating fare amounts. The estimated average loss per ride is then calculated by applying the set dollar value to each type of fare evasion. In comparison to Scenario 1, the average fare lost calculated for buses using this approach was $1.43.

The merit of this approach is that it presents the estimate in relation to current ridership fares. Also, monthly passes tend to dilute the average fare per ride (used in scenario 1) and this approach reduces the impact of such passes.

Scenario 3

The final approach is based on the current fare rates, but applies a weighting based on the time of day and the zone fares that apply in those periods. During AM peak period, midday, and PM peak periods the fare rate increases. For this scenario, the highest zone fare was used for AM and PM peak periods. The Zone 1 fare was applied to mid-day evasion levels to arrive at the weighted average. Using this approach, along with percentage values developed for the first scenario, the loss per bus evasion was determined to be $2.08.

This approach does not consider the overall profile of TransLink riders as, for instance, concession fares are not used. This scenario will overestimate the true amount of fare loss, but does provide perspective on a worst-case scenario.

[11] Calculated by TransLink based on revenue by mode divided by the number of revenue rides.

Estimated Lost Revenue

The calculation of revenue loss involves applying the fare evasion rates noted above to the estimated annual revenue ridership for each mode, to arrive at the estimated annual evaded rides. These are then multiplied by the estimated average loss per ride, to arrive at the total estimated revenue loss.

Mode	Estimated Annual Evaded Rides	Estimated Average Loss per Ride		
		Scenario 1	Scenario 2	Scenario 3
Bus	1,871,899	$1.07	$ 1.43	2.08
SkyTrain	2,163,983	1.43	1.58	2.41
SeaBus	113,925	1.24	1.49	1.69
West Coast Express	21,668	4.32	5.49	7.66
Weighted Average	4,171,475	$ 1.28	$ 1.53	$2.27

Mode	Estimated Annual Evaded Rides	Estimated Revenue Loss by Mode		
		Scenario 1	Scenario 2	Scenario 3
Bus	1,871,899	$ 2,002,932	$ 2,676,816	$ 3,893,550
SkyTrain	2,163,983	3,094,496	3,419,093	5,215,199
SeaBus	113,925	141,267	169,748	192,533
West Coast Express	21,668	93,606	118,957	165,977
Total	4,171,475	**$ 5,332,301**	**$ 6,384,614**	**$ 9,467,259**
As a Percent of Revenue		1.8%	2.1%	3.1%

These differences illustrate the challenges in developing a single “correct” rate to use in estimating lost revenue. Small changes in the estimated loss per rider have a greater impact when applied across a large ridership base.

While we believe that there are merits to both the first and second scenario, we have chosen to report the second scenario amounts in the Executive Summary on the basis that this amount is less likely to understate the amount of evasion currently within the TransLink system.

Estimated Precision

As previously noted, we set a sample level that was intended to provide a level of precision of $^{+}$/- 5%. The estimated error for the second scenario is $942,000, or 14%. By this we mean that we are 95% confident that the evasion is within the range of $5,442,000 and $7,326,000.

We note that the error of 14% exceeds our planned error rate. This results from the actual evasion rate being below our initial estimate. As noted earlier in our report, the error rate using the same sample size will increase as the evasion rate decreases, and is a product of the approach adopted by TransLink. We believe that the sample used for this report remains valid.

5 TransLink's Current Fare Checking and Enforcement Practices

Overview

Overall, the model employed by TransLink is effective in reducing fare evasion towards the target level set by management. Bus and WCE fare evasion, which together represent almost 75% of total ridership, are below this threshold. However, opportunities exist to reduce fare evasion on modes with higher evasion, especially SkyTrain, and to further ensure that evasion rates will not increase in the future.

In order for fare checking and enforcement activities to be effective in maintaining or reducing the current level of fare evasion, a rider typically would need to have a reasonable expectation of being questioned as to whether they have purchased a valid fare. In addition, when enforcement action is necessary it must result in a consequence that is adequate to deter future non-compliance by the evader and those witnessing the enforcement action being undertaken. However, our findings indicate the consequences associated with being caught evading a fare may not be adequate.

Fare Checking and Fare Enforcement Functions

The TransLink fare checking and fare enforcement model includes three functions with distinct but sometimes overlapping responsibilities:

- **Operators** – Bus Operators, SkyTrain and Marine Attendants are primarily charged with informing the public of TransLink fare requirements in assisting both Security and Police personnel in the conduct of their duties**;**
- **Security Personnel** – Primarily charged with enforcing compliance with Transit Regulations and assisting Transit Police in investigations of minor infractions of the Criminal Code which directly relate to TransLink property; and
- **Transit Police** – Charged with enforcement of the Criminal Code and some aspects of the Transit legislation.

Station Attendants and Terminal Attendants are the most visible portion of TransLink's overall fare checking process. They are frequently present at entrances and are active in asking riders to show their passes. However, Bus Operators, SkyTrain Station Attendants, SeaBus Terminal Attendants, and WCE Station Attendants do not have the responsibility for pursuing fare evaders. Rather, their role is to identify evaders, inform them of the evasion, and request that they purchase the appropriate fare. In limited instances they will also request Transit Police attendance to deal with evading riders. This limited authority appears apparent to many evaders. We observed instances where fare evaders detected by Operators continued to board Transit services without purchasing a ticket, even when asked to do so.

Transit Police provide a variety of services and have the ability to arrest people for outstanding warrants, enforce drug laws, and enforce the Criminal Code outside TransLink property. Only a portion of Transit Police efforts are devoted to fare evasion. With an expanded role for the Transit Police in recent years, the presence of these Transit Police officers on various modes related to fare checking has appeared to be diminished. Under the current enforcement program, only Transit Police have the authority to issue fines which may result in a monetary consequence to the fare evader.

Recently published figures indicate that approximately 30,000 tickets were issued in fiscal 2006 and of those tickets only 2,400 or 8% were paid. Based on this number, and the estimate of approximately 4 million rides

being evaded each year, there is less than a 1% chance of receiving a ticket. There is less than a 0.1% chance that riders pay any fine revenue[12].

One reason for the low rate of ticket payment is the inability to link transit fines to other desired government functions. For instance, in regards to motor vehicle fines, vehicle licensing and registration is withheld until traffic violations are paid. As a result, the only actual consequence to the individual is the short delay that they encounter while awaiting their violation ticket.

Transit Security members undertake much of the fare audit program, briefly stopping riders at stations and on-board buses. Security members do not have the authority to issue fines for fare evasion. We understand from our conversations that some riders can become agitated and aggressive when ticketed, and that there is greater personal exposure to the individual issuing the ticket. For that reason, we do not believe that Transit Security should be put in a position of greater potential harm that could result if they also were authorized to issue tickets. Rather, that role should remain solely with Transit Police.

Recommendation

We recommend that management strengthen its fare enforcement by pursuing ways to link violation tickets with other government functions (e.g. driver license renewal). We believe that this change could have the most significant impact on fare evasion by creating significantly enhanced consequences of evasion.

Fare Checking and Fare Enforcement Options

During our meetings with TransLink staff, we identified several options available to managing fare evasion:

- Reduce fare evasion by altering the design of the system;
- Increase the level of effort related to activities already in place to further reduce evasion;
- Increasing the impact on those caught evading; and
- Reduce fare riders desire to evade.

Further, management may choose to accept current levels of fare evasion levels and maintain the status quo in terms of fare checking and enforcement.

Evasion Efforts Impacted by System Design

The TransLink system is an open system which employs a self assessment or “proof of payment” system for the purchase and collection of fares. As a result, the perceived opportunity to evade fares is higher than is the case within a closed or “gated” transit system.

SkyTrain represents the greatest opportunity for fare evasion within the system as ticket machines are not supervised by operators and in many cases patrons may have valid reasons for not addressing the ticket machines prior to boarding the SkyTrain (e.g. they already have a valid daily, monthly, or yearly pass). As a result, it is not difficult for fare evaders to blend in with those who have a valid ticket.

In contrast, the Bus system represents the lowest perception of opportunity as in order to access bus service a potential evader, with minor exception, will have to physically walk past an individual charged with operating the bus without addressing the fare box located within visual distance of that operator. While these operators

[12] Fine revenues are collected and retained by the Provincial Government.

are not directly responsible for enforcing fare compliance, in the eyes of the public there is the potential for embarrassment if questioned by the operator. In addition, a perceived and actual enforcement aspect to the operator's duties results from their ability to communicate directly with those charged with enforcement responsibilities such as security and police. The designation of buses as fare paid zones, and related advertisements have also served to reduce the perception of fare evasion opportunities on buses.

Both the SeaBus and the WCE represent a moderate opportunity for fare evasion as a result of station attendants being present to oversee individuals entering the train or SeaBus platform and, in the case of the WCE, the consistent checking of tickets for passengers leaving Waterfront Station.

Altering the physical infrastructure (e.g. SKyTrain stations, WCE stations, SeaBus terminals, etc.) is likely to be costly. We understand that management has debated the merits of such a change, and that there are both positive and negative factors to consider. For instance, we are told that implementing some types of gated systems could potentially impede the ability of Transit Police to question riders once inside a Fare Paid Zone. As the scope of our review was on estimating the amount of fare evasion occurring across the respective transit modes, we have not explored the costs, benefits, and challenges of this option.

Fare Checking Efforts

TransLink management sets fare checking levels in proportion to overall ridership. The collection of this fare evasion data is then undertaken by Coast Mountain Bus Company's TransLink Security group. As noted in Section 3, this incurs significant time on the part of Security Staff. In addition, Security Personnel also undertake independent, discretionary fare checking activities. We believe that by reducing the sample size used by the TransLink Planning group in estimating fare evasion would allow Transit Security greater discretion in allocating its resources. We do not believe that TransLink Security should reduce its overall level of efforts, but believe that by applying a risk-based allocation of effort would likely result in a more efficient use of resources. For instance, allocating efforts based on revenue loss, and not evasion rates, would likely result in TransLink applying 60% of its efforts at SkyTrain stations and 40% of its efforts on buses. Although SeaBus evasion rates are higher, the revenue loss would likely not support any sustained enforcement efforts on this mode.

Recommendation

We suggest that the TransLink Security group shift to a risk-based allocation of fare checking, focusing its efforts on those stations and routes with higher revenue losses.

Impact on Riders Evading Fares

Enforcement actions generally available to Transit Security in dealing with a fare evader include:

- Requiring the individual to purchase a valid fare;
- Detaining the individual pending the arrival of Transit Police to enable issuance of a fine; and
- Removing the individual from transit property.

Purchase of a Valid Fare

By requiring that fare evaders only purchase a valid fare in order to continue their use of the transit system, both the risk of evasion is increased and the compliance model is weakened. As the public becomes aware, through seeing enforcement actions undertaken, or through their own interaction, that the only true penalty to fare evasion is the time and expense it would take to purchase an actual fare, their assessment of the incentive and opportunity for committing evasion may change.

An enforcement model without a meaningful disincentive is only effective where 100% of individuals are checked for compliance. This is likely not an option for TransLink as a result of the costs relating to the increased staffing that would be required to implement 100% fare checking.

Removal from Transit Property

This enforcement action is not normally undertaken as individuals are more likely to agree to pay the fare that is owed at the request of security. Further, when it is used, the deterrent is typically only effective while TransLink personnel are on-site and observing the rider.

Aside from the financial penalty, one of the most significant consequences to riders can be the delay associated with being detected as evading the fare. If the evaders upon detection were removed as an enforcement option, all evaders would be required to leave transit property or fare paid zones upon detection, resulting in a meaningful delay to evaders that are found to be on the Bus or SkyTrain (97% of all ridership). In the case of SkyTrain, in order to ensure that the consequence was meaningful, a temporary ban on access to the local SkyTrain station would also have to be imposed on fare evaders. We are also told by TransLink personnel that while this is a possible option, removing riders must be done based on pre-set criteria and on a consistent basis.

While it is advisable for TransLink to further pursue the ability to tie Transit fines to some form of government activity, such as licensing administered by the Insurance Corporation of BC as a means of increasing collections and consequence, an increased focus on non-monetary inconveniences for individuals who attempt to evade fares will serve to increase the consequence of fare evasion.

Recommendation

We recommend that management strengthen its fare enforcement by implementing more significant consequences to ride evaders, including removal from the property.

Reducing Fare Evader's Desire to Evade

Most of the current fare enforcement checking and fare enforcement focus in on detecting and, in some instances, penalizing evaders for attempting to evade fares. Others options that TransLink may wish to pursue relate to reducing the desire of riders to evade in the first place. This may occur by:

- Reducing riders' ability to rationalize evasion, and
- Reducing the general riders' view that "everyone else is doing it so why shouldn't I" syndrome.

Reducing Rider's Ability to Rationalize Evasion

Some fare evaders will rationalize that entering the transit system without the purchase of an appropriate fare is acceptable. Efforts aimed at reducing the rider's rationalization could represent significant opportunity for TransLink to reduce fare evasion without making substantial and costly changes to the design of the current transit model. Activities in this area would focus more on educating riders on the expectation that everyone purchase a fare and the intended consequences to those that don't. Such efforts may This education is likely to result from more than just observing respective fare checking and fare enforcement activities.

Rider Perception that Evasion is Wide Spread

Periodically, the media releases articles indicating that evasion is widespread, although few of these provide specific rates of evasion supporting those assertions. These reports have the ability to affect public perception in this regard and have the ability to affect the ability of an individual to rationalize fare evasion.

In contrast to the media, our findings show only moderate evasion levels. By publishing these figures TransLink may be better positioned to counter the affects of the media reports which support the thinking that “everyone is doing it”. The statistic that over 97% of all individuals pay the appropriate fare when riding transit, may go a long way to affect public perception in this regard, negating the publics’ ability to rationalize fare evasion based on the premise that a substantial portion of others also evade fares.

6 Restrictions

We have relied upon information provided to us by management and employees of TransLink and other sources as noted above. We have not independently verified or established the reliability of those sources by reference to independent evidence. We have, however, satisfied ourselves, so far as possible, that the information presented is consistent with other information made available to us in the course of our work in accordance with the terms of this engagement. We have not carried out a financial audit.

The information and findings in this report are based on information that has been made available to us. We cannot express an opinion as to the accuracy or completeness of the information provided to us. We reserve the right to review our comments and, at our sole discretion, amend our report in light of any information that becomes known to us subsequent to the date of this report.

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