



IE UNIVERSIDAD

TESIS DOCTORAL/ DOCTORAL
DISSERTATION

EL IMPACTO DE LAS CARACTERÍSTICAS DE LOS HORARIOS
DE LOS TRABAJADORES EN EL RESULTADO ESPECÍFICO DE
AUSENTISMO DE LOS TRABAJADORES /THE IMPACT OF
CHARACTERISTICS OF WORKER'S SCHEDULES ON THE
SPECIFIC WORKER OUTCOME ABSENTEEISM

POONAM JASSI

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Abstract

Absenteeism in home care can increase operating expenses and impact client satisfaction, but little is known about the effect of operations managers' planning decisions on this important worker-level outcome. The present work investigates how absenteeism is affected by the characteristics of workers' schedules. To this end I use data from a home care organization, which covers 1,356,113 home visits done by 1,827 caregivers to 21,472 patients over a period of 5 years. I find that certain elements of scheduling desirability that would improve schedules based on worker preferences do in fact impact caregiver absenteeism. In specific, gaps in worker schedules, schedule modifications and consistency within week schedules contribute to likelihood of worker absence. This study contributes to a nascent stream of research that bridges operations management and human resource management, showing how operating decisions in the planning process can have important consequences on the quality and cost of care. More generally our future analysis will be informative for settings in which relatively unskilled service workers are required to stick to schedules subject to frequent modifications and substantial day-by-day variability.

Resumen

El ausentismo en la atención domiciliaria puede aumentar los gastos de funcionamiento y repercutir en la satisfacción de los clientes, pero se sabe poco sobre el efecto de las decisiones de planificación de los directores de operaciones en este importante resultado a nivel de los trabajadores. El presente trabajo investiga cómo el ausentismo se ve afectado por las características de los horarios de los trabajadores. Para ello utilizo los datos de una organización de atención domiciliaria, que abarca 1.356.113 visitas a domicilio realizadas por 1.827 cuidadores a 21.472 pacientes en un período de 5 años. Considero que ciertos elementos de la conveniencia de la programación que mejorarían los horarios basados en las preferencias de los trabajadores repercuten de hecho en el ausentismo de los cuidadores. Concretamente, las lagunas en los horarios de los trabajadores, las modificaciones de los horarios y la coherencia en los horarios de las semanas contribuyen a la probabilidad de ausencia del trabajador. Este estudio contribuye a una naciente corriente de investigación que tiende un puente entre la gestión de las operaciones y la gestión de los recursos humanos, mostrando cómo las decisiones operativas en el proceso de planificación pueden tener importantes consecuencias en la calidad y el costo de la atención. En términos más generales, nuestro futuro análisis será informativo para los entornos en los que se requiere que los trabajadores de servicios relativamente poco cualificados se atengan a horarios sujetos a frecuentes modificaciones y a una considerable variabilidad diaria.

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Introduction

Rising health care costs and an aging demographic have created tremendous pressure to measure and improve the efficiency of health care providers (Hussey, De Vries et al 2009). In this scenario home care is a growing field because care in the community is more cost effective than in an acute setting such as a hospital and patients tend to prefer it compared to other options such as nursing homes. The number of home care recipients in Canada increased by almost 100 percent between 1995 and 2006, with demand expected to grow as the large volume of baby boomers move through their senior years (Cruikshank et al, 2009).

Past research has focused mainly on optimizing the generation of schedules based on certain attributes or preferences of the clients or workers, such as skillset of workers, priority in medical needs of clients, minimizing travel and idle time (Paraskevopoulos et al., 2017). Models have been built to address daily scheduling, using these parameters to derive schedules that minimize total costs and client inconvenience (Braekers et al, 2016). Similarly, research on scheduling home care research has focused on routing of home care workers, specifically around ways to optimize the scheduling application (Fikar and Hirsch, 2017).

However, these models tend to assume that workers' performance is independent from schedule characteristics, and their variation across time (Paraskevopoulos et al., 2017). This idea has been empirically and theoretically challenged by research that suggests that worker performance indeed is affected by the characteristics and stability of worker schedules. Labor productivity was



found to increase by 5% in an experiment among retail workers by instituting practices that provided more stable schedules for workers such as predictability, consistency and adequacy (Williams et al, 2018). Additionally, extant empirical research uses relatively unsophisticated measures of schedule characteristics, which do not capture the nuanced ways in which workers may unfavorably perceive their schedules. Understanding in depth how workers' schedule characteristics impact worker outcomes is particularly salient in an environment like home care, where schedules need to adhere to a demand pattern that is highly irregular during the day and constantly in flux due to absenteeism, turnover, and changes in patient visits (new visits, cancelled visits etc).

This work seeks to investigate possible features of worker schedules (e.g., stability) link to the employee outcome of absenteeism using data from a home care organization. Absenteeism is a concern in this industry because when a scheduled staff member provides short notice of absence, and a replacement is not found in time to attend the visit, customer complaints are likely to occur. Additionally, absentee calls disrupt continuity of care as even if a replacement is found, particularly if the replaced worker is not one of the designated “back-ups” for the client or someone they are familiar with—a situation that can generate customer complaints too. Finally, absenteeism forces the care giving organization to maintain a larger than needed staff, with obvious negative effects on its profitability or financial viability. A great deal of research has been conducted within and outside of health care on absenteeism. In particular, a recent study by Wang and Gupta (2014) investigates nurse absenteeism and identifies predictors of absenteeism. The study also looks at assigning nursing with heterogeneous



absenteeism rates to different work units and the resulting impact. However, research about the effect of scheduling factors on absenteeism remains deficient, and with it the possibility of establishing if these factors can be manipulated to reduce staff absences.

This study takes place in a large home care organization with multiple sites. The data in this study covers events spanning a five year period. Workers in this setting are scheduled to see clients in the community to provide personal care and supportive services to help maintain the independence and safety of clients at home. The schedules of these workers are developed by the office scheduling coordinators and are subject to fluctuations and real time adjustments. Although some workers with higher seniority may have stable schedules, in general in home care it is common that workers schedules are not consistent on a daily or weekly basis – especially in comparison to other environments that HCA’s or caregivers work in, such as hospitals or retirement homes and long term care facilities, where workers are generally given scheduled shifts with fixed times allotted to each patient.

This study aims to identify the characteristics of a schedule that impact worker absenteeism. The fundamental assumption of this study is that when a worker receives schedules that are subject to frequent adjustments, or that are incompatible with workers’ scheduling preferences, stress and frustration may lead to the decision to not come to work.

Predicting how worker schedules drive absenteeism will allow for enhanced worker and client outcomes. Besides being relevant for the home care



industry, results for this study are relevant for the many work environments where relatively unskilled employees do service work based on irregular and constantly changing schedules. From a theoretical standpoint, I expect that this study would provide a more complete understanding of the meaning of “desirable schedule”, by identifying novel features of workers schedules that have a bearing on worker outcomes. From a practical standpoint, I anticipate the results of this study will be used in training staff and in adjusting workforce planning in home care. Schedule creation for home care workers will have additional elements to incorporate. A more thorough review process can also be established prior to distributing schedules to staff to improve acceptance. Outside of homecare, the results can be extrapolated in work environments where relatively unskilled labor operate with fluctuating schedules.

Introducción

El aumento de los costos de la atención de la salud y el envejecimiento de la población han creado una enorme presión para medir y mejorar la eficiencia de los proveedores de atención de la salud (Hussey, De Vries et al 2009). En este escenario, el cuidado en el hogar es un campo en crecimiento porque la atención en la comunidad es más rentable que en un entorno agudo como un hospital y los pacientes tienden a preferirlo en comparación con otras opciones como los hogares de ancianos. El número de beneficiarios de la atención en el hogar en el Canadá aumentó casi un 100% entre 1995 y 2006, y se prevé que la demanda aumente a medida que el gran volumen de personas de la generación de la posguerra pase a la edad adulta (Cruikshank y otros, 2009).

Las investigaciones anteriores se han centrado principalmente en la optimización de la generación de horarios basados en ciertos atributos o preferencias de los clientes o trabajadores, como el conjunto de aptitudes de los trabajadores, la prioridad en las necesidades médicas de los clientes, la reducción al mínimo de los viajes y el tiempo ocioso (Paraskevopoulos et al., 2017). Se han elaborado modelos para abordar la programación diaria, utilizando estos parámetros para derivar horarios que minimicen los costos totales y las molestias de los clientes (Braekers et al., 2016). Del mismo modo, la investigación sobre la programación de la atención domiciliaria se ha centrado en el enrutamiento de los trabajadores de la atención domiciliaria,

específicamente en torno a las formas de optimizar la aplicación de la programación (Fikar y Hirsch, 2017).

Sin embargo, estos modelos tienden a suponer que el desempeño de los trabajadores es independiente de las características de la programación y de su variación a lo largo del tiempo (Paraskevopoulos et al., 2017). Esta idea ha sido cuestionada empírica y teóricamente por investigaciones que sugieren que el rendimiento de los trabajadores se ve efectivamente afectado por las características y la estabilidad de los horarios de los trabajadores. En un experimento realizado entre trabajadores del sector minorista se descubrió que la productividad laboral aumentaba en un 5% al instituir prácticas que proporcionaban horarios más estables a los trabajadores, como la previsibilidad, la coherencia y la adecuación (Williams et al, 2018). Además, la investigación empírica existente utiliza medidas relativamente poco sofisticadas de las características de los horarios, que no captan los matices de las formas en que los trabajadores pueden percibir desfavorablemente sus horarios. Comprender en profundidad la forma en que las características del horario de los trabajadores influyen en los resultados de los trabajadores es particularmente importante en un entorno como el de la atención domiciliaria, en el que los horarios deben ajustarse a un patrón de demanda que es muy irregular durante el día y que fluctúa constantemente debido al absentismo, la rotación y los cambios en las visitas de los pacientes (nuevas visitas, visitas canceladas, etc.).

Esta labor tiene por objeto investigar las posibles características de los horarios de los trabajadores (por ejemplo, la estabilidad) en relación con el resultado del ausentismo de los empleados, utilizando datos de una organización

de atención a domicilio. El ausentismo es una preocupación en esta industria porque cuando un empleado programado da un breve aviso de ausencia, y no se encuentra un reemplazo a tiempo para asistir a la visita, es probable que se produzcan quejas de los clientes. Además, las llamadas de ausentes interrumpen la continuidad de la atención, incluso si se encuentra un sustituto, en particular si el trabajador sustituido no es uno de los "refuerzos" designados para el cliente o alguien con quien esté familiarizado, situación que también puede generar quejas de los clientes. Por último, el ausentismo obliga a la organización que presta la atención a mantener un personal más numeroso de lo necesario, con evidentes efectos negativos en su rentabilidad o viabilidad financiera. Se ha realizado una gran cantidad de investigaciones dentro y fuera de la atención sanitaria sobre el ausentismo. En particular, un estudio reciente de Wang y Gupta (2014) investiga el ausentismo de las enfermeras e identifica los factores predictivos del ausentismo. El estudio también examina la asignación de enfermeras con tasas de ausentismo heterogéneas a diferentes unidades de trabajo y el impacto resultante. Sin embargo, la investigación sobre el efecto de los factores de programación en el absentismo sigue siendo deficiente, y con ella la posibilidad de establecer si estos factores pueden ser manipulados para reducir las ausencias del personal.

Este estudio tiene lugar en una gran organización de atención domiciliaria con múltiples emplazamientos. Los datos de este estudio cubren eventos que abarcan un período de cinco años. Los trabajadores en este entorno están programados para ver a los clientes en la comunidad para proporcionar cuidado personal y servicios de apoyo para ayudar a mantener la independencia y la

seguridad de los clientes en el hogar. Los horarios de estos trabajadores son desarrollados por los coordinadores de programación de la oficina y están sujetos a fluctuaciones y ajustes en tiempo real. Aunque algunos trabajadores con mayor antigüedad pueden tener horarios estables, en general en la atención domiciliaria es común que los horarios de los trabajadores no sean coherentes a diario o semanalmente, especialmente en comparación con otros entornos en los que trabajan los HCA o los cuidadores, como los hospitales o las residencias de ancianos y las instalaciones de atención a largo plazo, donde los trabajadores suelen tener turnos programados con horarios fijos asignados a cada paciente.

El presente estudio tiene por objeto determinar las características de un horario que repercuten en el ausentismo de los trabajadores. El supuesto fundamental de este estudio es que cuando un trabajador recibe horarios que están sujetos a ajustes frecuentes, o que son incompatibles con las preferencias de programación de los trabajadores, el estrés y la frustración pueden llevar a la decisión de no venir a trabajar.

Predecir cómo los horarios de los trabajadores impulsan el ausentismo permitirá mejorar los resultados de los trabajadores y los clientes. Además de ser pertinentes para la industria de la atención a domicilio, los resultados de este estudio son pertinentes para los numerosos entornos laborales en los que empleados relativamente poco cualificados realizan trabajos de servicio basados en horarios irregulares y en constante cambio. Desde un punto de vista teórico, espero que este estudio proporcione una comprensión más completa del significado de "horario deseable", identificando las características novedosas de los horarios de los trabajadores que influyen en los resultados del trabajador.



Desde un punto de vista práctico, preveo que los resultados de este estudio se utilizarán en la capacitación del personal y en el ajuste de la planificación de la fuerza laboral en la atención domiciliaria. La creación de horarios para los trabajadores de cuidados en el hogar tendrá elementos adicionales que incorporar. También se puede establecer un proceso de revisión más completo antes de distribuir los horarios al personal para mejorar la aceptación. Fuera de los cuidados en el hogar, los resultados pueden extrapolarse a los entornos laborales en los que la mano de obra relativamente poco calificada opera con horarios fluctuantes.

Literature Review

Absenteeism in any industry creates workflow challenges. In Canada, at industry level, the most work days were missed by employees in health care and social assistance (Stats Canada, 2011). Blumenfeld and Inman (2009) investigated the impact of absenteeism on operational performance. Using queuing models of an assembly line, they find that throughput decreases and the number of defects increase with absenteeism, because substitute workers are less skilled and overload team leaders with frequent help requests.

A great deal of research has been conducted on factors that lead to absenteeism, finding key antecedents in workplace stress and burnout. A survey of workers employed in 250 US companies found perceived stress scores to be positively associated with absenteeism (Jacobsen et al, 1996). Similar results are reported in Tang and Hammontree (1992) in a study of the effects of stress on absenteeism in the police force (Tang, T. L., & Hammontree, M. L., 1992).

Subsequent research begun to conceptualize unfavorable perceptions of schedules as an important source of work stress and, ultimately, of absenteeism. Ala-Mursula et al. (2002) investigate how different aspects of job control (start and stop of work day, scheduling of breaks, scheduling of shifts, handling of private matters during the work day, scheduling of vacations and paid leave) impact health problems associated with sickness absence. They find that, specifically in women, low level of work-time control is associated with poor health, psychological distress and sickness absence. Conversely, having control over working schedules allows employees to successfully manage the work/non-

work boundaries and to integrate working life with private life. Golden et al (2014) look at the determinants of happiness and the independent role played by having discretion over one's working time, using data pooled from two years of a nationally representative US survey. They find that discretion over the timing of one's work matters far more for happiness than does the work shift duration. It may be assumed that working long hours can lead to stress, however this research indicates that satisfaction levels are impacted greater by fluctuating work schedules than length of work shifts. In a subsequent study Golden (2015) found that variable work shifts, in particular, irregular and on-call work, are associated with significantly higher reported work-family conflict occurrences. Greater frequency of irregular shifts, unwelcome overtime work, and lack of schedule control makes daily work-life navigation difficult, ultimately increasing the changes of absenteeism. It was found that employees working non-standard shift-time work reported higher overall burnout and health problems (Jamal, M., 2004). In addition, workers with non-standard predictable schedules were less stressed than those with non -standard unpredictable hours (Lozano, M. et al, 2016).

In the health care setting, research by Davey, Cummings and Newburn Cook (2009) has looked into predictors of absenteeism in acute care hospital settings. They find that past attendance in nurses is the greatest predictor of absenteeism. Prior individual absences were significantly related to absenteeism in nurses. Rajbhandary and Basu (2010) focuses on working conditions of nurses and the related absenteeism and finds that the association between workload and absenteeism is a function of nurses' skill level. High workload had a stronger

impact on the decision not to come to work for low skilled nurses (Licensed Practical Nurses's) than for highly skilled nurses (Registered Nurses's). The authors speculate that nurses with high skill sets feel better able to manage the workload than less skilled nurses. Similarly, Green et al. (2013) find that when nurses anticipate a higher workload due to fewer nurses being scheduled for a shift, absenteeism is exacerbated. The anticipated stress of managing a higher workload deters them from coming to work. Wang and Gupta (2014) investigate how matching of the content of the schedule (i.e., which unit are the nurses assigned to) affects absenteeism. They find that nurses that were not comfortable with the units they were scheduled to operate in would have higher absenteeism rates due to the associated stress. In a nutshell workload, schedule content and presence at work when the next schedule is being planned all have an impact on nurse absenteeism, suggesting that the process of planning caregivers is subject to complex behavioral dynamics. The converging evidence about the negative effects of undesirable schedules on employee absenteeism is in agreement with a more general study that Geurts et al (1999) executed with mental health workers. They found that perceived inequality in the employee/employer relationship (e.g., adverse schedule characteristics) had a negative effect on absenteeism, but this effect was not mediated by resentment or poor organizational commitment. That is, their result suggest that the negative effect of poor schedules (from the employee's perspective) on absenteeism is directly linked to stress or health issues, rather than to poor motivation or resentment.

Despite the adverse effects of using flexible labor resources can have on employees' willingness to attend to work, empirical evidence indicates that

flexible labor helps with creating volume flexibility and maximizing profit (Kesavan, Staats and Gilland, 2014). Hur, Mabert & Bretthauer (2004) find that making real time work schedule adjustments can lead to enhanced productivity. A flexible labor force (e.g., one including part time workers) enables an organization to respond to changing client demands. Additional hours workers can provide enable upside flexibility. Such flexibility is quite essential in the home care setting, where client demand fluctuations are constant. Clients schedules vary daily to accommodate medical appointments, hospital admission, change in health status, family needs etc. Being characterized by both irregular work schedules and relatively high levels of absenteeism, the home care industry offers an ideal setting to further scientific understanding of how individuals react to different characteristics of their work schedules. In addition, the home care worker population stands at a much lower skill level than nurses, which most of the past health care research has been focused on. Given its lower skill level and hence substitutability, this collective of workers is particularly exposed to the risk of have highly irregular schedules. Studying it hence offers the natural opportunity to observe the effect of unusually high levels of schedule irregularity and low levels of schedule control on relevant worker outcomes. Additionally, high levels of absenteeism and client initiated visit changes make the study of this context highly relevant for practice.

From a theoretical standpoint, I note that to date extant conceptualization of work schedule characteristics have been relatively unsophisticated, being limited to actual and anticipated workload (Green et al. 2013; Wang and Gupta 2014), degree of worker control over his or her schedule (Ala-Mursula et al., 2002;

Golden, 2014) overlap of scheduled activities with worker skills and preferences (Rajbhandary and Basu, 2010) among the others. Schedule instability has been looked at in terms of impacting workers ability to manage child care arrangements (Henly and Lambert, 2014) as well as the impact on psychological distress with fluctuating schedules (Schneider and Harknett, 2019). Nurses have felt fear of job loss in declining overtime requests, which in turn create increased schedule instability (Golden and Wiens-Tuers, 2005). Investigating precarious work schedules suggests possibilities for furthermeasuring of four aspects of work: usual and fluctuating hours, nonstandard working time, schedule predictability, and employee schedule control/input (Henly and Lambert, 2014) as reserach indicates these aspects may have significant implications for worker and family well-being.

With this study I aim at providing a deeper conceptualization of schedule desirability for the worker, hence identifying different criteria along which schedules can be optimized from a behavioral standpoint. From an empirical standpoint, I aim to provide objective assessment of how different characteristics of schedule desirability impact the relevant worker outcomes of absenteeism. This study aims to highlight what enhancements can be made in schedules based on worker preferences in order to improve the worker outcome of absenteeism.



Research Setting

I examine the research questions utilizing unique data from a large organization providing home healthcare services in Canada. The organization is the largest provider of outpatient rehabilitation and community healthcare services in Canada. Founded in 1974 as a research and education company, the organization today operates a network of over 250 clinics and community care centers, and over 70 community care homes, with over 15,000 employees. The company offers services in home health, eldercare, physiotherapy, occupational therapy, exercise and behavioral therapies, chiropractic, nursing, speech, massage. I specifically focus on the study of caregivers or health care aides (HCA's) which comprise the majority of the home health work force. I also specifically focus on home care operations across British Columbia (BC) as regulations for health care professionals vary across Provinces. In order to be eligible to work as a HCA in any publicly funded health care setting in BC, applicants must be registered with the BC Care Aide & Community Health Worker Registry, which requires the completion of an approved HCA education program. HCA's in home care provide general assistance to clients to maintain their independence through personal care (bathing, grooming, oral care), meal preparation, medication reminders, respite for family members and a variety of other duties under their scope of practice.

The BC unit is under the management of a single Director of Operations, with local managers across the Province in the various jurisdictions. Local managers can be but do not have to be nurses. All HCA's are however supervised by a nurse manager, referred to as a Client Care Manager (CCM). This position



is responsible for ongoing training, performance evaluation and rewards for the HCA's in the community. Caregivers are rewarded with a "Bravo" card which contains a note to recognize the positive action and a \$5 gift card. There is no limit to the number of "Bravo"s a caregiver can receive in a year. The human resource department awards them when a compliment is given by a client, a supervisor or a fellow staff member by contacting them over the phone to let them know they have received a compliment. The gift card with a personalized note is then mailed to the staff. The office also places the name on the "Bravo" wall, so that staff that visit the office can also see the recognition. The number of HCA's per CCM varies per jurisdiction however could range from 30 to over 100. HCA's within the division are all casual and not guaranteed hours of work. Casual employees in Canada differ from part-time employees in that casual employees are employees who do not have regular or systematic hours of work or a guarantee of continuing work. A typical casual employee is employed on a daily basis when the need arises.

Each local operation consists of Client Care Coordinator (CCC) staff that is responsible for the scheduling of the home care visits. The number of these roles varies with the size of the operation. The main objective of the CCC is to match clients and HCA's with schedules that ensure no missed care and that optimize client preferences and HCA availability. Although the CCC is responsible for the planning of the HCA schedules, the HCAs do not have a reporting relationship with the CCC's—this is a unique prerogative of the CCM.



The Provincial Operations also has HR support and Clinical support positions. See Figure 1 for sample Organizational Chart.

Individual CCCs are responsible for alerting HR when there is need for additional HCA staff in the area they schedule for. They determine this by their ability to fill all visits during their schedule creation. Management may also direct HR on staffing needs based on feedback from funders. Additionally, as HR manages all terminations and resignations, they are aware of when staff have separated from the organization and require replacement. Staffing needs are communicated on an ongoing basis. As they arise, HR posts the required open positions on multiple job sites and the company's web site. This is the most successful method of drawing job applications. Other strategies are employed, specifically when there are large numbers of new hires required, such as hosting job fairs, open houses, and working with outside agencies. Advertising can also include radio slots, local newspapers and posters in local community centers. Applicants are encouraged to email HR their resume and cover letter. Although rare, some applicants will visit the office and apply in person. Recruiting new staff is a challenge as there is a great deal of competition for workers within home care and across other settings (care homes, hospitals, private hire etc). Publicly funded entities tend to have higher pay than private organizations however private companies generally allow for greater flexibility in terms of hours required to work. This is particularly attractive to individuals who work multiple jobs or have other competing priorities such as family obligations. As HCA's are predominantly women, the need for flexibility for family priorities is quite prevalent.



Due to the competitive nature of HCA recruitment, it is advised that HR responds to applicants within the first working hour if possible. If the application is complete and deemed worth pursuing, the HR representative will conduct an initial phone screen with the applicant. This can either be done immediately or at a scheduled time if the applicant can't speak right away. The phone screen is based on pre-determined questions used for all BC offices. These initial calls generally take less than 15 minutes and focus on if the candidate meets the minimum requirements for employment. If it is determined that the HCA can work in the desired area, is able to provide proof of their HCA certificate, agrees to supply a clear criminal record check prior to commencing work and are available to work a minimum of 20 hours a week, the HCA is then moved onto the next step – an in person interview. The in person interview takes place at the office. During this scheduled time, the applicant is first put through standard in-person interview questions by HR. If the CCM has availability, the CCM will also attend the in person interview. The questions are meant to assess candidate strengths, experience and skillset. It is also used to highlight any potential red flags. After the verbal interview, the candidate is asked to complete a written English test. The verbal and written components of the interview can usually be complete within an hour. The applicant is then told that HR will follow up on next steps. Once the English test is evaluated and the interview notes are summarized, HR determines if the applicant is suitable for hire. An offer is then extended over the phone to the candidate, subject to successful completion of reference checks and required documentation.



If the successful candidate satisfies the necessary documentation requirements, he/she is asked to attend an orientation session at the office. These sessions are generally done in groups for efficiency. The orientation is a full day of learning for the HCA to become familiar with the company, its care philosophy and the basic policies and procedures. The HCA is given a uniform on orientation day as well as a welcome kit to the company. The agenda includes learning about the company, the role, and outlining expectations. The HCA meets their supervisor as well as their CCC when they complete the office tour. Lunch is provided for the new hires and the afternoon session is focused on education from the nurse manager. This includes a module on medication management, an important aspect to the HCA role. If the HCA is joining a unionized office, a union rep attends the orientation and provides an overview of the collective agreement and of union contacts.

The HCA is required to complete their availability schedule prior to the end of orientation day. This is meant to be aligned with the requirements in the union agreement if there is one present. In non-union offices, there would have been a discussion with HR and the candidate on the hours that were required. This step can be difficult as many HCA's change their availability from their original hire date. Open availability is desired as it enables flexibility for CCC's to schedule clients. As HCA's change their availability and limit the hours they are able to work, more HCA's are then required to pick up the difference. The availability is entered into the system for the CCC's future use. Other employee attributes are entered by HR upon completion of orientation. This includes if the HCA has any allergies (could be to smoking or pets), if the HCA speaks additional languages



or has completed specialized course work. HR also submits in the system where the HCA is able to work. As some departments are close in proximity, an HCA may provide permission to travel across departments in order to see a greater number of clients. Generally, this is limited to departments under the same collective agreement if it is a union office so there are not two different sets of guidelines the staff need to learn and differentiate while working. These items are input into the system as requirements (a staff cannot be sent to a home with pets if they are allergic). Other aspects of what the staff would like to see in a schedule may be noted in comments, however are not hard wired in the system. For example, an HCA may like and prefer to work with children. This may be documented in the employee file, but would most likely only be action by the CCC if he/she is made aware by the HCA. The stronger the relationship between the CCC and the HCA, the greater these preferences become known and can be worked into the schedule generation.

Once the orientation day is complete, the HCAs are told they will be contacted to complete buddy shifts. The company policy is that all new hires complete at least two buddy or shadow shifts prior to working alone in the community. For this to be scheduled, the HCA must have provided a clear criminal record check. This may take some time to process so there may be a delay in the starting of certain staff. However, once the document is in and saved to the employee file, the CCC begins the shadowing schedule within the HCA's given availability. The CCM may let the CCC know who he/she feels will be a good fit for the new hire to shadow. It is generally seasoned staff or staff with above average performance. Once the shadow shifts are complete, the staff are



ready to see clients on their own. This whole process – from interview to starting to see clients can take anywhere from 2 weeks to 2 months as per the timing of the various requirements. Once hired, the staff enter a three month probationary period. Here it is very important for the CCM and CCC's to keep an eye on any initial red flags of the new hires performance. This includes looking at any missed visits, any client complaints or errors such as medication errors. Once the HCA passes the 3 month mark, it is more difficult to terminate the employee relationship, especially if corrective measures were not put into place. A process map of how workers are recruited and induced into the organization is shown in Figure 2.

In the BC Unit, there are 6 departments based on the local geography. These departments are either unionized or not. Comox and Prince George are the two non-union departments, the remaining five are unionized (Surrey, Fraser Valley, Vancouver, Burnaby and Nanaimo). Union offices would have agreed to be organized by a labor movement at some point in history. The departments with unions have had active agreements for many years. There were no changes in union status in the course of this study. Union offices impact the manner in which schedules are generated. Under the collective agreements, there are generally clauses on how working hours are awarded. Each unionized office has its own collective agreement, however in general, working hours or visits are to be awarded based on the seniority of the worker. Seniority may build on tenure (years with the organization) or on hours worked. This is also stipulated in the collective agreement. The union offices must keep an up to date listing of workers seniority. When scheduling clients, they must work to maximize hours to senior



workers based on their availability. The collective agreements also state parameters on how the hours are to be scheduled (required gaps in scheduled hours from one day to the next, minimum number of hours to be scheduled in a block, maximum hours to be scheduled in a work week – generally 40). Each agreement has different parameters for this. The schedulers are to do their best to adhere to the collective agreement. If the workers feel they were not scheduled as per the agreement, they are able to grieve any hours they feel should have been awarded to them. If the grieved hours cannot be disputed by the organization, they must be paid out to the worker. This can incur a great deal of costs as the extra hours cannot be billed for.

Another important difference between union and non-union offices is the presence of sick pay. In union offices, employees are granted sick day pay based on seniority. In non-union offices, workers do not get paid if they are absent from work. There may be language in the collective agreement about the amount of time required to provide notice of a sick day in order to receive payment. As the population that is served is vulnerable, it is highly encouraged that if a worker is sick to not go to work in order to avoid spreading the illness. However, it is noted that a great deal of sick calls may be due to caregiving responsibilities of the workers, not of illness. Many workers may have a child sick with no back up child care. Most absentee calls do not require follow up. Therefore, it may be difficult to determine if all absenteeism calls are true absenteeism calls or if perhaps an HCA chooses to opt out of work or be absent if they find the scheduled hours undesirable. However, if a worker is absent for multiple days in a row, their CCM will follow up with a call to ensure everything is ok. Absences are not subject to



discipline unless there was no communication with the office to book the day off, or if significant notice was not provided.

Once a HCA books off, the schedulers will try immediately to fill their visits for the day. They will do this based on seniority in union offices. In general, the goal for both the union and the non-union offices is to replace an absent worker with workers that already have experience with the client to adhere to continuity guidelines (the lower the number of workers assigned to a client, the better). The system will prompt the scheduler with the history for each individual client. If all works out, the visits are rescheduled with the appropriate worker and the client is made aware of the staff change. However, if there is no one with history available, the client may receive a new worker. This can lead to complaints, as new workers are not familiar with the routines of the client. In the worst-case scenario, no worker at all is available to fill the visit. If this happens, the client will be notified that their visit cannot be filled and it will have to be cancelled. This can be very upsetting to the client and result in complaint.

If the reverse occurs and a client requests a cancellation due to illness or other reason (doctor's appointment, away from area with family etc), the HCA will be compensated for the visit if it is short notice as per the collective agreement. If there is no collective agreement in place, the worker is not compensated for client cancellation- regardless of it is short notice or not. If it is not short notice, the scheduler must try to fill the cancelled visit with another client. Compensation is generally not given for non-short notice cancellations unless stipulated in the collective agreement or a replacement visit is provided.



In addition, the scheduling process is structured differently for union and non-union offices. The basic principle is the same, however. Clients' needs are input based on processing intakes. A new client will be sent into the office either by fax or email. The intake coordinator is responsible for letting the funder (government, private or insurance) know if the organization has capacity to take on the new client. Generally, all new intakes are accepted unless the organization is in a capacity restraint. This happens when the organization is unable to recruit enough staff to fill the demand in volume and referrals are usually put on hold instead of being declined. Note that this only occurred once during the time frame of this study. Once the new client is accepted, the parameters of their needs are entered into the system. This includes preferred or necessary timing of visits (if medication is required to be administered the visit times are not flexible) and duration of visits. The duration of visits are predetermined and only changed if the HCA is unable to complete the tasks under the time that is indicated in the referral. If the HCA is able to complete the tasks sooner, or if they require more time, they are to let the local CCM know to re-assess the amount of time that should be allotted for the visit. Any other specific client needs are entered on intake (language preferences, allergies to smoking/pets, required training). The intake coordinator then alerts the scheduling coordinator for the department that a new client has been processed. The CCM for the area is also included in the correspondence as they are required to see all new clients prior to sending HCA's in to ensure that the environment is safe and that all necessary steps to initiate service have been put in place. These new clients are activated amongst the pool of current clients for scheduling purposes.



Schedules are distributed to staff as per the collective agreement. For some departments this could be weekly, for others bi-weekly. If the department is non-union, it is up to the local manager to determine how often schedules are shared. Schedules are generally shared by email however in some departments, printed copies of the schedules are left at the local office for staff to pick up. Schedulers are tasked to fill as many visits on the planner prior to distributing schedules to staff. If a union department, the scheduler must follow the collective agreement in scheduling. If not, he/she is able to schedule based on their preference. This means there is less room for bias in union offices for scheduling. For non union- there could be an element of scheduling that favors workers that are less problematic, however there is no data that has been collected to support this. Schedule changes are not sent out via email or printed out. Any revisions made to a schedule once distributed are shared to the worker by phone or voicemail. HCAs have real time access to a scheduling portal that shows up to date information. If a scheduler is not able to share the changes over the phone, he/she will leave a message for the HCA to check their portal and accept the change. Based on the collective agreement, changes may or may not be finalized without the permission of the HCA. The collective agreements also will dictate the amount of time required to make a schedule change that requires worker approval. It is also the schedulers' responsibility to keep the client up to date with any changes to their schedule. This includes if a worker is anticipated to be late, if the time of their visit needs to be changed and if their worker needs to be modified. This is a source of complaint with clients as schedulers may neglect to take the additional step to inform the client.



HCAAs input their availability as the greatest factor to influence their schedules. They are able to provide details to schedulers on their ability to accept extra shifts and their requests to work within certain geographical boundaries, however the scheduler is not required to incorporate these requests if they are outside of the collective agreement. Schedulers that do accommodate additional requests from HCAAs may benefit from stronger relationships with the workers, which could assist in challenges like filling short notice book offs and other scheduling needs. Figure 3 Depicts how worker's planning takes place from communication of preferences to execution of care.

The organization I study operates in highly regulated setting, where the majority (over eighty percent) of home care prices are set by contracts with the government or insurance companies, meaning that besides private pay clients, home care organizations cannot charge their patients a premium to cover rising operating costs or improvement investments. These contracts are awarded in a competitive bid process. Once the contracts expire, they may be extended. If not, they are re-opened for competitive bid. This means that if an organization holds a current contract, it is not guaranteed to have that business lifelong. Many things are considered in the competitive bid process including the organizations financial health, adherence to best practices and quality assurance framework—with the ability to measure client satisfaction scores holding great importance. Financial health is challenging, as these organizations face rising cost pressure especially due to labor cost, which represent the lion's share of operating expenses. If you incorporate salary, benefits, and mileage pay, labor costs can reach up to 80% of expenses. Government agencies and insurance companies



also want to ensure that these organizations are not profiting too heavily on this work, as public funds are used and should be appropriated in a just manner. Annual salary increases typically over around one to three percent and, in districts where workers are unionized, seniority further propels wages. In this regulated setting, health care administration monitors home care providers by measuring various ongoing Key Performance Indicators (KPIs) such as client satisfaction scores, missed visit rates and continuity (i.e., number of different workers sent into clients homes across visits). Failure to meet threshold values for these KPIs can lead to potential loss in volume, in the worse case, to breach of the service contract and loss of business. Customer complaints are therefore a major concern for the studied organization, as they formally tie to the viability of the business.

Clients can come in as completely new clients, or they could be clients that have been serviced before and have gone off service, but now require support again. The three general types of clients are funded either through private pay (out of pocket, usually someone's family member who is paying for care), through insurance (if someone was injured and insurance is paying for it) or publicly through the government. Each department has a difference proportion of client by funder. The volume of each depends on several factors. First, not all departments have government contracts (Surrey, Burnaby and Vancouver do not, Nanaimo, Comox and Fraser Valley do). However the departments without government contracts may still get work from the government if it requested. Departments with contracts can have guaranteed volumes (quotas set by the government for the providers) or the contracts can be considered overflow. This



is where the government only gives new clients to the agency when they cannot service it themselves or their guaranteed providers cannot service. The departments with government contracts in this setting all have overflow contracts. Other providers in the areas have guarantee volume contracts that they would have been awarded in a competitive bid process. New clients in public funding are generally those that are being discharged from the hospital after an event (a fall, a stroke or surgery). It would be determined that the client would need support to be discharged home. The amount of support would be determined by a nurse at the hospital or community health office. Then a requisition would be sent to the department office to take on the new client by fax. The office staff would need to respond within four hours by return fax that the client can be taken on. The CCC would then have to schedule the new client based on the timing outlined in the requisition. A CCM reviews all new requisitions to ensure that nothing needs to be done in advance of an HCA seeing the client. It is best practice that the CCM sees the client prior to HCA's go in, however with government clients this may not be possible as clients will likely need support right out of the hospital. There may not be enough time for the CCM to see the client prior to the first HCA scheduled visits. For insurance and private clients, the CCM's would do this more readily.

For insurance, the volume depends on how many other providers are in the area and the prevalence of injury. Departments with more labor intensive work environments will see higher worker related injuries. Areas with harsh road conditions will see more clients that have suffered from a motor vehicle accident.



For private pay, volumes of this work depend on the seniors population in the area of the department as well as the income levels.

Discharges occurs from a public funding stand point when a discharge fax has been submit to the department office. This can be when the government funding has expired and it is deemed the client no longer needs support. Or this could be that the clients services need to be put on hold as they have had another event that has taken them to the hospital. In some cases, discharges occur when clients are moved to long term care homes. In addition, for overflow contracts, discharge can be when the government has the capacity to take on the support themselves. This is termed repatriation. For private pay clients, whoever is paying for the services can chose to stop services at any time. This could be due to financial constraints or perhaps choosing another provider. Insurance clients are discharged in similar patterns to public pay clients. Public pay and insurance clients are reassessed on an ongoing basis to determine if there is any change in the support needs of the client. In addition, feedback from HCA's can impact the hours authorized for support. For example, if the HCA's consistently need more time to complete the tasks outlined, then funding levels can be enhanced.

The funding source has some impact on the HCA that is scheduled with the client. Private pay clients generally have more specific preferences for HCA traits. As they are paying out of pocket, there is greater attention paid to matching the client and HCA based on these desired traits. For insurance funding, sometimes specific experience or training is required and only HCA's with the appropriate skillset would be scheduled. Otherwise, HCA's are scheduled across all funding types.



Managing the volume of work is a constant balancing act. As certain aspects cannot be influenced, it is difficult to predict the volume of new clients or intakes at a given time. There are trends based on seasonality (flu season in the winter, greater insurance work with bad driving conditions etc) however they are just directional. The goal is to have enough work to keep the HCA's busy however not too much that shifts cannot be filled. The organization also has growth targets it strives to fulfil. Providing quality service, communicating well with funders and accepting all intakes are mechanisms to support growth. Marketing may also influence private pay growth where appropriate.

In order to meet its targets, a major concern for the organization is turnover. It takes a significant amount of financial and non-financial effort to recruit and orient new staff prior to having them see clients directly. The organization invests in an orientation program that involves "shadow" shifts, in which new HCA's can watch experienced HCA's provide care and learn in real time. These visits are not billable and cost the organization directly. In addition, recruitment of HCA's is not easy. There is great competition with other home care organizations, as well as with facilities, which generally pay higher. These include long term care facilities or hospitals that offer standard hours and guaranteed shifts. Investment needs to be made in local and online marketing for recruitment including sponsoring job postings, advertising for job fairs and providing current staff with referral bonuses. After all of this, if a staff does not work out, the cost to the employer is significant.

In essence the major operational concerns for the organization and thus drivers of substantial cost are minimizing client complaints, employee



absenteeism and turnover. As discussed earlier, the primary reason for a complaint in home care is a missed visit, which generally happens when a scheduled staff member books off short notice and a replacement is not found in time to attend the visit or the client is not satisfied with the replacement. Absentee calls not only disrupt continuity of care (even if a replacement is found, it may not be one of the designated “back-ups” for the client), but they can also put the client at risk. In addition, staff that pick up the additional shifts usually trigger over time costs, a substantial ongoing challenge to manage within the organization. Last minute changes in schedule due to absences, also increases the need of larger available workers’ pool to accommodate for these changes, which on its turn increases recruitment cost. Therefore understanding what factors contribute to absenteeism and if these factors can be used to predict staff absences will allow for enhanced workforce planning and improved client outcomes.

The setting of this study is characterized with high level of employee absenteeism and schedule volatility and is therefore advantageous to study the effects of scheduling of tasks on employee absenteeism.

Theory and hypotheses

In identifying different criteria along which schedules can be optimized from a behavioral standpoint, I first seek to investigate the impact of scheduling of employees time that may be problematic for the workers. Problematic scheduling could prompt workers to choose to not come to work that day, to engage in behaviors that may cause customer complaints, or eventually choose to leave the company if persistent.



The basis of a workers schedule in our setting is driven off of availability calendars submitted by the worker on a quarterly basis. Workers mark off the times of days and which days they are available and submit to their scheduler. Outside of the set availability, any time off must be requested separately as a vacation request. It is understood that workers must work any shift that is scheduled within their availability. Failure to do so is marked as a refusal and is subject to disciplinary action. Disciplines are meetings that occur between the employee, the union rep and the employer when an action in accordance with the employer's performance management policy. Each discipline is documented in the employee file. If persistent disciplines occur of the same nature, the employee could be subject to more serious consequences such as suspension or even termination. Some locations do not have stipulations around required hours however in unionized locations workers must submit availability to work in accordance with parameters set out in the collective agreement. For example, all new staff in unionized areas are required to be available to work at least one weekend a month, but this requirement is less stringent as seniority increases. Schedules are then built within an employee's given availability, matching client visits with available hours. It is not guaranteed that visits are put in the employees schedule for the whole amount of time they are available (a situation that is referred to as "schedule maximization" in our setting). This is subject to client hours available. In unionized offices, when workers' available hours exceed demand seniority determines the extent to which a worker's schedule is maximized. If less senior staff are scheduled for more visits than staff with higher seniority within the same availability that have not reached 40 hours a week, the



senior staff can grieve the hours, or issue a formal complaint and get paid for the unfilled available hours, which is a cost to the organization. Adding new staff to the unit has to be approved by the union. New staff may not be approved if there are not enough hours to satisfy current members. In addition, schedulers are tasked to fill as many client visits as possible before sharing assignments with staff. This means that when workers receive their schedules (either weekly or bi-weekly) they cover the majority of shifts that are available.

Effects of unfilled schedule

After workers schedules are shared, in addition to grieving hours, employees frequently raise concerns around not having enough hours within their availability. Unfilled schedules can be problematic for workers financially. The number of hours scheduled may not justify the costs of coming to work (which can include the cost of covering child care or other responsibilities). A worker may also have the option to work flexibly for a different employer who can ensure greater hours for the day, a fact that helps with fulfilling obligations such as gas, rent or other living costs. Lastly, unfilled schedules can imply that the opportunity costs of not showing to work is low to the workers, and instead using the freed time for personal purposes. Hence, if I define as *filled schedule* for a given workday the ratio of scheduled hours over available hours from the worker daily looking across a week (see Figure 4), I propose the following hypothesis:

H1: Workers with less filled schedules in a particular week are more likely to be absent the following week

As scheduled hours are shared and organized on a weekly basis, and staff base their availability requests on weekly parameters, I use the subsequent week from our measurement of filled hours to determine the occurrence of absenteeism.

Effects of gaps in schedule

Outside of not feeling the number of hours of work are adequate within a workers availability, another frequent complaint is the amount of gaps or idle time scheduled in a particular day. I define as *schedule gap* relative to a workday the amount of time not scheduled in a worker's day between first and last client (see Figure 5). For example, out of a 12-hour workday, a worker may have only of seven hours scheduled with clients, leaving five gap hours. Schedule gap and schedule filling are related but different concepts: a worker can have low schedule filling with no schedule gaps, to the extent that assigned patient visits are scheduled back-to-back. Workers complain that when they are assigned schedules with large gaps days feel longer and less productive. Workers may need to spend this gap time sitting in their cars waiting for their next client or killing time in ways they may find wasteful. Faced with the prospects of a day schedule with a large gap, a worker may decide not to work that day. It has been shown that working irregular/on-call shifts and split-shifts aggravates work family conflict greater than rotating shift times (Schneider and Harknett, 2019). Having a greater ability to set one's work schedule (start and end times and take time off from work) is significantly linked with lower work-family conflict (Golden, 2015). I hence propose:

H2: Workers with large gaps in a schedule in a particular week, are more likely to be absent the following week

With schedules shared and organized on a weekly basis, and staff based their availability requests on weekly parameters, I use the subsequent week from our measurement of gaps hours to determine the occurrence of absenteeism.

Effects of schedule modifications

The nature of home care is that schedules fluctuate a great deal on an ongoing basis as client needs change. Clients may enter the hospital and need their care to be placed on hold, they may receive an increase in hours as their care needs elevate, they may request days without care for personal reasons or they may pass away. Schedules also fluctuate frequently based on employees' changes. If workers call in sick then there are shifts to be filled or if they turnover without notice. In addition to shifts that were not filled on original schedules, these parameters create ongoing shifts to be filled on a daily basis. These shifts may fall into workers' availability in which they are asked to pick up the hours. They may however fall outside of their available hours but may be asked to accept to help avoid missed visits. In both cases, this would create a variation in original hours scheduled and actual hours worked—a variable I refer to as *schedule modification* (Figure 6). When variation in schedule is positive workers may feel burnout from several days of long hours and uneasy about serving patients with whom they are not familiar. When variation in schedule is negative, workers may feel anxiety around the predictability of their work and associated income stream. In any case, the stress arising from poor control of work hours, together with

eventual workload peaks, may cause absenteeism in caregivers. Workers exposed to cancelled shifts or on-call shifts are significantly more likely to experience psychological distress. Past literature has found that this distress is significantly more when workers are given less than 3 days notice fare compared to those with more than 2 weeks of their schedules (Schneider and Harknett, 2019). Worker with mandatory overtime experience both work-family conflict and work stress (Golden, 2015). As such, I propose the following hypothesis:

H3: The greater the variation from scheduled hours to actual hours worked in a given week, the more likely the occurrence of an absenteeism day in the subsequent week

As schedules are shared and organized on a weekly basis, and staff based their availability requests on weekly parameters, I use the subsequent week from our measurement of schedule modifications to determine the occurrence of absenteeism.

Effects of schedule inconsistency

Another problematic element of scheduling lies in the consistency of hours worked, which refers to the degree of overlap in a worker's schedules across days or across weeks. The schedule is consistent within the week if the worker is scheduled the same hours across weekdays (compatibly with the worker's availability), while it is consistent across weeks if the workers is scheduled the same hours in the same days of two or more weeks (see Figure 7 and Figure 8). Schedule inconsistencies arise for the same reasons that drive schedule modifications: other workers' absenteeism, client fluctuations, etc. This is also

important for clients as another frequent complaint is having different workers in their home each day. With new or inconsistent staff, the clients feel they have to repetitively show where things are in the home, or certain preferences on how they would like the care to be done. If the same worker is able to see the same client at the same time, a routine between the client and the worker is established which reduces stress and anxiety to the client and family.

I expect that within-week schedule inconsistency is a source of temporal stress for the worker (Schneider and Harknett, 2019), which may find it hard to adjust to very different work hours from one day to another and may impact family routines (Henly and Lambert, 2014). This situation is likely to generate a stressful condition for the worker, with possible negative attitude towards work, which can result in absenteeism or poor patient attention. Workers with week-to-week variation in income can experience difficulty paying bills, requiring use of alternative credit products and the inability to manage emergency expenses – causing psychological distress (Schneider and Harknett, 2019). Stability and predictability of work schedules shape child care arrangements (Carrillo et al, 2017) which may be disrupted when inconsistent. I therefore suggest the following hypothesis:

H4: Scheduling workers with high within-week schedule inconsistency are more likely to be absent the following week

H5: Scheduling workers with high across-week schedule inconsistency are more likely to be absent the following week

In this setting, schedules are shared and organized on a weekly basis and staff base their availability requests on weekly parameters, I thus use the subsequent



week from our measurement of schedule inconsistency to determine the occurrence of absenteeism.

Data

I use HCA-week dataset with weekly personnel and performance records over a five-year period, from January 2012 to December 2016 (260 weeks) The HCAs belong to six different departments of the BC unit, with a total of 26 CCMs over the period. I collected most of the data from the enterprise resource management information system used daily for the operational, financial and human resources management of the organization. In particular, through this information system the CCCs manage the scheduling of the clients visits based on the client requirements and the HCAs' qualifications and availability.

Workers are induced in the organization based on needs identified by the coordination team. Each area coordinator is responsible for letting HR know when they require new staff and for what hours of work. This may be due to an increase in hours, a change in workers availabilities or employee turnover. Jobs are then posted on a variety of internet sites. HR screens the applicants for the areas requiring staff with an initial phone screen. During the phone screen, potential employees are asked to provide their availability. If this matches the need and if the candidate meets all certification requirements, they are brought in for an in person interview. Once hired, their availability is entered into the system and they become available to be scheduled. Client hours are entered into the system through the intake coordinator. A fax is received for any new clients or changes to clients schedules on a home support plan (HSP). Upon receiving the fax, the



client is contacted by the intake coordinator and the hours are confirmed. The intake coordinator must ensure the client is set up appropriately as any service outside of the HSP will not be compensated. Schedules are then created based on the client hours and employee availability. Employees are allowed to request changes to their schedules only if 72 hours of notice is given. Any client visits that have not been assigned to a staff remain on the scheduling system's "planner." These visits can only be assigned to staff by verbal or written approval, even if within the employees availability.

For each event that happens during the visits and any other communication of the office with the clients, hospitals and HCAs, the organization keeps an electronic record in the form of a short message. I coded the subject line of the messages, resulting in 134,273 dated notes. Each note is linked to the HCA and the date of the visit. These notes contain a wealth of information that inform about important issues regarding the home care management in the organization. For example, I have the information qualifying whether the HCA gave a short notice that they cannot attend their scheduled visit, due to being sick, or having difficulties reaching the client due to weather conditions, or just do not show up to the visit without any notice. Another important qualification of the data through the dated notes is that the dated notes include any complaints from the clients when they were not satisfied with the quality of the service as well as compliments to the HCA for exceptionally good service.

Finally, to gain alternative perspectives of the unit's workflow and scheduling processes, the use of the management software, and any issues



related to the management of the HCAs, I conducted interviews with the Client Care Coordinator and the BC Regional HR Coordinator.

Measures

Dependent Variable: *HCA absenteeism*. I measure absenteeism of individual HCAs at the week level. The absenteeism variable is a binary variable where 1 indicates that the HCA was absent in the week that they were scheduled to work and 0 otherwise.

Independent Variables. The five measures of undesirable schedule for this study are filling of schedules, gaps in schedules, schedule filling, within week schedule consistency and across week schedule consistency.

Schedule filling. The variable is defined as the number of hours scheduled in a work week out of total hours available to work that week. To measure this I calculate on a given week the percentage of hours filled on original schedule out of available hours based on employees' submitted availability schedule. For example if the worker is available to work 40 hours in a given week, and they are only scheduled to work from 20 hours, the worker would have 50% schedule filling for that week (Figure 4).

Gaps in schedules. The variable is defined as the amount of hours not scheduled in a worker's day between first and last client. To measure this I calculated the percentage of time that is not filled from the overall time in a day the HCA is working. The overall time is calculated as the number of hours from the beginning of the first visit until the end of the last visit of the HCA in a day.

The analysis of uses week-level rather than day-level variables, hence the unfilled schedule is calculated as the average percentage of unfilled daily schedule over each week (Figure 5).

Schedule modification. This independent variable is the degree to which the schedule of an HCA hours worked varies from the hours originally scheduled. I operationalize this on a weekly basis by measuring visit modifications (additions, deletions or changes in visits from original schedule). For an individual worker, if the schedule has been stable for the full day, I do not mark as a modification for the day (Figure 6). For days in which there is a modification, I calculate a percentage of modified visits vs original visits. This is then averaged for weekly periods.

Within week schedule consistency. I operationalized the degree to which the schedule of an HCA varies from day to day within a week using the Herfindahl Index (HHI) of the starting times of the scheduled visits within a week. Smaller values of the HHI, close to zero, correspond to a *instable* schedule where the starting time of the visits varies each day within the week, whereas values of the HHI close to 1 correspond to a *stable* schedule, where most scheduled visits every day of the week are at the same time (Figure 7).

Across week schedule consistency. I operationalized this variable with the average, across all weekdays, of the Herfindahl Index of the starting times of the scheduled visits within the same day of the week (e.g. Monday) with the previous week. HHI has values from 0 to 1. Values close to 0 correspond to *instable* schedule, where most scheduled visits vary each day of the week (i.e. on Monday

the employee starts working at a different time from Monday), while values closer to 1 correspond to a *stable* schedule, where most scheduled visits each day of the week are at the same time (i.e. on Monday the employee starts working at the same time as previous Monday) (Figure 8).

Control Variables

I control for the month and year of the visit, consistent with Wang & Gupta (2014). I also control for the department where the HCA is registered in order to isolate the effect of the different departments. Since schedule filling is associated to worker tenure, at least in unionized areas, I control also for worker's tenure within the organization. On average HCAs have tenure of 3.35 years within the company (st. dev. 3.95). In addition I control for employee age and number of clients per employee per week. On average HCAs are 44.96 years old (st. dev. 12.22) and visit 2.77 different clients per week (st. dev. 1.49).

Analytical Strategy

In order to get a sense of the proper specification of the regression models I engaged in a preliminary investigation of the property of the dataset. Figure 9 illustrates the HCA absenteeism rate distribution by the seven different departments of the BC Unit. Figure 10 illustrates the turnover rate and Figure 11 the client dissatisfaction rate distribution by the seven different departments of the BC Unit. The differences in absenteeism rates, turnover rates and client dissatisfaction rates across departments are statistically significant (unreported



preliminary analysis). This suggests that the statistical model needs to allow for this variation across departments.

The data I use for the analysis provide matched weekly-employee dataset for a total of 1,024 HCAs over the 5-year period. After cleaning the data from missing values, the total number of observations used for analysis is 73,356. On average HCAs work during 71.64 weeks (st dev. 73.10; min 1 and max 259). Note that 12 out of the 1,024 employees have performed visits in a single week. Given that I use *Absenteeism* in $t+1$ as a dependent variable, I lose the observations for these 12 employees as well as the first week of observations for each of the rest employees. Therefore in the final dataset consists of 72,332 employee-week observations.

I use HCA random effects model to control for time-invariant, unobserved characteristics of the HCAs that could be driving both the schedule characteristics of each employee as well as their absenteeism rate, thus leading to biased results. My approach allows to study the differences among the HCAs, while controlling for unobserved characteristics of the HCAs (Bollen and Brand 2010). I control for month and year fixed effects to take into account seasonality.

One potential concern is that the results may be driven by endogeneity. A possible source of bias in the estimation of the effects of schedule characteristics on worker outcomes is the existence of unobserved factors or reverse causality. For instance, workers who tend to have lower absenteeism may be “awarded” with better schedules, thereby biasing the effects of schedule desirability on worker absenteeism. I address this issue in two different ways. First I use random

effects model, which controls for unobserved characteristics of the employee as well as the month and the year. Second, I perform a 2SLS regression with instrumental variables for the five independent variables. For *Schedule Filling* I use a demand-driven instrumental variable, which is calculated by the number of total visits of all HCAs (except the focal one) of the focal department and week. The rationale behind using this instrument is that in weeks with high demand, a higher portion of available hours will be filled. Similarly, for *Gaps in Schedule*, I use another demand-driven instrument, calculated by the average gaps in the schedule of all HCAs (except the focal one) of the focal department and week. The rationale behind using this instrument is that gaps in schedule are usually driven by low demand in a particular hour span.

The main driver of schedule modifications is the last minute absences of the other HCAs in the particular department. Therefore, I calculate the instrument for *Schedule Modifications* by summing the total number of absences of all HCAs (except the focal one) of the focal department and week. Lastly for the week consistency variables I use the number of unique clients that the HCAs visit in a particular week or across week. Specifically, for *Within Week Consistency* I use the fraction of non-unique clients (i.e. repeated clients) out of the total number of clients of a HCA in a week, whereas for *Across Week Consistency* I use the fraction of non-unique clients (i.e. repeated clients) out of total clients of a HCA in a week relative to the preceding week. The rationale behind these instruments is that clients tend to have similar requirements and orders over the weeks and if a HCA visits the same clients, their schedule tend to be more consistent.

Results

Table 1 provides descriptive statistics as well as pairwise correlations of the main variables of interest.

Table 2 presents results of the random effects analysis. Given that the dependent variable is binary I first perform random-effects Logistic regression presented in model 1 of Table 2. For ease of presentation and interpretation of the results I then perform an OLS random-effects regression, which confirms the results of the logistic model and provides support for the use of OLS regression with the binary dependent variable *Absenteeism*. I therefore proceed with the analysis using OLS, instead of logistic regression. Due to potential dependence among the schedule characteristics I insert the five independent variables one by one (see models 2 to 6), before inserting them together in a single model (model 7). As it can be observed in Table 2 the OLS analysis provides support for Hypothesis 2, 3 and 4 in both the one by one models (2 to 6) as well as the complete model (7). However, as previously explained these results may be biased due to endogeneity. Therefore, I use 2SLS presented in Table 3 as the main analysis. Similarly to Table 2, I insert the independent variables one by one. The coefficient of *Schedule Filling* in model 1 has the expected negative coefficient but it is not significant ($\beta=-0.283$, $p>0.1$). Therefore, the analysis does not provide support for Hypothesis 1. The coefficient of *Gaps in Schedule* is positive and significant at 1% ($\beta=0.517$) implying that the higher the number of gaps in the schedule, the higher the number of absences in the following week. Therefore, Hypothesis 2 is supported. The coefficient of *Schedule Modification* is

positive and significant at 10% ($\beta=22.643$) implying that the higher the number of modifications in the schedule, the higher the number of absences in the following week. Therefore, Hypothesis 3 is partially supported. The coefficient of *Within Week Consistency* is negative and significant at 1% ($\beta=-0.037$) implying that the higher the within week consistency in in the schedule, the lower the number of absences in the following week. Therefore, Hypothesis 4 is supported. Contrary to the expected relationship, the coefficient of *Across Week Consistency* is positive and significant at 1% ($\beta=2.566$) implying that the higher the across week consistency in in the schedule, the higher the number of absences in the following week. These results imply that HCAs, who have similar schedules in two consecutive weeks tend to be absent more the following week. Therefore, Hypothesis 5 is not supported.

Post hoc analysis

The major concern of HCAs when they see a low level of filling in their schedule is that the hours scheduled may not justify the cost of commuting or other costs associated to coming to work. As a result, employee may decide to be absent only on that particular day. Therefore there is a reason to expect that the effect of *Schedule Filling* is only present at the day, rather at the week level. To check this empirically, I repeat the analysis for Hypothesis 1 on the day level. Table 4 presents the results of the random effects model with *Schedule Filling* and *Absenteeism* calculated on the day level. As it can be observed from Model 1, *Schedule Filling* has a negative and significant coefficient at 1% ($\beta=-0.023$).

Effect sizes

To gain additional insights into the size of the effect of the schedule characteristics on employee absenteeism, I analyze the marginal effects of different levels of each of the supported hypothesis (Figure 12). When *Gaps in the Schedule* increase from 0 to 0.42 (which is 90% of the sample), the probability of *Absenteeism* in the following week increases by 0.02 (or 28.57%). When *Schedule Modifications* increase from 0 to 1 (which is 90% of the sample), the probability of *Absenteeism* in the following week increases by 0.12 (or 137.50%). When *Within Week Consistency* increase from 0.15 to 0.52 (which is 90% of the sample), the probability of *Absenteeism* in the following week decreases by 0.02 (or 22.22%). Finally, when daily *Schedule Filling* increase from 0 to 0.85 (which is 90% of the sample), the probability of *Absenteeism* in that day decreases by 0.02 (or 100%).

Robustness checks:

To confirm the robustness of my results, I perform several robustness checks, all of which support the presented findings.

First, use a dummy variable for each supervisor in order to isolate the effect of the supervisor on the employee performance. There are in total 22 different supervisors. Supervisor data is available for only 638 of the 1012 employees used in the main analysis, therefore the number of observations in this analysis is reduced to 55,076. The results follow the same pattern as the main analysis (see Table 5).

Second, I use a dummy variable indicating whether the department is Union vs Non-union office. In particular the dummy variable equals to 1 if the department is Surrey, Fraser Valley, Vancouver or Nanaimo and 0 if the department is Comox or Prince George. The results follow the same pattern as the main analysis (see Table 6).

Third, in some department promotion is based on tenure and in other it is based on number of clocked hours, therefore I use a dummy variable to control for this distinction. Information on the promotion structure of the departments is available for just two of them: Fraser Valley- tenure based promotion and Vancouver- clocked hours based promotion. Therefore this analysis includes observations only from these two departments. The results follow the same pattern as the main analysis (see Table 7).

Lastly, I create a dummy variable with a value of 1 if the employee is reported to be available over 12 hours a day (presumably full-time) and 0 otherwise. The results follow the same pattern as the main analysis (see Table 8).

Discussion and Conclusion

This study provides multiple contributions to understanding how a worker's schedule impacts worker's outcomes—a stream of research that has been gaining momentum in recent years. From a theoretical standpoint, an important contribution of this work is to provide a richer conceptualization of the different facets of schedule desirability for the worker, compared to previous studies. Most

of past research focuses on the effect of worker control over the schedule (Ala-Mursula et al., 2002; Golden et al., 2014) anticipated workload by the worker (Rajbhandary and Basu, 2010; Green et al., 2013) or types of scheduled tasks or schedule content (Wang and Gupta, 2014). A few studies specifically focus on the variability of the schedule that are imposed by the organization on the worker, considering variables such as limited advance notice, day mismatch, day instability, week-to-week week variability, or contiguous shifts (Henly and Lambert, 2014; Schneider and Harknett, 2019). However, these studies estimate the effect of schedule filling and instability on perceptual variables such as work-life conflict, thereby failing to quantify the impact of these variables on the organizations where these workers operate. By showing that these variables have a significant and sizeable effect on absenteeism, we move a step forward towards exploring the economic costs for the organizations that rely on flexible and uncertain worker schedules.

A further advantage and contribution of this study compared to prior research originates from the micro-level data that I could collect about worker schedules and outcomes. To begin with, this data is objective, as its origin was the scheduling system of the studied company, and not workers' self-reported schedule characteristics or outcomes, as in Henly and Lambert (2014) or Schneider and Harknett (2019). Second, this data is longitudinal, rather than cross-sectional, as in the abovementioned studies. My dataset hence provides a much more detailed, day-by-day, picture of variations in the schedule and absenteeism of one worker, which allows for removing the effect of unobservable worker characteristics from the link between schedule characteristics and worker

outcomes. Lastly, the large sample that I assembled and the availability of variables that characterize the overall operations of the studied organization allowed me to create instrumental variables that reduce possible biases in the estimation of the effects of schedule filling and instability on worker absenteeism.

Finally, this study evaluates the effect of worker schedules in the health care environment, which although similar in scheduling dynamics to other service settings, holds a different perspective due to the nature of the work and the potential implications of loss of service. Even just one additional hour of direct nurse to patient care can prevent adverse events such as pneumonia (Cho et al., 2003). While we could not estimate the effect of missed care due to absenteeism on clinical outcomes for the patients, my results suggest that scheduling parameters may indirectly impact patients' well-being and medical conditions. That is, paradoxically, adapting caregivers' schedules to patients' demand may adversely affect quality of care. In particular, gaps in schedule—which are a direct consequence of within-day variation in demand levels—have the strongest negative effect on absenteeism and hence on missed care.

Overall, these results are highly relevant to operations management literature. For a long time, the literature on scheduling has assumed that workers do not change their behaviors in response to schedules (Paraskevopoulos et al., 2017). Recent empirical research on the effect of flexible work arrangements (Kesavan, Staats et al., 2014), while detecting diseconomies of flexibility, does not explicitly investigate the effect of workers' schedule, neither conceptually nor empirically. This work therefore points to a new direction of empirical operations management research on flexible work arrangements.

As a manager operating in this industry myself, I can foresee multiple practical implications of this study. The schedule characteristics studied in this dissertation can be easily adjusted to enhance the scheduling practice in real settings. Although, as in other papers, a formula or model is not developed to maximize schedules based on this outcome, the paper directly presents areas of improvement through training opportunities for the organization. Model optimization in home care as been historically focused on financial targets – how to minimize pay by reducing travel, scheduling workers with clients to optimize efficiency to enhance profitability. These models can be tested in real time. This study, however, seeks to understand how scheduling practices impact employees – which in turn impacts profitability. Absent workers have visits that take time to fill, and if left unfilled cannot be billed for. Losing workers due to low morale or employee engagement costs the organization tremendously in recruitment and on-barding costs.

In the home care environment, this research can be immediately applied. It also opens the door for future research to better understand the causal factors underlying the observed phenomenon. The first implication is the need to shift mindset in the offices from the perspective of scheduling from a pure client centered perspective. The current model is based predominately on the schedule being created based on client needs and times, and the HCA's are then worked around to maximize coverage of clients. This is because client preference and satisfaction is the key indicator of success. Although it is known that employees have preference, maximizing employee preference is not directly linked with performance measures and is thus less of a priority. With the results of this



research indicating what preferences are the most important and how they will impact performance measures, this can be implemented by educating and training scheduling staff. Absenteeism makes the job of scheduling staff much more difficult as they are responsible for covering visits that become unfilled due to absenteeism. By educating the CCC's on the supported hypotheses, and promoting a shift in mindset to incorporate employee preferences into scheduling, revised scheduling practices can ensue. These practices would not mean putting employee preferences above client scheduling, it would require taking consideration of both.

Results from this study can be immediately applied to scheduling and workforce planning. Prior to sharing schedules with workers, the scheduling supervisor or senior scheduler can be assigned to review the schedules to ensure that each worker is not assigned a schedule with strong unfavorable deviations on multiple facets. Imagine, for instance, that a worker's schedule is below the 25th percentile in terms of schedule filling, within-week and across-week consistency, but above the 75th percentile in terms of gaps in schedule. The simultaneous presence of these extreme conditions may alert the scheduling supervisor or a potential upcoming absenteeism risk. Changes can be made in real time and this can become part of the weekly scheduling routine. It will be understood that taking the time to review and correct in advance will prevent the need to fill shifts due to absenteeism or turnover later. In addition, it will reduce the number of client complaints that are called in which take up schedulers time and impact morale. This could be done by seniority. In schedules where multiple gaps exist in a day and or periods of long gaps, coordinators will be trained on



how to identify opportunities to fill the gaps. This could mean moving around client times, however this will increase the likelihood the client will be seen.

To put into place the supported hypothesis 3, coordinators will be given greater incentive to ensure client schedules are as full as possible prior to sharing. When coordinators run out of time or are busy filling sick calls – they may not put as much attention to ensuring schedules have been maximized. The scheduling system is able to monitor how many visits have not been filled prior to schedules being sent out. This is something that is not strictly enforced in this setting. By doing so and by provided more dedicated time for coordinators to fill all client visits, the likelihood of workers needing to be called to fill visits that were not scheduled will decrease. This will reduce the variation in scheduled hours to actual hours. This should not be confused by Hypothesis 1, which looks at the filling of schedules for employees. The key here is to make sure all client visits have been cleared. This then reduces the amount of calls to change employee schedules to add on the missed visits. The visits do not necessarily need to be used to fill up a employees time – just limit fluctuations to changes to schedules requested after they have been shared.

The last supported hypothesis looks at within week inconsistency. Applying this research, schedulers can be trained to focus on minimizing within week inconsistency as opposed to across week (hypothesis 5 was not supported). The temporal stress from day to day fluctuations in hours worked can be reduced by the coordinators scanning schedules and comparing day to day hours. The scheduler can look at an employees week and easily see if each day looks different within the given availability. The scheduling coordinator can be



trained to seek different remedies for this. This could be to move client times, or to consult with the worker to see if they would rather give up certain clients than have varying schedules. These clients can then be added to other workers schedules prior to schedules being shared.

Implementing training and incentives to schedulers to screen for and adjust schedules based on the supported hypotheses is definitely achievable. As this research provides clear evidence that these adjustments would impact absence calls and in the long term reduce work trying to fill shifts, schedulers will buy in if properly educated. The hypothesis that were not supported do not need to be considered, allowing focus on those that will have impact.

For the developers of the software used in home care scheduling, this opens doors to create tools to detect and flag when these characteristics are outside of the determined threshold. Instead of relying on the coordinator to review and adjust manually, the software could assist in guiding and highlighting areas to focus on to optimize the schedules prior to distribution.

This opens the door for other areas in which home care workers needs and wants can be heard and used to implement improvements. This follows the shift of not just focusing on pleasing the client, going further to take greater time in addressing the needs of both the client and the worker. This could be with other areas of scheduling that were not looked at in this study or different aspects that impact workers (education days, vacation planning, and perhaps even compensation items).



As a manager, this study is important in understanding how to prioritize the demands from workers. Managers are constantly faced with complaints from employees and clients. For the most part, client complaints are addressed more critically and urgently as they are viewed to pose potential risk to the business. Employee complaints are difficult to prioritize as they are frequent and may just be from the most vocal employees – not representative of the entire collective. With this study, management can provide insight to employees into which areas of the scheduling practice are being addressed and why. This will show that the coordinators are being trained to focus on the areas that matter most to the employee group – not just try to fix scheduling issues on the go from employees they either like or are tired of hearing complaints from. In staff meetings, these complaints are brought up frequently. This study will help to provide reasoning for the areas that will be implemented into practice, and in time reduce the overall number of employee complaints, improving morale and turnover.

Outside of homecare, this preliminary research and the planned future analysis can help shed light on many environments in which employees that are relatively unskilled are subject to doing service work on schedules that can vary in daily scheduled visits as well as change constantly. Understanding which elements of the scheduling practice were the most impactful for this group is an excellent start point for other areas of research.



Conclusions

This study brings to light the importance of scheduling practices on the outcome of absenteeism in home care, an environment in which schedules are not as stable as other settings caregivers may work in. Although the scheduling practice is complex with a variety of inputs, this study helps provide focus into areas for practical improvement. In looking at a select set of scheduling practices that occur, this study highlights which in fact have an impact and which do not on worker absenteeism. The magnitude of the impact is also identified. This allows us to understand that workers care about the way in which their workdays are scheduled, above and beyond just having enough hours of work as desired. Improvements to the weekly consistency in hours, the gaps that occur in an employee day and the number of modifications that have been made to the employees schedule from distribution to real time all impact employees decisions to come to work. These are all aspects of scheduling that the coordinator can be trained to improve. This can also open the doors for a technology solution to aide in maximizing results. This study provides insight into the relevance of listening to the needs of employees for the areas of scheduling that are important to them. Understanding this and adapting to these needs, is a novel approach to scheduling in this environment.

Conclusiones

Este estudio pone de manifiesto la importancia de las prácticas de programación sobre el resultado del ausentismo en la atención domiciliaria, un entorno en el que los horarios no son tan estables como en otros entornos en los que pueden trabajar los cuidadores. Si bien la práctica de la programación es compleja con una variedad de aportes, este estudio ayuda a centrar la atención en las áreas que pueden mejorarse en la práctica. Al examinar un conjunto selecto de prácticas de programación que se producen, este estudio pone de relieve las que de hecho tienen un impacto y las que no afectan al ausentismo de los trabajadores. También se identifica la magnitud del impacto. Esto nos permite entender que los trabajadores se preocupan por la forma en que se programan sus días de trabajo, más allá de tener suficientes horas de trabajo como se desea. Las mejoras en la consistencia semanal de las horas, las lagunas que ocurren en un día de trabajo y el número de modificaciones que se han hecho en el horario de los empleados desde la distribución hasta el tiempo real, todo esto impacta en las decisiones de los empleados para venir a trabajar. Todos estos son aspectos de la programación que el coordinador puede ser entrenado para mejorar. Esto también puede abrir las puertas a una solución tecnológica que ayude a maximizar los resultados. Este estudio proporciona una visión de la relevancia de escuchar las necesidades de los empleados en las áreas de la programación que son importantes para ellos. Entender esto y adaptarse a estas necesidades, es un enfoque novedoso para la programación en este entorno.

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Tables

Table 1: Summary Statistics and Correlation Table of Dependent, Independent and Control Variables of Interest (n=72, 332)

| Variables | Mean | S.D. | Min. | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------------------|-------|-------|-------|-------|---------|---------|---------|--------|---------|---------|---------|------|
| 1 Absenteeism following week | 0.07 | 0.26 | 0 | 1 | 1.00 | | | | | | | |
| 2 Schedule Filling | 0.32 | 0.25 | 0 | 1 | 0.05** | 1.00 | | | | | | |
| 3 Gaps in Schedule | 0.17 | 0.17 | 0 | 0.88 | 0.06** | 0.04** | 1.00 | | | | | |
| 4 Schedule Modifications | 0.01 | 0.03 | 0 | 1 | 0.02** | 0.01** | 0.01** | 1.00 | | | | |
| 5 Within Week Consistency | 0.32 | 0.23 | 0 | 1 | -0.05** | -0.14** | -0.30** | -0.01* | 1.00 | | | |
| 6 Across Week Consistency | 0.51 | 0.02 | 0.50 | 1 | 0.01** | -0.07** | 0.01* | 0.00 | 0.04** | 1.00 | | |
| 7 Employee Tenure | 3.35 | 3.95 | 0.02 | 23.98 | -0.05** | 0.06** | -0.10** | -0.00 | -0.03** | -0.08** | 1.00 | |
| 8 Employee Age | 44.96 | 12.22 | 20.90 | 67.98 | -0.08** | 0.01** | -0.03** | -0.00 | -0.02** | -0.05** | 0.43** | 1.00 |
| 9 Number of Clients | 2.77 | 1.49 | 0 | 8 | 0.08** | 0.15** | 0.26** | 0.01** | -0.50** | -0.01+ | -0.05** | 0.00 |

+, * and ** denote significance at 10%, 5% and 1% levels respectively

Table 2: Random effects estimation of Schedule Filling, Gaps in Schedule, Schedule Modifications, Within Week Consistency and Across Week Consistency on Absenteeism $t + 1$

| | Logit | OLS | OLS | OLS | OLS | OLS | OLS |
|--------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Schedule Filling | -0.054 (0.082) | -0.004 (0.006) | | | | | -0.005 (0.005) |
| Gaps in Schedule | 0.638** (0.127) | | 0.049** (0.009) | | | | 0.041** (0.008) |
| Schedule Modifications | 0.822* (0.344) | | | 0.111+ (0.058) | | | 0.108** (0.033) |
| Within Week Consistency | -0.921** (0.114) | | | | -0.045** (0.006) | | -0.040** (0.006) |
| Across Week Consistency | 2.506** (0.968) | | | | | 0.103+ (0.058) | 0.110+ (0.058) |
| Employee Tenure | -0.069** (0.014) | -0.003** (0.001) | -0.003** (0.001) | -0.003** (0.001) | -0.003** (0.001) | -0.003** (0.001) | -0.003** (0.001) |
| Employee Age | -0.020** (0.004) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) |
| Number of Clients | 0.026+ (0.015) | 0.007** (0.001) | 0.006** (0.001) | 0.007** (0.001) | 0.003* (0.001) | 0.007** (0.001) | 0.003** (0.001) |
| Constant | -4.073** (0.550) | 0.072** (0.013) | 0.061** (0.013) | 0.072** (0.013) | 0.100** (0.014) | 0.018 (0.033) | 0.032 (0.034) |
| Department Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Month Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 72,332 | 72,332 | 72,332 | 72,332 | 72,332 | 72,332 | 72,332 |
| Number of employees | 1,012 | 1,012 | 1,012 | 1,012 | 1,012 | 1,012 | 1,012 |
| R ² | - | 0.2277 | 0.2250 | 0.2279 | 0.2331 | 0.2290 | 0.2322 |

Standard errors clustered on Employee in parentheses, ** p<0.01, * p<0.05, + p<0.1.

Table 3: 2SLS Regression of Schedule Filling, Gaps in Schedule, Schedule Modifications, Within Week Consistency and Across Week Consistency on Absenteeism $t + 1$

| | (1) | (2) | (3) | (4) | (5) |
|--------------------------|--------------------|---------------------|---------------------|---------------------|---------------------|
| Schedule Filling | -0.283 (4.688) | | | | |
| Gaps in Schedule | | 0.517** (0.141) | | | |
| Schedule Modifications | | | 22.643+ (11.745) | | |
| Within Week Consistency | | | | -0.037** (0.010) | |
| Across Week Consistency | | | | | 2.566** (0.661) |
| Employee Tenure | -0.004+ (0.002) | -0.001 (0.001) | -0.002** (0.001) | -0.003** (0.001) | -0.002** (0.001) |
| Employee Age | -0.001 (0.005) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) |
| Number of clients | 0.007+ (0.004) | -0.002 (0.003) | 0.004 (0.003) | 0.004** (0.001) | 0.006** (0.001) |
| Constant | 0.105 (0.544) | -0.039 (0.034) | 0.070** (0.017) | 0.094** (0.014) | -1.254** (0.342) |
| Department Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Month Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Observations | 72,332 | 72,332 | 72,332 | 72,332 | 72,332 |
| Number of employees | 1,012 | 1,012 | 1,012 | 1,012 | 1,012 |
| R ² | 0.1007 | 0.1032 | 0.0375 | 0.2332 | 0.1755 |

Standard errors clustered on Employee in parentheses, ** p<0.01, * p<0.05, + p<0.1.

Table 4: Random effects estimation of Schedule filling on Absenteeism (day)

| | (1) |
|---|---------------------|
| Schedule Filling | -0.023** (0.003) |
| Employee Tenure | -0.001** (0.000) |
| Employee Age | -0.000** (0.000) |
| Number of Clients | -0.002** (0.000) |
| Constant | 0.030** (0.005) |
| Department Fixed Effects | Yes |
| Day of the Week Fixed Effects | Yes |
| Month Fixed Effects | Yes |
| Year Fixed Effects | Yes |
| Observations | 251,893 |
| Number of employees | 962 |
| R ² | 0.1023 |
| Standard errors clustered on Employee in parentheses, ** p<0.01, * p<0.05, + p<0. | |

Table 5: 2SLS Regression of Schedule Filling, Gaps in Schedule, Schedule Modifications, Within Week Consistency and Across Week Consistency on Absenteeism $t + 1$

| | (1) | (2) | (3) | (4) | (5) |
|--------------------------|-------------------|---------------------|---------------------|---------------------|---------------------|
| Schedule Filling | -0.168 (0.923) | | | | |
| Gaps in Schedule | | 0.636** (0.210) | | | |
| Schedule Modifications | | | 13.299+ (8.000) | | |
| Within Week Consistency | | | | -0.039** (0.013) | |
| Across Week Consistency | | | | | 3.486** (1.000) |
| Employee Tenure | -0.001 (0.004) | 0.000 (0.001) | -0.002* (0.001) | -0.002** (0.001) | -0.002+ (0.001) |
| Employee Age | -0.001 (0.001) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) |
| Number of clients | 0.008* (0.003) | -0.003 (0.004) | 0.006* (0.002) | 0.004* (0.002) | 0.007** (0.001) |
| Constant | 0.245 (0.572) | 0.047 (0.042) | 0.172** (0.043) | 0.140** (0.035) | -1.758** (0.546) |
| Supervisor Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Department Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Month Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Observations | 55,076 | 55,076 | 55,076 | 55,076 | 55,076 |
| Number of employees | 638 | 638 | 638 | 638 | 638 |
| R ² | 0.2378 | 0.1418 | 0.0907 | 0.2756 | 0.1909 |

Standard errors clustered on Employee in parentheses, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$.

Table 6: 2SLS Regression of Schedule Filling, Gaps in Schedule, Schedule Modifications, Within Week Consistency and Across Week Consistency on Absenteeism t + 1

| | (1) | (2) | (3) | (4) | (5) |
|--------------------------|--------------------|---------------------|---------------------|---------------------|---------------------|
| Schedule Filling | -0.283 (4.688) | | | | |
| Gaps in Schedule | | 0.517** (0.141) | | | |
| Schedule Modifications | | | 22.643+ (11.745) | | |
| Within Week Consistency | | | | -0.037** (0.010) | |
| Across Week Consistency | | | | | 2.566** (0.661) |
| Unionized department | 0.031 (0.488) | 0.061** (0.021) | -0.002 (0.011) | -0.008 (0.008) | 0.012 (0.011) |
| Employee Tenure | -0.004+ (0.002) | -0.001 (0.001) | -0.002** (0.001) | -0.003** (0.001) | -0.002** (0.001) |
| Employee Age | -0.001 (0.005) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) |
| Number of clients | 0.007+ (0.004) | -0.002 (0.003) | 0.004 (0.003) | 0.004** (0.001) | 0.006** (0.001) |
| Constant | 0.105 (0.544) | -0.039 (0.034) | 0.070** (0.017) | 0.094** (0.014) | -1.254** (0.342) |
| Department Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Month Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Observations | 72,332 | 72,332 | 72,332 | 72,332 | 72,332 |
| Number of employees | 1,012 | 1,012 | 1,012 | 1,012 | 1,012 |
| R ² | 0.1007 | 0.1032 | 0.0375 | 0.2332 | 0.1755 |

Standard errors clustered on Employee in parentheses, ** p<0.01, * p<0.05, + p<0.1.

Table 7: 2SLS Regression of Schedule Filling, Gaps in Schedule, Schedule Modifications, Within Week Consistency and Across Week Consistency on Absenteeism $t + 1$

| | (1) | (2) | (3) | (4) | (5) |
|-------------------------|--------------------|---------------------|---------------------|---------------------|---------------------|
| Schedule Filling | -0.676 (1.285) | | | | |
| Gaps in Schedule | | 0.518** (0.150) | | | |
| Schedule Modifications | | | 22.332+ (11.830) | | |
| Within Week Consistency | | | | -0.056** (0.016) | |
| Across Week Consistency | | | | | 3.793** (1.065) |
| Tenure based promotion | 0.118 (0.142) | 0.003 (0.014) | 0.040* (0.016) | 0.044** (0.007) | 0.041** (0.007) |
| Employee Tenure | -0.003 (0.004) | -0.001 (0.001) | -0.002 (0.002) | -0.004** (0.001) | -0.002* (0.001) |
| Employee Age | -0.000 (0.002) | -0.002** (0.000) | -0.001* (0.001) | -0.001** (0.000) | -0.001* (0.000) |
| Number of clients | 0.008** (0.002) | -0.000 (0.003) | 0.005 (0.003) | 0.003 (0.002) | 0.007** (0.002) |
| Constant | 0.208 (0.248) | 0.049* (0.020) | 0.088* (0.036) | 0.107** (0.020) | -1.861** (0.543) |
| Month Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Observations | 45,880 | 45,880 | 45,880 | 45,880 | 45,880 |
| Number of employees | 595 | 595 | 595 | 595 | 595 |
| R ² | 0.0253 | 0.1130 | 0.0234 | 0.1954 | 0.1956 |

Standard errors clustered on Employee in parentheses, ** p<0.01, * p<0.05, + p<0.1.

Table 8: 2SLS Regression of Schedule Filling, Gaps in Schedule, Schedule Modifications, Within Week Consistency and Across Week Consistency on Absenteeism $t + 1$

| | (1) | (2) | (3) | (4) | (5) |
|--------------------------|--------------------|---------------------|---------------------|---------------------|---------------------|
| Schedule Filling | -6.197 (20.822) | | | | |
| Gaps in Schedule | | 0.446** (0.162) | | | |
| Schedule Modifications | | | 19.816+ (11.455) | | |
| Within Week Consistency | | | | -0.026* (0.012) | |
| Across Week Consistency | | | | | 1.807* (0.825) |
| Full-time availability | -0.042 (0.130) | -0.004 (0.005) | 0.000 (0.007) | -0.001 (0.004) | -0.004 (0.004) |
| Employee Tenure | -0.010 (0.023) | -0.002+ (0.001) | -0.002** (0.001) | -0.003** (0.001) | -0.003** (0.001) |
| Employee Age | 0.006 (0.023) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) | -0.001** (0.000) |
| Number of clients | 0.013 (0.026) | -0.000 (0.002) | 0.004+ (0.003) | 0.004** (0.001) | 0.005** (0.001) |
| Constant | 0.821 (2.488) | -0.022 (0.042) | 0.074** (0.018) | 0.096** (0.016) | -0.849* (0.425) |
| Department Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Month Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Observations | 61,485 | 61,485 | 61,485 | 61,485 | 61,485 |
| Number of employees | 943 | 943 | 943 | 943 | 943 |
| R ² | 0.0077 | 0.1080 | 0.0373 | 0.1947 | 0.1515 |

Standard errors clustered on Employee in parentheses, ** p<0.01, * p<0.05, + p<0.1.

Figures

Figure 1: Organization Chart BC Home Health Operations

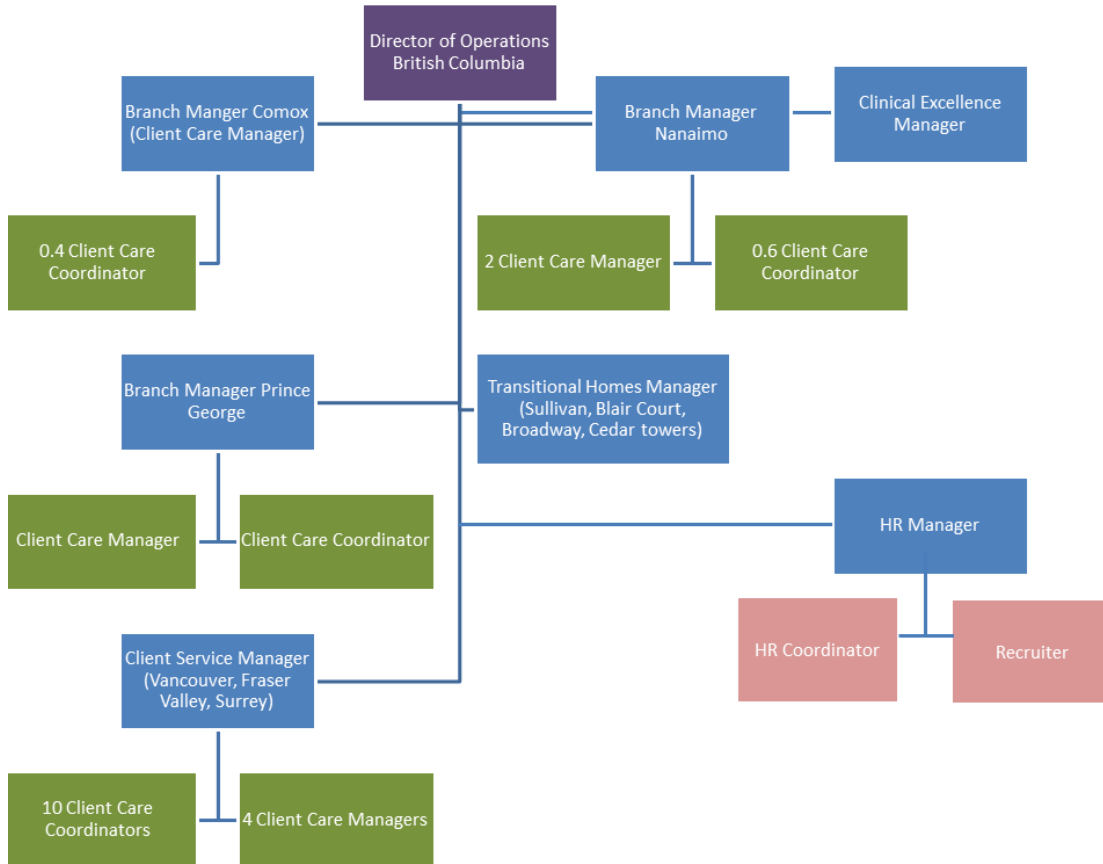
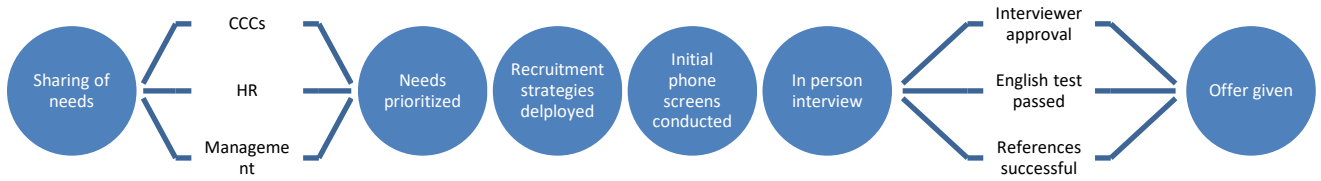


Figure 2: Worker recruitment and induction

Recruitment:



Induction:

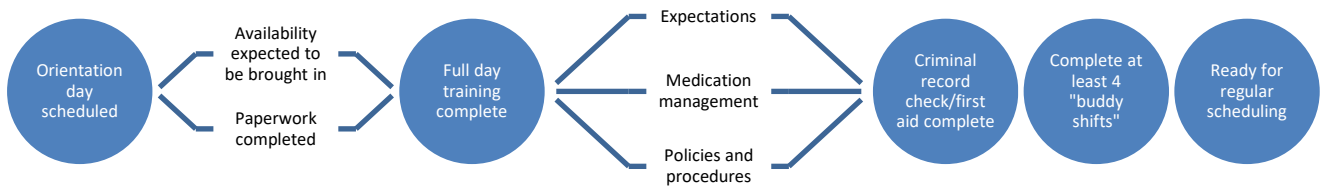


Figure 3: Worker scheduling based on preferences and attributes

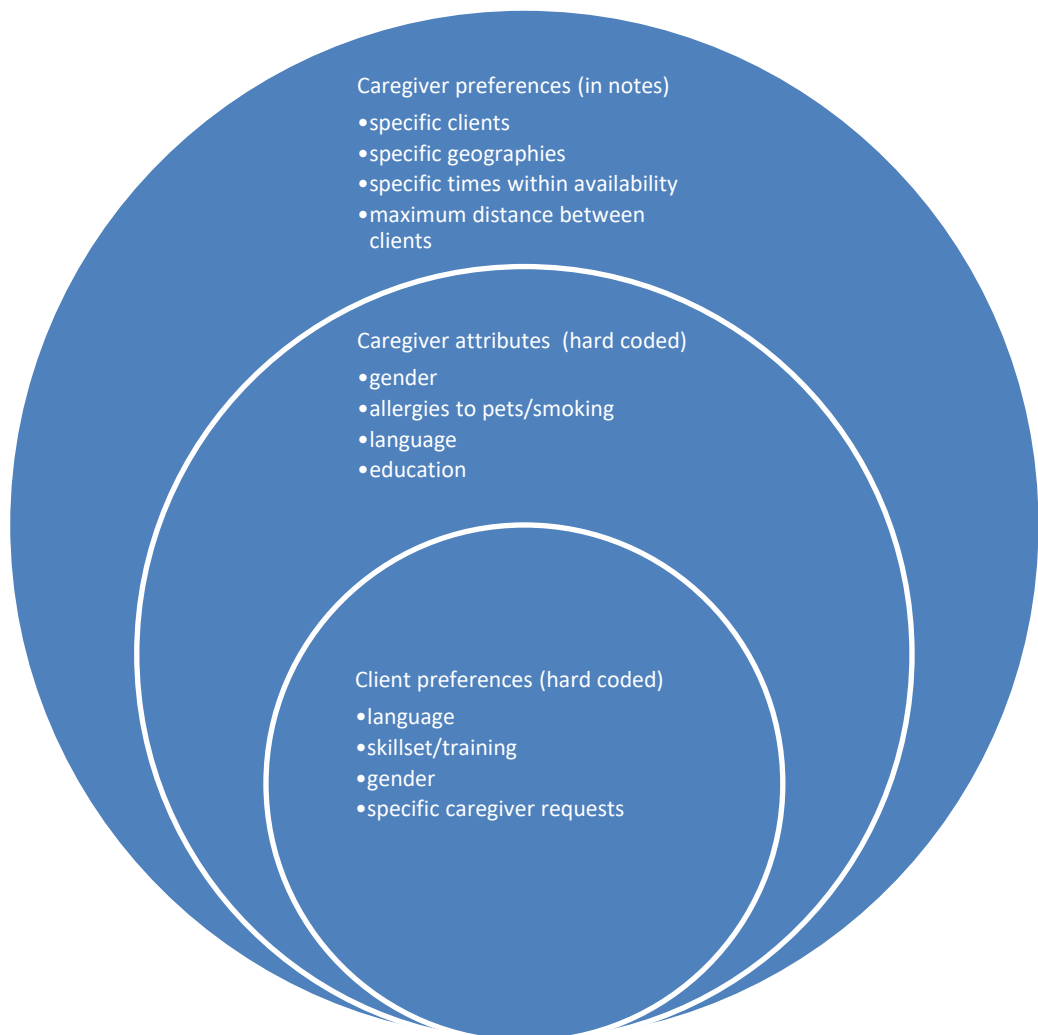




Figure 4: Example of Schedule Filling

| Schedule filling | Available Hours | | | | | Scheduled hours | |
|-------------------------|-----------------|---------|-----------|----------|--------|-----------------|--------|
| Week 1 | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
| 6 am - 7 am | Sch | Sch | Sch | Sch | Sch | | |
| 7 am - 8 am | Sch | Sch | Sch | Sch | Sch | | |
| 8 am - 9 am | Sch | Sch | Sch | Sch | Sch | | |
| 9 am - 10 am | Sch | Sch | Sch | Sch | Sch | | |
| 10 am - 11 am | | | | | | | |
| 11 am - 12 pm | Sch | Sch | Sch | Sch | Sch | | |
| 12 pm - 1 pm | Sch | Sch | Sch | Sch | Sch | | |
| 1pm - 2pm | | | | | | | |
| 2pm - 3pm | | | | | | | |
| 3pm - 4pm | | | | | | | |
| 4pm - 5pm | | | | | | | |
| 5pm - 6pm | | | | | | | |
| 6pm - 7 pm | | | | | | Sch | Sch |
| 7pm - 8pm | | | | | | | |
| 8pm - 9pm | | | | | | Sch | Sch |
| 9pm - 10 pm | | | | | | | |
| 10 pm - 11pm | | | | | | | |
| 11pm - 6 am | | | | | | | |



Figure 5: Example of Gaps in Schedule

| Gaps in Schedule | Work | Hours worked | | | | Gap hours | | | | |
|-------------------------|---------------|---------------------|------------------|-----------------|---------------|------------------|---------------|-------------|-------------|--|
| Week 1 | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | | | |
| 6 am - 7 am | | | | | | | | | | |
| 7 am - 8 am | Work | Work | Work | Work | Work | | | | | |
| 8 am - 9 am | Work | Work | Work | Work | Work | | | | | |
| 9 am - 10 am | | | | | | | | | | |
| 10 am - 11 am | | | | | | | | | | |
| 11 am - 12 pm | | | | | | | | | | |
| 12 pm - 1 pm | Work | Work | Work | Work | Work | Work | Work | | | |
| 1pm - 2pm | Work | Work | Work | Work | Work | Work | Work | | | |
| 2pm - 3pm | | | | | | | | | | |
| 3pm - 4pm | | | | | | | | | | |
| 4pm - 5pm | | | | | | | | | | |
| 5pm - 6pm | | | | | | Work | Work | | | |
| 6pm - 7 pm | | | | | | Work | Work | Work | Work | |
| 7pm - 8pm | | | | | | Work | Work | Work | Work | |
| 8pm - 9pm | Work | Work | Work | Work | Work | | | | | |
| 9pm - 10 pm | | | | | | | | | | |
| 10 pm - 11pm | | | | | | | | | | |
| 11pm - 6 am | | | | | | | | | | |

Figure 6: Example of Schedule Modification

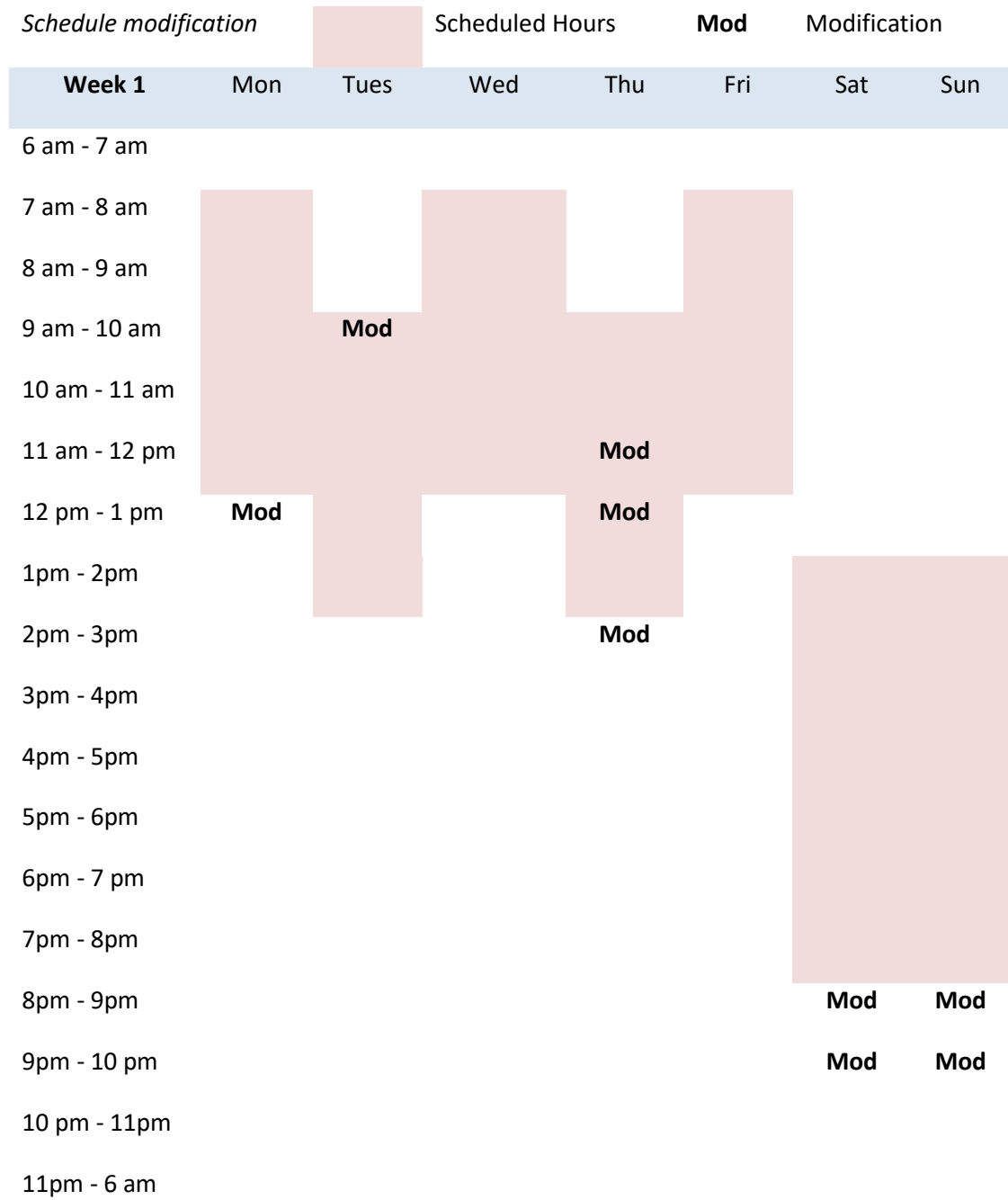


Figure 7: Example of Within Week Variability

| Within week variability | | Available Hours | | Work | | Hours worked | |
|-------------------------|--------|-----------------|-----------|----------|--------|--------------|--------|
| Week 1 | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
| 6 am - 7 am | Work | | | | Work | | |
| 7 am - 8 am | Work | | | | Work | | |
| 8 am - 9 am | Work | | Work | | Work | | |
| 9 am - 10 am | Work | Work | Work | | Work | | |
| 10 am - 11 am | Work | Work | Work | | | | |
| 11 am - 12 pm | Work | Work | Work | | | | |
| 12 pm - 1 pm | | Work | | | | | |
| 1pm - 2pm | | | | | | | |
| 2pm - 3pm | | | | Work | | Work | |
| 3pm - 4pm | | Work | | Work | | | |
| 4pm - 5pm | | Work | | Work | | | |
| 5pm - 6pm | | | | Work | | Work | |
| 6pm - 7 pm | | | | Work | | Work | Work |
| 7pm - 8pm | | | | | | Work | Work |
| 8pm - 9pm | | | | | | Work | Work |
| 9pm - 10 pm | | | | | | | Work |
| 10 pm - 11pm | | | | | | | Work |
| 11pm - 6 am | | | | | | | |



Figure 8: Example of Across Week Variability

| Across Week Variability | | | | | | | | | | | | | | | | |
|-------------------------|--------|---------|-----------|----------|--------|----------|--------|---------------|---------|-----------|----------|--------|----------|--------|--|--|
| Available Hours | Week 1 | | | | | | | Week 2 | | | | | | | | |
| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | | |
| 6 am - 7 am | Work | | | | Work | | | 6 am - 7 am | | Work | Work | | | Work | | |
| 7 am - 8 am | Work | | | | Work | | | 7 am - 8 am | Work | Work | | | | Work | | |
| 8 am - 9 am | Work | | Work | | Work | | | 8 am - 9 am | | Work | | | | Work | | |
| 9 am - 10 am | Work | Work | Work | | Work | | | 9 am - 10 am | Work | | Work | | | Work | | |
| 10 am - 11 am | Work | Work | Work | | | | | 10 am - 11 am | Work | | | | | Work | | |
| 11 am - 12 pm | Work | Work | Work | | | | | 11 am - 12 pm | Work | Work | | Work | | | | |
| 12 pm - 1 pm | | Work | | | | | | 12 pm - 1 pm | Work | Work | | Work | | | | |
| 1pm - 2pm | | | | | | | | 1pm - 2pm | | Work | | Work | | | | |
| 2pm - 3pm | | | | Work | | | Work | 2pm - 3pm | | Work | | Work | | | | |
| 3pm - 4pm | | Work | | Work | | | | 3pm - 4pm | | Work | | | | Work | | |
| 4pm - 5pm | | Work | | Work | | | | 4pm - 5pm | | Work | | | | Work | | |
| 5pm - 6pm | | | | Work | | Work | | 5pm - 6pm | | | | | | Work | | |
| 6pm - 7 pm | | | | Work | | Work | Work | 6pm - 7 pm | | | | | | Work | | |
| 7pm - 8pm | | | | | | Work | Work | 7pm - 8pm | | | | | | Work | | |
| 8pm - 9pm | | | | | | Work | Work | 8pm - 9pm | | | | | | Work | | |
| 9pm - 10 pm | | | | | | | Work | 9pm - 10 pm | | | | | | Work | | |
| 10 pm - 11pm | | | | | | | Work | 10 pm - 11pm | | | | | | Work | | |
| 11pm - 6 am | | | | | | | | 11pm - 6 am | | | | | | | | |

Figure 9: Absentee Rate Distribution (Boxplots) for HCAs by Department

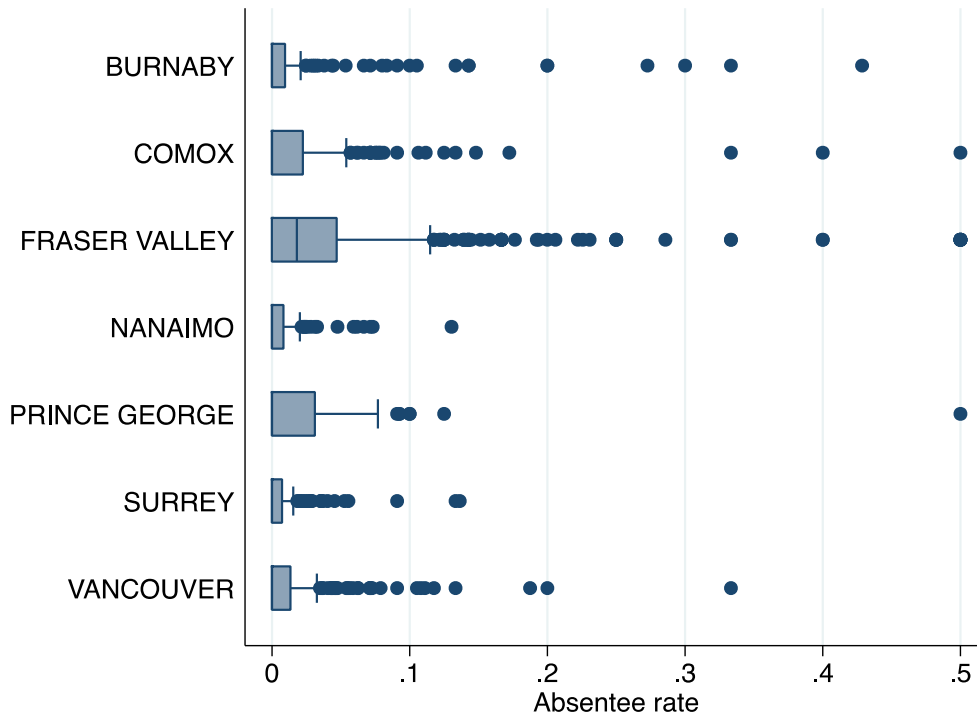


Figure 10: Turnover Rate for HCAs by Department

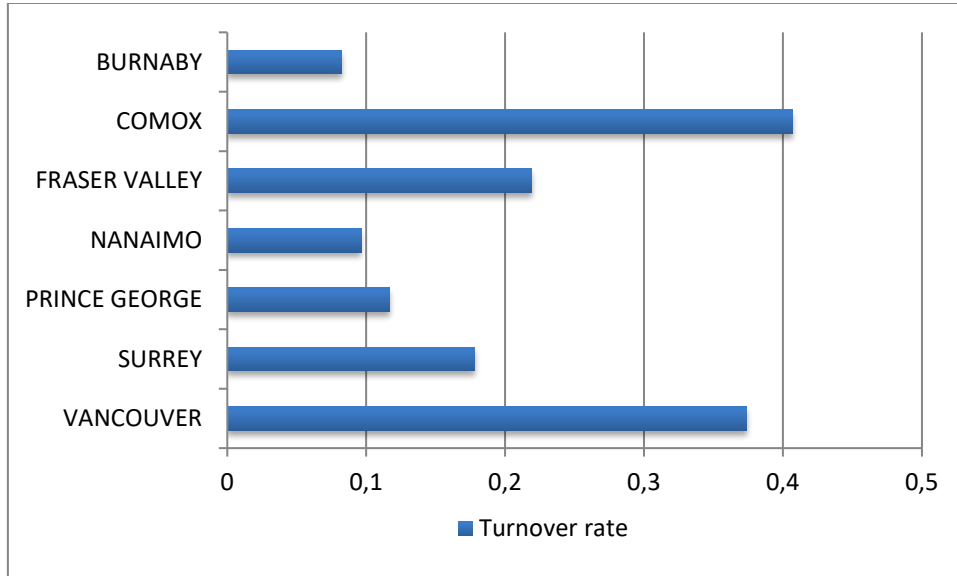


Figure 11: Client Dissatisfaction Rate Distribution (Boxplots) for HCAs by Department (Large Outliers are Removed for the Graph)

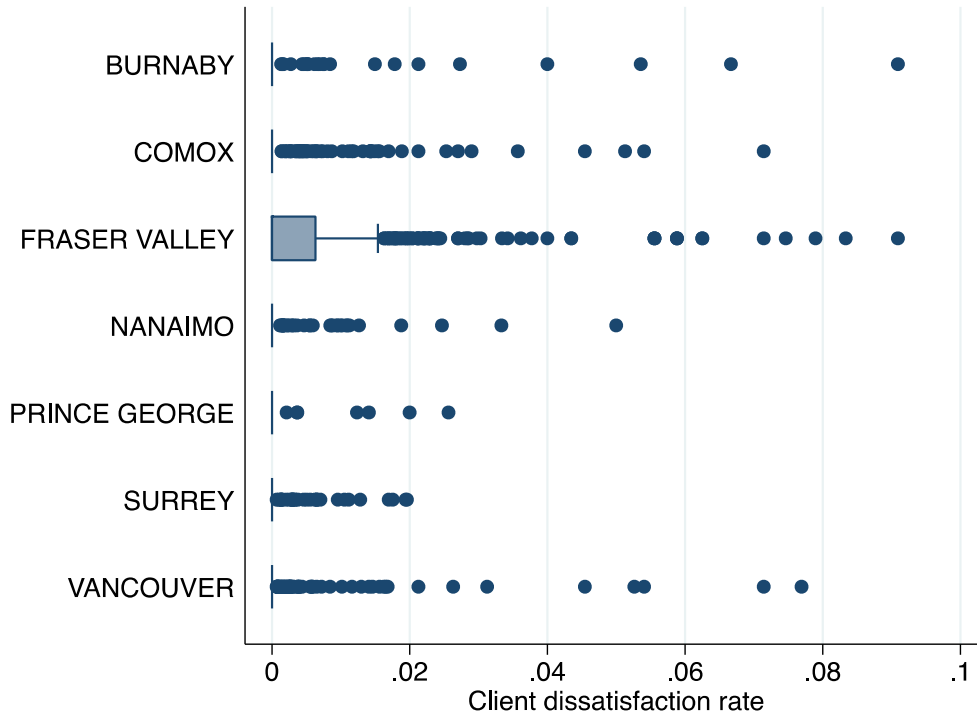


Figure 12: Margin Effects Plots

