

How Many Waste Collectors Behind the Dustcart?: When the Reality of Working Conditions Ruins a Manager's Cost-Cutting Dreams⁽¹⁾

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.The concept of age management is proving unable to prevent the exclusion of ageing workers – chiefly for health reasons – from the labour market. Our research paper examines this issue through the lens of a new idea we refer to as occupational health-driven employability and career path management and focuses specifically on the waste collection profession. We conducted a study to understand the consequences of a specific managerial decision (the switch from a two-person to a one-person crew of waste collectors) on working conditions. The participation of a physiologist and an ergonomist gave us the opportunity to recommend improvements to the managerial approach to such decision-making. This unorthodox multidisciplinary approach allowed us to show that while it may be tempting for managers to introduce cost rationalisation measures, the latter have material consequences for working conditions – even for the health of waste collectors. When presented with our paper's results, the manager/contract giver took on the role of an occupational health and safety (OHS) officer during a call for tenders, demonstrating that the two worlds of the manager and the OHS officer can overlap.

Introduction

For three decades now, the increase in life expectancy due to population ageing has prompted major concern rather than celebration, as this demographic shift runs the risk of creating a social security shortfall (Rocard, 1991). Since the 1990s, each new French government has tried to turn pensioners into contributors and taken a host of measures to raise the retirement age. This is why they have extensively promoted an actionable concept – age management – which is supposed to allow businesses to put the government's pension policy into practice.⁽²⁾

In 2020, however, there was little to show for all these efforts. Although the employment rate for workers aged 55 to 64 did increase, mainly as an automatic

consequence of reforms to raise the retirement age, to 52.1% in 2018 compared to less than 30% at the start of the 2000s, it remains low in comparison to that of other countries – 61.4% for all OECD nations (Bellon, Meriaux and Soussan, 2020; Dares, 2011). Furthermore, studies assessing the impact of the 2010 pension reform show that there has been an explosion in forms of unemployment and underemployment and in the number of vulnerable workers receiving social protection benefits, especially long-term unemployment benefits (Dubois and Koubi, 2017; Unedic, 2016) but also disability pensions (with roughly 80,000 recipients added between end-2010 and end-2014 (COR, 2017)). The number of sick leave days taken jumps significantly with age – amounting to an average of 52 days for people aged 55 to 59, 76 days for those over 60 – whereas the average number of sick leave days taken is 35 among the general population (Cnam, 2018).

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⁽²⁾ This article was translated by the Translation Center of the French Ministry of the Economy, Finance and Industrial and Digital Sovereignty

In light of the persistent issue of older jobseekers being forced out of the labour market and the scale of these challenges, by examining age management through an international literature review (Salmon and Juban, 2018; Salmon, 2019; Salmon et al., 2022), we were able to identify that the concept does not sufficiently take into account how an ageing workforce impacts occupational health. This is despite the fact that a worker's continued employment is contingent in part on their health status (France Stratégie policy institute, 2018). Other researchers are more categorical: "Health status is the single most important factor 'pushing' people out of work and reducing the likelihood that they will return" (Phillipson and Smith, 2005).

To address this state of affairs, we use the concept of occupational health-driven employability and career path management (GEPaST) (Salmon et al., 2020; Salmon and Juban, 2021; Salmon et al., 2022). Developed in order to put health back at the centre of discussion, GEPaST considers a person's employability as contingent on their getting a job that is "satisfactory" from a health perspective, meaning one that allows them to not only avoid damaging their health, but to build a healthy lifestyle. Health is thus understood, as Canguilhem puts it, as an "increase in the normative power of the individual" (Canguilhem, [1984]-2002). GEPaST is based on the fundamental premise that all stakeholders involved in devising human resources management (HRM) practices have a role to play in managing occupational health and ageing, including by restoring flexibility for workers, even when their job involves all manner of constraints.

Against this backdrop, we received a request for assistance from a consulting engineer at Carsat.⁽³⁾ This occupational health and safety (OHS) officer reached out to us due to his concerns about how an increasingly widespread management practice was impacting the health of waste collectors. Waste collection crews were downsized from one driver and two collectors (two-person collection) to crews of one driver and one collector (one-person collection).

When the OHS officer asked us to document the consequences of this downsizing of crews on the working conditions of the employees, it gave us the opportunity to bridge the worlds of OHS officers and managers (the latter being in this case contract givers). When it comes to the subcontracting of waste collection services, contract givers have an especially valuable position given their wide latitude of action, including over several firms (subcontractors) at once. Consequently, contract givers are essential players in a GEPaST approach.

Our story is about waste collectors. It tells of a conflict between, on one side, managers who are tempted to rationalise costs (by switching to one-person collection) and the material consequences of such a decision on the working conditions and health of waste collectors. We opted to examine this situation by conducting a multidisciplinary intervention research study. The results of our research have led the contract giver,

in the course of a call for tenders, to wear the hat of an OHS officer, thereby proving that the management and OHS worlds are not perfectly separate.

Waste collectors: the most familiar of strangers

Everyone is familiar with waste collectors. They drive by our houses early in the morning or late in the evening, and ring our doorbells once a year in December for the holidays. But do we know exactly what their daily work involves? To try to understand, we hopped aboard a dustcart and observed a number of complete routes over several days. Since the best way to learn is by doing, one of us even rode at the rear of the dustcart and realised, over the course of a few days, that we did not know how to collect waste. Later on, once we had a more in-depth experience of what the work is like, we thought about its characteristics, both on the business and the work environment front, only to reach the conclusion that the duties of the job are both complex and interlinked.

Hard streets

At 4am, the dustcart is revving up. I woke up at 2:30am, a little dazed because I had slept poorly, as I wasn't used to going to bed at 6:30pm. It's the third consecutive day of my observation of the waste collection route, and I had been warned that I would "feel jetlagged". Of course, my husband is the one who dropped the kids off at school this morning. In the cab, I'm talking to the driver, Stéphane, while we watch on the screen the waste collectors behind the vehicle. The route begins in the city and we come to a stop every few metres. Since every minute counts, the collectors jump off the rear step, push and haul in the containers, and then run to get back onto the step. My research colleague, who is trying a hand at the job of waste collector for the day, is struggling to keep up the pace and to stay in sync with the regular collector, as he frequently ends up in the dustcart's blind spot, or worse, behind the vehicle altogether, creating a safety hazard. Fortunately, our hosts are patient and courteous.

On this part of the route, household waste is collected from containers, so the work is straightforward. In other areas, where elected officials do not want to run the risk of blighting the streets with rubbish bins or rustling the feathers of constituents who do not have room to store them, a variety of non-standard containers are used, whether bags or boxes, according to the residents' fancies. Unable to use the automatic bin lifter for these methods of disposal, the collectors wear out their shoulders throwing the bags and boxes above the hopper. The exact same procedure is used to collect green waste: there isn't anything worse than having to pick up big reusable bags stuffed with mowed grass, grass water and rainwater that have been sitting out for four days!

By around 8:30am, the crew is under pressure. They've fallen somewhat behind schedule and pull up to a school at the worst possible time: children

⁽³⁾ French retirement and occupational health insurance fund.

are running from all directions and the moms who are behind the wheel are grumbling. “To them, since we pick up crap we are crap”, Stéphane mutters. As some children laugh, Stéphane smiles faintly and continues: “When we’re collecting and pass by kids and all that, it’s true that it makes us chuckle because kids cry out ‘Aaahhh!’ and hold their noses because we stink, you know. The dustcart reeks. The collector behind the vehicle has their nose shoved in it. From a health and safety point of view, it’s not great at all, but we don’t have a choice, it goes with the territory of this line of work”. The children are dwarfed by the containers and the dustcart has loads of blind spots, making the location dangerous. The crew works quickly and leaves the area promptly.

Next we’re on a two-lane, narrow road. But, what on earth are the waste collectors doing now? They glance quickly at the road and cross it to go pick up the bags on the other side. “Well now Stéphane, that’s bilateral collection, which is prohibited, they could get hit by a car driving in the opposite direction!” I observe. Patiently Stéphane explains to me that I’m right and that they are supposed to turn around at the roundabout and come back in the opposite direction, but that doing so would cause them to lose time they can’t afford to waste.

As we move into a rural area, the collections become more sporadic. Noticing on the screen that the collector appears to be surrounded by a thick cloud of grey smoke, I suddenly ask Stéphane about it. “That? That’s nothing, it’s February, that’s chimney ash! There’s worse! Sometimes, a motor oil container has ended up at the very bottom of the hopper, and then the shovel crushes part of it and you hear a crunching noise followed by “pshh!” It spurts out behind the dustcart! This can happen with oil, crap and so on... you have to get to the side, you don’t want to be in front of that! I’ll tell you, it happened to us one time, someone had emptied their septic tank into the waste container, but we managed to avoid the contents getting in our faces! People throw away anything and everything”.

Feeling somewhat uncomfortable, I get back to my list of questions. And what about cold weather? Today it’s negative 5°C outside. “Oh, when you’re dressed warm enough, this kind of weather is okay. But in the summer, it’s awful, maggots are in the rubbish and it shakes like so. Even with gloves on, you have to think twice about how to grab the bin without crushing too many of them!” Stéphane tells us, laughing. “But ultimately, the worst weather is rain. If we get rained on at the beginning of our route, we’re soaking wet for the next eight hours”.

At noon, we’re getting close to the end of the route, which was a short one. Even so, Joël, the regular collector, walks with difficulty, as though he was wearing a space-suit. “Him?” Stéphane says, sighing. “Well, he has knee problems. Romain has back problems. That’s because X, their previous employer, didn’t collect rubbish in containers. At X, they were picking up bags. They were lifting 12 to 13 tonnes of loose waste. As a two-person crew. On one route, per day. 12 to 13 tonnes. And 95% of that was loose waste. Big black bags. That’s why

they’re falling apart, you see. Collecting loose waste for 10 years like that, that kills a man. They were working at an insane pace, with hours that were... and now Joël’s knees are ruined”. And when I ask Joël’s age, Stéphane responds: “He’s 45”.

An old, straightforward-seeming profession facing highly topical issues

Behind the seemingly straightforward act of depositing the contents of a waste container into a dustcart, lies a complex system of organisation, at the level of waste collection companies and their operational environment. Consequently, the management of the waste collection profession, which tends to be portrayed in an exaggerated, old-fashioned way and which everyone thinks they know about, looks straightforward on the surface, but it is anything but.

A complex system of organisation at every level

The organisation of waste collection services is made complex by the high level of variability inherent in the business, as well as by the plethora of external factors placing constraints on companies.

Firstly, the collection of household waste is an intrinsically variable business in many respects: route density (with the largest volume of waste generated at Christmas), seasonality (green waste), weather conditions, road conditions and interactions with the public. This makes the profession very hard to make predictive models about at company level, as Stéphane explains: “On the computer, everything always looks fine, it doesn’t show the different hazards of the job, like a car that’s blocking the way or slippery road conditions. Last Monday, there was a ton of snow and we couldn’t service certain roads because it was too dangerous. The dustcart couldn’t get up the streets, so we didn’t do them until the next day, as we always try to come back to do them. But all those hazards, well, the computer doesn’t take them into account”.

Secondly, waste management companies are operating in a highly competitive environment, a fact that is ever-present in the managerial mindset given that the sector is largely unprofitable. And yet calls for tenders are launched at frequent intervals, every three, five or seven years. Furthermore, we have been told that new competitors have emerged alongside the incumbent operators. The especially aggressive practices of the former have unsettled the latter: “In the event, competitor X is taking on a lot of contracts right now in mere financial terms and is lowering prices, but the company is getting many contracts because it is going to get bought up shortly, and what they’re interested in is having as many contracts and vehicles as possible in order to have an acquisition cost that’s... [and] to make loads of money. They don’t care about anything else. They have planned their acquisition for [such year]... so up until [such year] they’re going to deliberately undercut prices on the market in order to get a maximum number of contracts, no matter if they are loss-making. And they don’t care if they push their workers to the brink physically. Their employees are paid bottom wages and aren’t eligible for overtime pay. They couldn’t care less”

(as told to us by an operations manager). Companies will also undercut prices in order to get a loss-making waste collection contract that they can take over and make up for the financial losses by operating in other profitable areas of business, such as waste sorting and recovery: “I want region X, so I position myself at below-market prices, and regardless of the cost, I sweep up everything, because beyond waste collection I have processing and other sorting and recovery operations, so on the whole... the dustcarts take care of my advertising, and I’m able to make money with the rest of my business activities. Collection allows me to merely bring in tonnes of waste that I can make money off of later down the chain” (account provided by an operations manager).

Thirdly, waste collection is part of a fast-evolving environment where a range of issues collide. In particular, decisions associated with the green transition are having an impact. When a public decision-maker invests in a new recycling channel and users change their sorting habits, the type, flow and volume of waste end up being affected, which in turn impact the day-to-day existence of waste collectors. Another example: a decision to tax users based on the weight of the waste they dispose of leads to changes for collectors, including the arrival of closed, microchipped bins, the use of IT equipment and new sources of tension with the public.

A profession that is neither anachronistic nor trivial
Despite its long existence and outdated image, the waste collection profession isn’t an exception or even an anachronism. V. Pueyo and S. Volkoff warn of the risk of considering it as such. In fact, they remark that certain optimistic perspectives assume that three previously announced developments have been made a reality (Boissonnat, 1995): (i) a digitalisation of operations – meaning a reduction in the main physical constraints and difficulties; (ii) a revamp of how the work is organised in order to eliminate the repetitive nature of it and to give workers more flexibility in managing their time; and (iii) an increase in qualifications, coupled with a decrease in forms of subordination. However, these general predictions have not come to pass based on our observations of collectors on the job. Statistical field surveys conducted on a workforce-wide basis do not back up these predictions either (Pueyo and Volkoff, 2011). Persistent physical constraints, tighter time constraints, interactions with the public that cause direct or indirect pressure, as well as the highly topical complexity of the chains of accountability on which quality of life in the workplace depends, mean that these authors consider the waste collection profession and waste collection more broadly as “having the features of a modern-day job”.

A profession in which the managerial approach has a role to play

T. Morlet discusses the results of a study conducted in 2008 and 2009 and overseen by social partners in the waste sector, in response to recommendations made by the French Agency for the Improvement of Working Conditions (Anact) with the aim of reducing occupational health risks and improving working conditions

in the sector (Morlet, 2011). These recommendations included incorporating OHS criteria in agreements between waste collection companies and local authorities, as well as organising work by implementing safer scheduling practices, rest time, manageable workloads, etc. The results of the study are clear: “The physiological approach is proving insufficient. The existence of technical and institutional measures intended to limit or reduce the occupational health risks faced by waste collectors is not proving as effective as might be hoped. Indeed, such measures too often overlook the tangible aspects of the work environment or of decision-making processes”. As management researchers, we feel justified in responding to the request we received from a Carsat OHS officer.

Scope of research and methodology

“Unfortunately, our competitors use one-person collection crews as a way to undercut prices. We experienced this with one of our contracts; a company responded to a call for tenders with a proposal for one-person collection, which undercut prices very quickly, but a quality work environment and safety measures weren’t in place for employees” (account provided by an operations manager).

Labour costs account for roughly 50% of waste collection costs. It is therefore easy to understand why the city managers and three private subcontractors are tempted to make the switch from a two-person to a one-person crew. Nevertheless, this change alarmed the Carsat OHS officer responsible for the region in question, prompting him to contact us to document its consequences on the working conditions, and ultimately the health, of collectors.

One-person collection: a gold mine for managers, a cause for concern for OHS officers and a nightmare for collectors?

Facing a highly competitive environment, all the managers working for this region are, or already have been, thinking about resorting to one-person crews, which appear to be the favoured solution to lower the main adjustment variable of waste collection costs: labour costs. Used as a way to stand out during the tender process, it can take several different forms in practice, some of which overlap one another.

Forcing through one-person crews

“Being competitive is a must. Right now we have other contracts to bid on and we don’t know what to do anymore, you know, because we’re thinking that if we put in a bid with a one-person crew, then maybe we’ll get it, but the guys are going to get burnt out, as they already clock a lot of hours. If we don’t put in a bid with a one-person crew, we’ll lose out on the contract... [...] When it comes to the switch to one-person waste collection, they’ve kind of perceived it as inevitable, in other words, ‘At any rate, we know that everyone is going that route’” (account provided by an operations manager).

A somewhat marginal/informal/systematic work organisation:

Work schedules:

"After submitting our draft contract for the call for tenders and being awarded the contract, we had a preparatory phase during which we could still change the work schedules, so at that point we communicated with each crew, saying to them: 'OK, you're going to do this, does that seem reasonable to you or not?'" (in the words of an operations manager);

Routes:

"They took out certain neighbourhoods, for example for three dustcarts they took out three neighbourhoods, and assigned them to another dustcart, so basically they relieved us a bit. They tried to redesign the routes a little. But in my experience, the route that I'm doing today hasn't been changed at all. It's the same as it's always been, all the more so that it's a rural route. Rural areas are constantly being built up, and the more time goes by, the longer the route gets. At some point, they're going to have to do something about it. So far, they've just taken away one guy and left the route as is. And said, quote-unquote: 'Deal with it'" (as recounted to us by a driver);

Improved teamwork between drivers and the collectors working alone:

"The drivers are supposed to get out of the dustcart and help out. They don't always stay behind the wheel. When there's a ton of bins, when there's a big building to do, the drivers come give the collectors a hand" (account from a local manager).

Self-regulation

One company negotiated, without being legally required to do so, an internal agreement governing one-person waste collection: "This agreement stipulates, for example, that a collector working alone cannot collect more than nine tonnes of green waste" (as told to us by a human resources director). In addition, informal self-regulation is in place: "After collectors reach a certain age, we can't require them to work in a one-person configuration" (according to a site manager). This same manager explained that his in-depth familiarity with the job's demands on the ground have occasionally pushed him to refuse to allow one-person collection on certain routes due to the tonnage involved, geographical constraints and even feedback from the collectors performing the routes.

Endeavouring to reach a 'win-win' negotiation

"All sorts of accommodations could be made to their working conditions. In cases where we can't pay them extra, we could say to them: 'You'll work 30 hours instead of 35 hours per week', meaning that the harsher working conditions would be offset by a decrease in their work hours. [...] The easiest thing would be to give them a bonus for working solo, but that's difficult to do, or to tell them: 'Your shift will end earlier or you'll work a day less'. In a way, we benefit from this way of operating, since we have just one collector on a route, and the employee also gets something out of it. It's win-win. I think that's the heart of the matter" (account from a city waste management director).

The use of collectors working alone is objectively on the rise. However, its consequences on waste collectors' working conditions have not been assessed

objectively, and this is even less the case for its potential consequences on their health. As for the effectiveness of all the accommodations mentioned thus far, to our knowledge, no study relevant to this matter has been conducted. Consequently, the Carsat OHS officer responsible for providing guidance to all these waste collection companies was met with the following problem: "I've been looking into one-person waste collection at this time. The deal is that this mode of working is becoming more widespread because it reduces costs, but it's used under the guise of risk prevention, with the reasoning being: 'Having a one-person collection crew avoids bilateral collection, and then it's also less dangerous because the collectors get less banged up by the containers. When they're working as a two-person crew, typically one of them goes to pull out the containers and pass them on to the other...'. It seems handling the containers can cause injuries. Let's assume that this is the case, but having said that, when I hear this reasoning, I say to myself that if one person does the same collection route solo that used to be done by two collectors, then that must make the job a whole lot harder. [...] So I thought, we should think about this. All the more so that there's a safety officer here at Carsat who wanted to get an injunction against company X for 'improper use of one-person collection'. I said to him, 'Wait, I don't know if it's improper because if they've reorganised things so that it's acceptable, you can't call it improper. Now, if one collector is doing the same collection route that used to be done by two collectors, then we need to look into it, yes. But as for the impact on workers' health, you're making guesses, are you sure of them? So the other day I had a meeting with the city and I said to the partners in attendance: 'Don't you think we could put our heads together about this matter, rather than going it alone? I'm going to ask you to do it.'"

This multidisciplinary intervention research study grew out of this original working group, which met on the initiative of Carsat's external OHS officer and brought together the city's waste management officials and subcontractors, as well as other stakeholders interested in the issues under study (Cramif,⁽⁴⁾ management centre, occupational health department, INRS⁽⁵⁾). The researchers therefore had access to four spheres: the city, itself the employer of the state-managed waste collectors, and the three private subcontractors with a public-service remit.

A difficult request, a multidisciplinary response, and an intervention research study with an original approach

The study's objectives were straightforward on the surface: "to suggest guidelines on implementing one-person waste collection crews while safeguarding employee health and safety". However, the Carsat OHS officer's request was difficult to address because it required comparing working conditions at a company

⁽⁴⁾ Regional health insurance fund for Ile-de-France.

⁽⁵⁾ French Research and Safety Institute for the Prevention of Occupational Accidents and Diseases.

that used both one-person and two-person collection crews. But our partners in the industry planning to host the researchers told us that it was not feasible to have, for research purposes, two crews perform the same route, with one dustcart manned by a single collector and the other manned by two collectors. In fact, given the highly sensitive nature of the topic under study, they were hesitant about the social acceptability of the study. The working group thus set to work on developing an original intervention research protocol which also took into account each partner's constraints.

When conducting a review of the literature, we found that few resources covered one-person collection, as the waste collection profession has only been studied under conditions of two-person collection crews. We did, however, note that collectors face the same constraints regardless of the way in which they conduct their job. These include physical, technical, work environment and work organisation constraints (Bourdouxhe, Guertin and Cloutier, 1992). Furthermore, the literature identifies four types of regulation enabling these constraints to be adapted:

- self-regulation (Denis, St-Vincent, Gonella, Couturier and Trudeau, 2007): working methods (pre-empting, adapting) are derived from choices influenced by external factors. Collectors are constantly oscillating between practices that are "effort saving but hazardous" and "safe but exhausting";
- collective regulation (Gerrossier, Massardier, Pueyo and Germain, 2008): providing informal mutual assistance, evening out workloads, improving workflow, finding room for flexibility for oneself and the other collector, breaking the monotony, etc.;
- work organisation regulation in the broadest sense;
- external regulation (content of calls for tenders, legislation, etc.).

Given the wide range of possible constraints and types of regulation, the link that we were interested in establishing between managerial decision-making and working conditions, as well as the resources available to the INRS, we decided to address the complex matter of "switching to one-person collection" by featuring contrasting viewpoints. Accordingly, our research spanned four disciplines: physiology, ergonomics, economics and management.

Likewise, the intervention research protocol combined several research methods. The physiologist performed quantitative measurements in order to study the response of the human body to different sets of working conditions. The ergonomist observed how the collectors perform their job in order to highlight, among other things, the changes engendered by the above-mentioned types of regulation. In parallel, the economist and the manager conducted a qualitative study based on semi-structured interviews that then underwent a conventional content analysis (Bardin, 2003; Berelson, 1952), with the software program NVivo being used to run partially automated data analyses that were interpreted by an analyst.

The approach involved several phases:

- designing a consensus-based research method with industry partners, in the context of the working group. This phase resulted in co-developing a scientifically sound method of comparing the routes performed by one-person and two-person collection crews. To this end, the industry partners mutually defined what they considered different but comparable routes performed by one-person and two-person collection crews, particularly with regard to their difficulty (which depends on many factors: type of waste or container(s), tonnage, mechanical assistance options, route duration, job duties, rural or urban collection);
- implementing the selected protocol;
- reporting and discussing the results with the rest of the working group: in this way, the results were tested against the knowledge of the stakeholders, thus lending legitimacy to the results.

Results

The four researchers from various disciplines carried out their work at the same time, on site at the offices of the government contract giver and the three private subcontractors. The measurements were carried out at the premises of the contract giver and two subcontractors, during existing routes under normal conditions, so as to avoid creating artificial conditions and to remain as close as possible to the realities on the ground. In all, 8 routes were studied in full by the ergonomist (observations, measurements, work activity reports, interviews with 10 collectors, 6 drivers and 4 driver-collectors) (Vieira, 2015). The physiologist monitored (via heart rate instruments and motion sensors) the workers performing identical routes: all told, 16 regular routes (10 performing one-person collection and 6 performing two-person collection) were studied, involving 37 workers (22 collectors: 10 performing one-person collection and 12 performing two-person collection; and 15 drivers: 9 working in a one-person collection configuration and 6 in a two-person collection configuration) (Desbrosses, Adam and Vieira, 2016; Desbrosses, Adam, Vieira and Gaudez, 2016). Drivers and collectors alike were studied, as some of the industry partners informed us that more teamwork was involved between drivers and collectors in a one-person collection setting, thereby easing the single collector's workload: it was a matter ripe for research.

In parallel, the economist and the manager conducted 19 semi-structured interviews at the premises of the contract giver and the three subcontractors: 15 one-on-one interviews and 4 group interviews, with a total of 25 people interviewed (12 managers, 1 secretary from the Health, Safety and Working Conditions Committee (CHSCT), 3 internal OHS officers, 6 waste collection crewmembers, 3 HR personnel members) (Delecroix et al., 2017; Salmon, 2019). The remaining phase involved comparing and contrasting the various approaches in an effort to establish a link between managerial decision-making and its consequences on the ground.

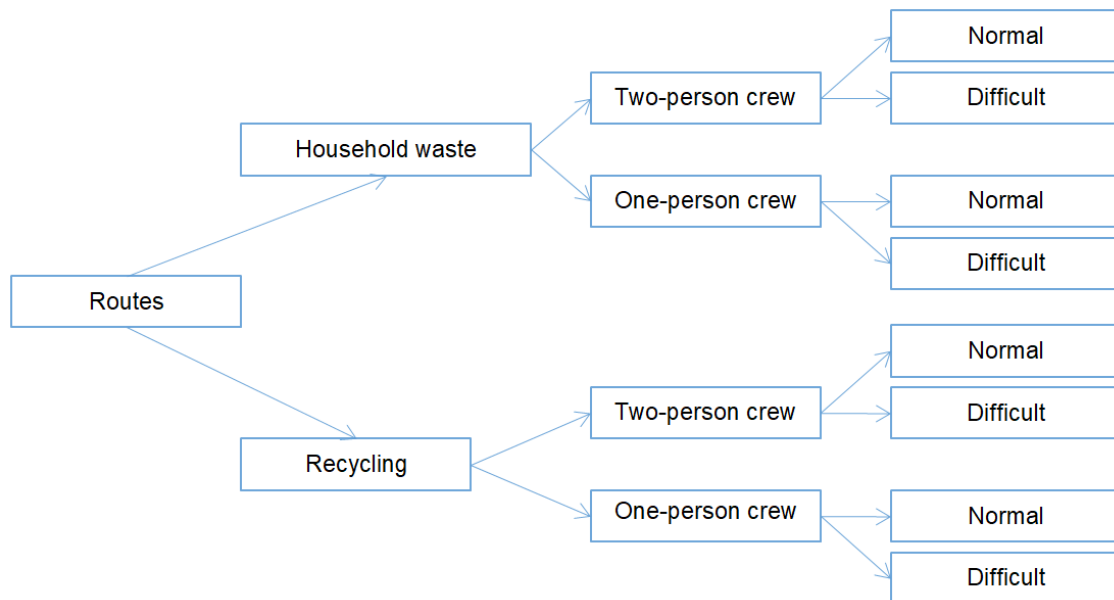


Figure 1: Diagram of routes monitored by the ergonomist and the physiologist to ensure the highest methodological rigour.

Quantified measurements pointed to the changes to working conditions brought on by the switch to one-person collection, as well as their consequences on the human body

The switch to one-person collection tangibly impacted working conditions

The physiologist's measurements underscored the differences in the amount of work performed by collectors in a one-person configuration compared to those working as a two-person crew, on the routes studied (see Table 1 below):

The ergonomist's results showed the changes to collectors' working conditions when performing their job in a one-person collection configuration. The ergonomist compared three minutes of work activity of two collectors, this time period being chosen randomly at the start of the route: a three-minute sequence for a one-person crew and for a two-person crew. This data was retrieved through live coding with the software program Captiv, which performs ergonomics analyses of work activity. (Figure 2)

The work was completed in rapid succession, with no task ever taking longer than 20 seconds. The collector dumped two containers in three minutes. The work involved pre-collection: either one of the collectors ran ahead of the dustcart in order to get the containers

	Two-person crew (two collectors behind dustcart)	One-person crew (single collector)	Change
Waste collection route time (in minutes, average \pm standard deviation)	401 \pm 48	434 \pm 90	↑
Average break time (in minutes, average \pm standard deviation)	33 \pm 12	26 \pm 8	↓
Average weight of waste collected by each collector (in tonnes, average \pm standard deviation)	4.7 \pm 0.6	9.6 \pm 2.2	↑
Number of steps taken by each collector (average \pm standard deviation)	12,238 \pm 3,702	16,599 \pm 4,865	↑
Average route length (in km, average \pm standard deviation)	44.6 \pm 8.6	58.3 \pm 18.4	↑

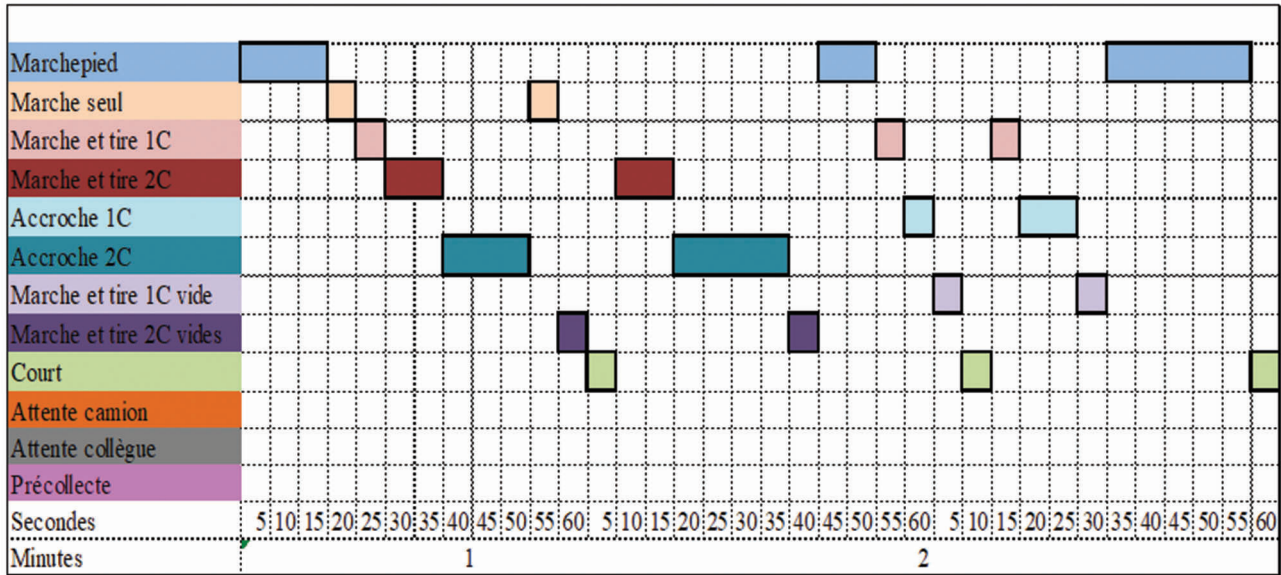


Figure 3: Work activity report 2. Work of a collector in a one-person configuration on a “normal” household waste route (route duration: 8 hours and 37 minutes).

Légende :

Marchepied : Riding on rear step

Marche seul : Walking only

Marche et tire 1 C : Walking and hauling 1 C

Marche et tire 2 C : Walking and hauling 2 C

Accroche 1 C : Dumping 1 C

Accroche 2 C : Dumping 2 C

Marche et tire 1 C vide : Walking and hauling 1 C (empty)

Marche et tire 2 C vides : Walking and hauling 2 C (empty)

Court : Running

Attente camion : Waiting on dustcart

Attente collègue : Waiting on workmate

Précollecte : Pre-collection

Secondes : Seconds

Minutes : Minutes

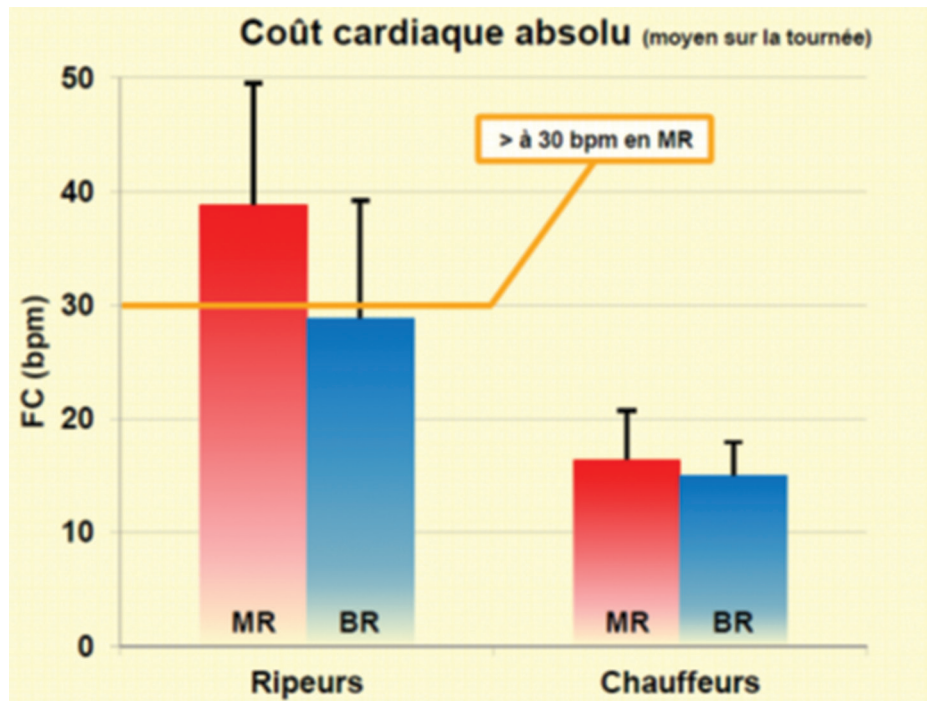


Figure 4: Total cardiac cost increased for collectors working as a one-person crew versus a two-person crew.

The trade-offs expected by the waste collection industry did not pan out

When asked about the possible increase in demands on workers due to the switch to one-person collection, industry members advanced two major types of argument:

- the routes had been adjusted to ease employees' workload;
- there was greater teamwork between drivers and the collectors working alone: drivers would get out of the cab more often to help collectors.

The first argument was refuted by the results outlined above and the physiologist disproved the second argument. The physiologist's findings showed that the drivers studied spent the same amount of time in a seated position regardless of working with a one-person or a two-person collection crew (86% of working hours, $\pm 8.4\%$). In addition, there was no significant difference in drivers' total cardiac cost from one type of collection to the other (16.4 ± 4.2 bpm and 15.0 ± 2.8 bpm, for one-person and two-person collection, respectively).

These results make sense. After all, the possibility for the driver to exit the cab to help the single collector depends not only on the driver's willingness, but on how the route is. To go help the collector, the driver has to bring the dustcart to a stop, apply the handbrake, climb down from the cab, go to the rear of the vehicle, handle the containers, get back in the cab and restart the vehicle. Such a time-consuming effort is only profitable when there is a collection point where many containers are gathered in one spot, for example at the bottom of a block of flats. It is not feasible for just one or two containers. However, these factors have not changed with the switch to one-person collection: drivers do not have more opportunities to go help a one-person collector than they do a two-person crew, even if their managers have asked them to do so.

Combining quantitative and qualitative analysis: producing quantitative data provided the missing link between managerial decision-making and the health of waste collectors

The physiological analysis data on physical workload revealed, for one-person collection, 10% longer working hours, a two-fold higher weight of waste collected per collector, and an amount of steps and a cardiac cost that are 35% higher than those of a two-person crew. The findings of the ergonomics analysis showed the disappearance of a large number of the teamwork-based possibilities for managing constraints, as well as the emergence of time-saving techniques in order to be able to keep up with the new demands of work.

These results ultimately demonstrate that the switch to one-person collection contributes to the deterioration of every dimension of health. Firstly, it reduces the flexibility collectors have to carry out their job, damaging health as it is defined by Canguilhem (1984). Secondly, the results of the physiological measurements underscore that one-person collection is physically more intense than two-person collection

under the conditions observed. Collectors are therefore at higher risk of developing musculoskeletal disorders and excessive cardiac strain, suggesting a deterioration of somatic health in both the medium and short term.

By combining a quantitative and a qualitative approach, we have established a link between the managerial decision to switch to one-person collection and the deterioration of every dimension of waste collectors' health. The route adjustments and the driver-collector teamwork dynamic touted by managers are clearly unable to make up for the increased demands collectors face when working in a one-person configuration.

These circumstances are a far cry from the "win-win" deal envisioned by some. Let's face it: the managers' arguments do not reflect the collectors' day-to-day experience on the job. Those who did not at first necessarily want to face the reality of the working conditions for one-person collectors can no longer look the other way.

Discussion: when managers wear the hat of an OHS officer

In keeping with our initial commitment, the results of the work conducted by the physiologist and the ergonomist were discussed before the working group. Given that the research method was developed collectively and that the terms of reference were vetted, the soundness of the results was not up for debate. At most, it was pointed out that the observations were made based on a certainly limited sample and certainly singular waste collection routes. That said, the concordance of the results obtained by the physiologist and the ergonomist through the use of many and varied measurement methods as well as the significant number of routes and crewmembers observed in total, quickly drowned out any objections.

With the soundness of the results established, managers were shocked by the revelation of the consequences of their decisions for their employees' health. Some even approached us discreetly outside of the working group meetings to make sure that such and such particularly alarming heart rate curve did not belong to one of their employees.

After the initial wave of shock, it was time to do some soul-searching. Our study showed that one-person collection dramatically increased the demands of an already difficult job while all but eliminating the first two types of regulation available to waste collectors, i.e. self-regulation and collective regulation. This left just two other types: work organisation regulation and external regulation. As part of the intervention research study, the working group began to think about how to implement these remaining forms of regulation.

The response of the city, itself the employer of the state-managed waste collectors (local government civil servants), was straightforward and swift: although it had been considering introducing one-person collection under a "win-win" agreement, hence its interest in taking part in our study, the city decided, at least for the

time being, to scrap these plans. It should be noted, however, that this decision is made possible by the fact that the city finances itself; it does not compete for funding. Even if this option is open to the city, it involves foregoing substantial savings and making trade-offs.

In contrast, this radical form of work organisation regulation seems out of reach for private subcontractors, who must find another solution. During our interviews, all the people we spoke to were unanimous in calling for contract givers to implement the fourth type of regulation, external regulation: “The solution consists of levelling the playing field for everybody by lightly regulating the competitive bidding process. To a certain extent it’s the only possible course of action, because if a player squeezes out the competition with an under-priced bid, my point is that a company has to get by and the other bidders have no choice but to fall in line, however well-meaning they may be...” (as recounted to us by a site manager). In the context of our intervention research study, it is again the contract giver, in this case the city, that would need to take action. It turned out that the end of our intervention research study coincided with the end of a contract, with the drafting of specifications for a new call for tenders. In the new specifications, the city introduced a clause restricting the use of one-person collection crews by subcontractors to certain clearly defined situations. Of course, this decision implies new financial efforts on the part of the city, with city managers being well aware that the proposed bids from potential subcontractors will be less competitive than if the subcontractors were not restricted in their use of one-person collection crews. Nevertheless, the city stands by this decision, as it protects waste collectors working for any of the city’s subcontractors from the unregulated practice of one-person collection for the next five years.

Conclusion

Covering the same subject through the lens of four different disciplines, our intervention research study was focused on producing quantitative data to understand how the switch to one-person collection impacts working conditions. By combining a quantitative and a qualitative approach, our study has established a link, one that has rarely been so clearly demonstrated, between managerial decision-making and the constraints imposed on the bodies of the waste collection crewmembers involved. In addition, our study has led the contract giver to take unprecedented, financially detrimental decisions in order to protect the health of waste collectors – both city employees and its subcontractors’ employees.

This rare outcome is interesting, as it shows that when the contract giver decides to do so, they have the power to play an active role in protecting the health of waste collection crewmembers through the specifications. The contract giver can decide to use their financial leeway to combat the damaging effects of competition and under-priced bids since they are able to set identical requirements for all service providers. Given their contractual position, they also have every power

to ensure that these requirements are met. Our intervention research study demonstrates that the contract giver, far from being a manager disconnected from the reality of work, can be a major driver of what we refer to as “occupational health-driven employability and career path management”. Of course, the action outlined in this paper “merely” consisted of protecting waste collectors from any foreseeable deterioration in their health due to a managerial decision, and the GEPaST concept goes much further in that it is ideally part of a preventive approach and has a broad vision of health. But nothing is off the table: legally, the contract giver has significant latitude in drafting the specifications. The special technical specifications common to all lots already include requirements regarding preventive medicine and training, work uniforms, safety and compliance with the recommendations of the French Health Insurance Fund. This list could be augmented by GEPaST-related requirements. Our work shows that managers, given the right conditions, can wear the hat of an OHS officer.

This raises the following question: what are the conditions for success? Our intervention research study was carried out under very special conditions in many ways. Firstly, let’s look back on the enlistment of the stakeholders, with the impetus coming from a consulting engineer at Carsat. This experienced external OHS officer, having longstanding ties with both the contract giver and industry partners, managed to persuade all these stakeholders to take part in an altogether unusual working group made up of competitors. There were various reasons why industry partners agreed to take part. The first industry partner was under threat of an injunction for questionable practices and, in participating, hoped to be treated with leniency by the Carsat OHS officer. The second industry partner had voluntarily regulated one-person collection internally to protect their waste collectors, making financial sacrifices in order to do so while expressing concerns that under the next contract they would be forced to abandon such ethical conduct: they hoped the study’s findings would prove them right and help them to stay the course, which is what occurred in the end. The third industry partner was ambivalent: having to suddenly switch to one-person collection under pressure in the wake of a poorly negotiated contract, perhaps they would have preferred never to learn about the consequences of this mistake, but they were also concerned and did not dare refuse the external OHS officer’s invitation to participate. Well versed in health and safety issues, the contract giver had to manage an unstable labour environment surrounding the issue of switching to one-person collection and the study was part of the negotiation; in addition, the contract giver was speculating over their legal liability in the event of an accident, including if one were to occur at a subcontractor. Secondly, the co-developed method largely lent legitimacy to the results, which were difficult for some to accept but nevertheless confirmed by the working group. Thirdly, we must stress the significant amount of resources that were deployed to complete the study. The intervention research study was successful thanks to all of these conditions being met.

Having made this observation, is this combination of conditions absolutely necessary in all cases, or can a study be successful without such an alchemy? In other words, is it possible to extend the study's approach under different conditions? GEPaST is predicated on the idea that all stakeholders involved in devising HRM practices have a role to play, as we have found that occupational health and safety issues concern a myriad of players. First and foremost, we seem to have established their need to form a network. But outside of the unusual circumstances we experienced, how can all levels of managers as well as internal and/or external OHS officers be persuaded to form a "community" sharing a common approach to a given occupational health issue, in this specific case that of one-person waste collection, and more generally that of occupational longevity in a demanding profession? In an inevitably different context, how can they be persuaded to work together to solve this problem using GEPaST?

The question is all the more relevant given recent developments involving our research subjects: the external OHS officer is now retired and no one has taken over the case. The contract is coming to an end and a new specifications document is being drawn up. There is talk of dropping the clause restricting one-person collection, as such restrictions are considered by subcontractors as being too costly and limiting. As the French poet Nicolas Boileau once put it, "A hundred times consider what you've said: Polish, repolish, every colour lay". Management is a living discipline, as is GEPaST, whose survival demands constant vigilance.

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