

Combined effects of shift systems and work requirements on customs officers

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Objectives The aim of this study was to examine the combined impact of different shift schedules and job demands on the physical health of customs officers.

Methods The following schedules were used: 4×6 hours, 3×8 hours, 2×12 hours, and day work. Data were collected via a questionnaire specially designed for the evaluation of specific job demands on the basis of ergonomic analyses in 10 units. A correspondence analysis led to the identification of 3 variables representing different categories of work-related constraints, namely, physically demanding job, boring, monotonous job, and conflicting relations with travelers. These variables were included in a series of logistic regression analyses on the health aspects of the customs officers.

Results The analyses highlighted the dominating effect of the 3×8 hour and 4×6 hour schedules on the occurrence of health problems but also showed strong effects for confrontation with travelers. The conflictual relations with travelers had the largest and most marked influence, it played a role in the area of sleep and cardiovascular and digestive problems. All of the 3 central job demands had an effect on sleep.

Conclusions The results point to a need for a multifaceted approach to research and intervention regarding the difficulties encountered by shift workers, from both the occupational medicine and the work design point of view. This conclusion seems particularly relevant for several professional sectors in which workers are confronted with both shift work and customer-focused jobs (police, prison guards, nurses, and the like).

Key terms 2×12 hours, 4×6 hours, customer-focused job, health, job demands.

Today, it is recognized that the negative effects of shift work are not merely the result of biological and social desynchronization, but may also stem from other adverse conditions linked to the work performed. This idea, expressed 20 years ago (1) and further developed since then (2–5), has not yet been fully integrated into the theoretical models presented in the shiftwork literature (6). It has only been explored in a limited manner by a relatively small number of laboratory and field studies. The long-term combined effects of shift schedules and job demands on health have been documented by only a few studies (7–9). Thus it seemed necessary to analyze further data gathered within the framework of a survey of customs officers who carry out somewhat similar jobs in different locations and on different schedules. The results and implications of other aspects of this research have been presented in earlier papers (10, 11).

Subjects and methods

Subjects

At the joint request of the French customs service and the unions, a survey was carried out in order to evaluate the repercussions of job demands and shift systems on the health, family life, and social life of customs officers. The customs service carries out the task of permanent surveillance of the borders and runs numerous controls within France. Forty-four national units representative of the diversity of shift systems, job demands, and local conditions were covered. The shift systems practiced by these units varied in function according to the geographic location of the unit and the nature of the job performed. The shift schedules primarily differed around 2 parameters, namely, the daily duration of work (6, 8, 9 or 12 hours) and the shift cycle. From these, a

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subsample of 4 groups was selected for the purpose of this study (6 hours, 8 hours, 12 hours, and day work) giving a total of 302 participants.

Shift schedules

4×6-hour shift. The 1st schedule is based on 4 shifts of 6 hours each, morning (0700—1300), afternoon (1300—1900), evening (1900—0100) and night (0100—0700). Shift rotation is rapid, with a highly irregular cycle characterized by the need to schedule 6.5 shifts to accomplish the weekly work. This necessity results in an obligation to work at least 6 days out of 7 and to accumulate periodically 2 shifts on the same day (usually 0700—1300 and 1900—0100). Seven of the units studied used this work schedule and were included in the analyses. In these units, of the 94 employees who participated in the survey, 42% were 40 or more years of age.

3×8-hour shift. Two units used a 3-shift schedule with each shift of roughly equal duration, namely, morning (0500 or 0600—1300), afternoon (1300—2000 or 2100), night (2100—0500). These units generally operated at fixed border crossings and performed their work inside specialized check-points protected from the elements. Shift rotation was rapid, and the schedule was highly variable. Then work sequences ranged from 2 to 5 days. Of the 53 employees who participated in the survey, 39% were 40 or more years of age.

2×12-hour shift. A schedule of two 12-hour shifts (day shift 0700—1900, night shift 1900—0700) was carried out by 5 units of customs service employees who worked at the Paris airport authority. The employees work 1 night shift for every 2 day shifts in a fast rotation system. A theoretical sequence of day-day-night was followed with some variation, depending on the requirements of the unit and the employees' wishes. Of the 115 employees who participated in the survey, 28% were 40 or more years of age.

Day work. Among the customs surveillance units, only the airborne divisions work exclusively daytime hours due to the nature of their work (identification and monitoring of suspicious vessels and pleasure boats). Two such units were surveyed: one organized exclusively on the basis of day work (0800 to 1200—1400 to 1700), and the other combining long days (0700—1900) with short days (0700—1200 or 1300—1900). Of the 40 employees who participated in the survey, 66% were 40 or more years of age.

Procedure

Data collection

The data collection contained 2 steps (figure 1). The first, carried out among 10 units, consisted of an ergonomic

analysis (by observation and interviews) of the unfolding of the work activities, and it was intended to provide the elements necessary for the construction of a support questionnaire for the 2nd step of the study. This questionnaire was constructed in such a way as to be balanced with regard to the diversity of shift systems and work conditions. It contained 223 items selected on the basis of the presurvey and related shiftwork literature.

The following 8 areas were covered: personal data, housing and commuting conditions, family situation, shift schedules (structures and practice, attitude towards), work history (how long on shift work, geographic moves), job demands, health and sleep, and leisure-time activities.

The items used for health were taken from existing health measures (12). They mainly covered gastrointestinal and cardiovascular complaints (11 items), medication (10 items), and questions about health behavior (eating habits, caffeine consumption, smoking) and sleep difficulties (3 items).

Work conditions were evaluated by a series of 39 questions covering the following different factors inventoried during the course of the initial step (ergonomic analysis of work): (i) physical and postural demands of the job; (ii) environmental factors (temperature, luminosity, etc) and their possible effects on physical painfulness of the job; (iii) psychological demands for attention

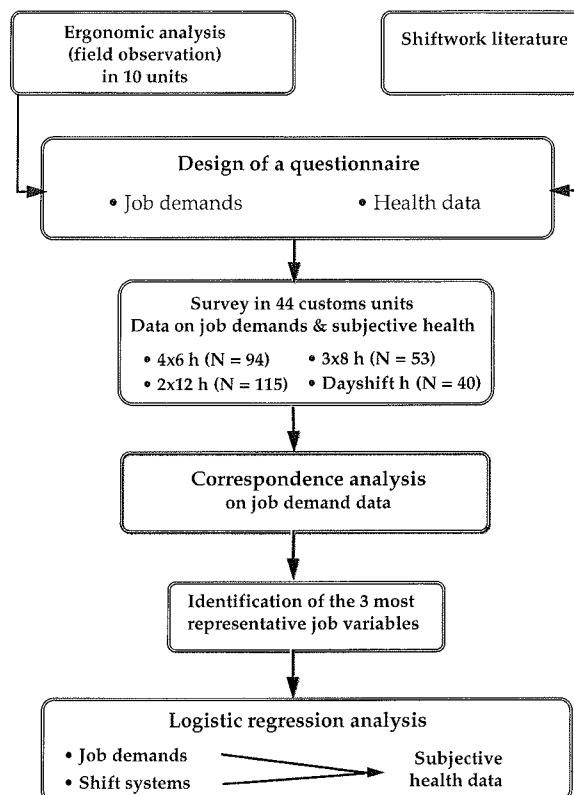


Figure 1. Outlines of the study.

and vigilance; (iv) appropriateness of material means for performing the job; (v) quality of professional training and whether it was adapted to the reality of the field; (vi) interest and variety of the job to be performed; (vii) freedom to use initiative, autonomy, and possibility or not of using personal competence; (viii) being sedentary or mobile as required by the job (frequency of travel and distance covered daily); (ix) interaction with customers, that is, characterization of the nature of relations established at the time of controls (appearance of conflicts, altercations or, on the contrary, neutrality of exchanges) and their effects on the life and socioprofessional image of the customs officers; (x) perception of risks run during job performance and the variation of this perception according to time of day or night and the prolongation of shifts; (xi) temporal dynamics of the job and variations in the rhythms of work during the course of the work periods; and (xii) effect of climatic conditions on job activity and possible influences on the temporal organization of the job.

Statistical analyses

In the 1st phase, the structure of work demands were analyzed by means of a correspondence analysis (13). The analysis was done with statistical SAS/Stat software. The aim of the analysis was to elucidate the structure of the customs officers' work experience and to identify a

few variables capable of adequately summarizing that experience. The analysis included 39 variables, each having 2, 3, or 4 modalities; it produced 2 axes expressing 7.7% and 5.1% of inertia.

On the basis of this analysis, 3 of the 39 variables appeared to be the most pertinent for use in the 2nd step, which examined the respective impact of shift work and the tasks demands on health, due to their capacity to sum up within themselves a series of other variables and their capacity as valued by their contributions to inertia. The 3 variables follow:

1. "Physically demanding job" which corresponded to the question "Are you subject to physically fatiguing work conditions?" in the questionnaire. This variable was chosen because the correspondence analysis indicated that it summarized the characteristic constraints of the typical situation of the "exposed" worker (strong job; physical, environmental, psychological constraints).
2. "Conflicting relations with travelers" which corresponded to the question "Do the interactions with travelers become exhausting after several hours?" This variable was chosen as the best indicator to represent the relational difficulties with customers (aggressive behavior, frequent disputes or altercations during customs checks).
3. "Boring, monotonous job" which corresponded to the question "How diversified do you find your job (very;

Table 1. Logistic regression analysis of the subjective health indicators, adjusted odds ratio (OR) for all factors in the table. (95% CI =

Health indicator	Gender		Age group (years)					
	Male		30—40		40—50		50—60	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sleep disturbances ($\chi^2=67.2$ - $P<0.0001$)	.	.	.	.	2.5**	1.09—5.89	2.5*	0.70—8.62
Sleeping pills ($\chi^2=31.9$ - $P=0.0008$)	.	.	.	.	4.7**	1.62—13.44	5.7**	1.43—22.24
Tranquillizers ($\chi^2=34.7$ - $P=0.0003$)	.	.	.	.	4.1**	1.54—10.91	8.6***	2.40—30.69
Antidepressants ($\chi^2=32.1$ - $P=0.0007$)	0.3**	0.14—0.80	.	.	4.1**	1.51—11.13	7.8**	2.13—28.32
Heart beating irregularly ($\chi^2=31.4$ - $P=0.0009$)	.	.	.	.	2.4*	1.05—5.66	6.4**	2.0—20.21
Heart palpitations ($\chi^2=29.7$ - $P=0.002$)	.	.	.	.	3.4**	1.37—8.34	5.8**	1.78—18.65
High blood pressure (HBP) ($\chi^2=25.05$ - $P=0.0089$)	.	.	.	.	2.2*	0.90—5.48	2.9*	0.86—9.45
Drug control HBP ($\chi^2=31.40$ - $P<0.0001$)	.	.	.	.	3.6*	1.19—11.10	6.9**	1.71—27.70
Shortness of breath ($\chi^2=37.48$ - $P=0.001$)	.	.	2.9**	1.21—7.04	4.4**	1.71—11.25	7.7***	2.26—25.67
Precordialgia ($\chi^2=31.46$ - $P=0.001$)	.	.	.	.	3.5**	1.39—8.77	4.5**	1.32—14.96
Digestion difficulties ($\chi^2=42.9$ - $P<0.0001$)	.	.	.	.	.	.	2.6*	0.83—8.06
Disturbed appetite ($\chi^2=44.2$ - $P<0.0001$)	.	.	0.5*	0.25—1.08	.	.	.	.
Nauseous ($\chi^2=32.9$ - $P=0.0005$)	0.5*	0.20—1.05	.	.	.	.	5.4**	1.66—17.39
Bloated stomach or flatulence ($\chi^2=42.1$ - $P<0.0001$)	0.5*	0.27—1.09	2.2*	1.06—4.51	3.8***	1.74—8.36	8.7***	2.62—28.66
Stomach upsets ($\chi^2=56.1$ - $P<0.0001$)	.	.	.	.	.	.	.	.
Antacids ($\chi^2=34.1$ - $P<0.0003$)	0.4**	0.19—0.86	.	.	2.2*	0.94—4.87	5**	1.59—15.44
Constipation ($\chi^2=21.9$ - $P<0.02$)	.	.	.	.	.	.	2.9*	0.96—8.65
Visual problems ($\chi^2=31.52$ - $P=0.0009$)	.	.	.	.	2.2*	1.03—4.73	4**	1.33—11.91
Leg problems ($\chi^2=39.21$ - $P<0.0001$)	0.4**	0.18—0.80	.	.	1.2	0.56—2.60	4.2*	1.13—15.08
Backaches ($\chi^2=24.15$ - $P<0.01$)	0.5*	0.23—1.01	.	.	.	.	.	.
Pain killers ($\chi^2=49.59$ - $P=0.0001$)	0.3***	0.15—0.62	.	.	2.7**	1.22—5.84	5.4**	1.64—17.91

*** $P<0.001$. ** $P<0.01$. * $P<0.05$. . $P<0.1$.

somewhat; not enough)?" This variable was chosen because the result of the correspondence analysis showed that it was associated with the following items: "possibility to use individual competence", "feelings proved in the situation of time constraints", "freedom of action within work".

The use of such variables avoids having to introduce a large number of intercorrelated independent variables into the causal analyses, in which variables run the risk of mutually disputing their explicative power.

The 2nd step consisted of a series of logistic regressions to determine the effects of job demands and shift work on health. This technique gave an estimation of the relative risk in comparison with a reference group (odds ratio). It is equal to 1 if the considered factor is not linked to the studied health problem. If it is more than 1, it means that the factor provokes a rise in the occurrence in the studied problems, a rise all the more important when the odds ratio is high. The increase or decrease of the risk is reflected by the value of the odds ratio (OR). The independent variables were the type of work schedule (3×8 hours, 4×6 hours, 2×12 hours, day work), the 3 job variables ("physically demanding job", "boring, monotonous job", "conflicting relations with travelers") and the 2 individual characteristics gender and age (20<30, 30<40, 40<50, 50<60 years). Shiftwork experience was not included as an independent variable because, in

this population, it was strongly linked with age. The dependent variables were the different complaints concerning gastrointestinal, sleep, cardiovascular and nervous problems. For this study, the reference group comprised 20- to 30-year-old female day workers who were not subject to any of the 3 job variables. However, it must be noted that the conclusions reached were not dependent on the choice of reference situation.

Results

Table 1 shows the results for the total cohort.

Effects of gender

The effects of gender showed up in a significant way only for a few items. The women suffered more from musculoskeletal problems and from some digestive symptoms (nausea, bloated stomach, flatulence). They took more medication (antidepressants, painkillers and stomach ache pills).

Effects of age

The second part of the results documented the effects of age, a classic phenomenon but one that merits attention. The probability of voicing complaints for each type of

95% confidence interval)

Shift schedule						Work conditions					
4×6 h		3×8 h		2×12 h		Physically demanding job		Relation with travelers		Monotonous	
OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
3.5**	1.38—8.68	5.5**	1.79—16.73	2.2*	0.89—5.37	2.7**	1.37—5.19	4.1***	1.78—9.61	2.6*	1.14—5.89
4.7**	1.16—18.76	6.5**	1.46—28.78	.	.	.	.	1.9*	0.88—3.91	.	.
7**	1.75—27.17	6**	1.40—25.54	3.2*	0.82—12.71	.	.	.	.	.	.
5.8**	1.47—22.92	5.1*	1.16—21.98	.	.	.	.	.	.	.	.
5.5**	1.86—16.09	4.9**	1.51—15.89	.	.	.	.	1.7*	0.93—3.25	.	.
4.6**	1.57—13.57	4.2**	1.28—13.41	.	.	.	.	.	.	.	.
1.9	0.73—5.16	3.1*	1.05—9.10	.	.	2.2**	1.17—4.08	.	.	.	.
5.4**	1.32—22.22	4.9*	1.07—21.96	.	.	0.5*	0.20—1.11	.	.	.	.
2.9*	1.06—7.84	4**	1.37—11.80	.	.	.	.	2.1*	1.10—3.85	.	.
3.1*	1.02—8.83	2.7*	0.82—8.64	.	.	.	.	2.7**	1.41—5.14	.	.
2.3*	0.93—5.43	3.3*	1.19—9.11	.	.	.	.	3.1**	1.56—6.15	1.9*	0.88—3.91
2.7*	1.06—6.96	3.5*	1.21—9.67	.	.	1.7*	0.93—3.25	2.5**	1.33—4.65	.	.
3.6*	1.18—10.57	2.8*	0.85—9.26	.	.	.	.	2.8**	1.45—5.30	.	.
2.6*	1.07—6.25	3*	1.11—8.16	.	.	.	.	3.3***	1.67—6.34	.	.
.	.	3.7**	1.36—10.07	.	.	.	.	3.5***	1.81—6.86	.	.
2.9*	1.08—7.69	3*	1.03—8.57	.	.	.	.	1.8*	0.95—3.21	.	.
.	.	.	.	.	.	.	.	2*	1.09—3.66	1.9*	0.90—3.99
3.2*	1.21—8.58	3*	0.80—6.88	3*	1.14—7.77	.	.	.	.	2.2*	1.10—4.69
5.8***	2.27—14.89	5.3**	1.86—14.86	3.4**	1.36—8.26	.	.	.	.	.	.
.	.	.	.	.	.	2.3**	1.18—4.29	.	.	.	.
3.4**	1.30—8.85	2.8*	0.97—8.07	.	.	2.1*	1.08—3.92	.	.	2.9**	1.36—6.02

health problem becomes higher as age increases. For complaints concerning sleep, the effect of age comes into play in a significant way beginning at the age of 40 years with the probability being 2 times higher for perceived sleep difficulties and nearly 5 times higher for the taking of sleeping pills. It is interesting to point out that there was no notable increase in this effect for the 50- to 60-year age range. Regarding the taking of tranquilizers and antidepressants, the effect of age again comes into play at the age of 40 years, the probability being 4 times higher than that of the reference age and increasing in the 50- to 60-year age range, the odds ratios being 2 times more significant [OR 8.6, $P < 0.001$, 95% confidence interval (95% CI) 2.40–30.69 for tranquilizers; OR 7.8, $P < 0.01$, 95% CI 2.13–28.32 for antidepressants].

The cardiovascular problems followed the same trend. For gastrointestinal problems, the effect of age showed up later, the probability of voicing complaints being significantly higher only for the 50- to 60-year age range.

Effects of work schedule

On one hand, it appeared that the 2×12-hour rota had no significant effect on the majority of the health complaints. Regarding the difficulties usually linked with shift work, there was an increase in sleep disturbances (OR 2.2, $P < 0.1$, 95% CI 0.89–5.37) and the taking of tranquilizers (OR 3.2, $P < 0.1$, 95% CI 0.82–12.71) at the 0.10 level. Two other kinds of difficulties increased with the 2×12-hour rota: visual problems (OR 3, $P < 0.05$, 95% CI 1.14–7.77) and pain in the legs (OR 3.4, $P < 0.01$, 95% CI 1.36–8.26).

On the other hand, the 3×8-hour and 4×6-hour work schedules had their own significant effects that concerned the principal aspects of health, such as cardiovascular, gastrointestinal and sleeping problems. On the whole, for those working 3×8-hour and 4×6-hour schedules, the probability that these problems will appear was at least 3 times higher than that for the reference situation. The 4×6-hour schedule, as set up within the customs teams, also turned out to be as unfavorable for health as the classic 3×8-hour schedule. These schedules gave rise to similar effects, which were, for the most part, of the same amplitude.

However, the odds ratio for stomach pain was significant for those working a 3×8-hour schedule (OR 3.7, $P < 0.01$, 95% CI 1.03–8.57) but not for those working the 4×6-hour schedule.

These effects had an amplitude comparable to that attributable to the 40- to 50-year age range. In effect, the odds ratios of the 2-shift schedules were generally equal to or greater than those associated with the 40- to 50-year age range. Everything also occurred as if working these schedules was equal to accelerating the aging process by approximately 10 years.

Effects of job demands

Job demands had an effect on sleep and cardiovascular and gastrointestinal problems.

Physically demanding job

Physically demanding jobs had an effect on backaches and the taking of painkillers. This relationship stemmed from the nature of the job and did not involve an examination of circadian rhythmic disturbance. On the other hand, carrying out a professional activity under physically trying conditions leads more easily to sleeping problems.

Boring, monotonous job

Monotony in work had an effect on only 4 items. Regarding sleep problems and the taking of antidepressants, an interpretation involving psychological mechanisms seemed plausible.

Conflictual relations with travelers

The conflictual relations with travelers simultaneously affected digestion, the cardiovascular system, and sleep. The probability of having sleeping problems was 4 times greater when the subjects were exposed to conflictual relations with travelers. The taking of sleeping pills was equally greater as compared with the reference situation (OR 1.9, $P < 0.10$, 95% CI 0.88–3.91).

A confrontation with travelers had affected gastrointestinal problems in a manner similar to working 3×8-hour and 4×6-hour schedules, the odds ratio ranging between 2 and 3.5. However, the impact of this variable was greater than that of the 40- to 50-year age category.

Among the cardiovascular indicators, only shortness of breath (OR 2.1, $P < 0.05$, 95% CI 1.10–3.85) and chest pains (OR 2.7, $P < 0.01$, 95% CI 1.41–5.14) were shown to be sensitive to confrontation with travelers. The odds ratios obtained were inferior to those corresponding to the 40- to 50-year and 50- to 60-year age ranges, but they were of the same order as those associated with a 4×6-hour schedule. An effect of a conflicting relation with travelers was seen for arterial hypertension. The odds ratio was 2.2 ($P < 0.05$, 95% CI 1.17–4.08), and it was of the same order as that obtained for the 40- to 50-year and 50- to 60-year age ranges, although for the latter the significance threshold was weaker.

Discussion and concluding remarks

Several aspects of the job demands of custom agents have an effect on their health. These effects manifest them-

selves as health problems typically found in shiftwork conditions (14, 15). The amplitude of both of these effects, job demands and shift work, were of the same order. They were comparable to the effects of age.

All 3 of the central demands identified using a correspondence analysis of the questionnaires had an effect on sleep. The odds ratios associated with conflictual relations with travelers were superior to those associated with the other 2 job-demand variables, but the difference was not significant. The influence of these 3 job variables was of the same order as that of the 3x8-hour and 4x6-hour schedules and that of those over the threshold of 40 years of age. The taking of sleeping pills, for which the probability was equally increased by working 3x8-hour and 4x6-hour schedules, did not appear to increase with exposure to a boring, monotonous job or a physically demanding job. Even stressful interactions with travelers was only responsible for an effect to the statistical threshold of 0.10.

In addition, the 3 central job-related variables each had specific impacts.

A *boring and monotonous job* increased the probability of taking painkillers and suffering from vision problems, 2 kinds of effects not usually connected with shift work. These effects could have been linked to a hidden variable associated with monotony but not included in the regression. In fact, the jobs judged monotonous by the customs agents frequently involved having to remain in fixed positions, which could have led to the taking of painkillers.

A *physically demanding job* was the only predictor variable associated with the probability of backache, an effect for which the chain of cause and effect is easily construed. This relationship stemmed from the nature of the job and did not involve an examination of circadian rhythmic disturbance. It is remarkable that, in this population, contrary to what could have been expected, age had no significance. This finding could be explained by the informal distribution of jobs within a team based on the criterion of age and seniority, as can be observed in other professional sectors (16). Nor did shift work have a significance. Physically demanding jobs increased the probability of taking painkillers. It is notable that the 4x6-hour and 3x8-hour schedules had similar effects. At the same time these variables did not have an effect on backache, but the relation between shift schedules and the use of painkillers could be explained by the influence of shift work on leg problems.

The *conflictual relations with travelers* variable had the largest and most marked influence. In addition to sleep, it played a role in the area of cardiovascular and digestive problems. Confrontation with travelers turned out to be the source of a greater probability of shortness of breath, chest pains and arrhythmias, complaints which are also frequently generated by exposure to 3x8-hour

and 4x6-hour schedules. The stressful relations with travelers was a source of more frequent states of hypertension, which, in this population, was only noted in relation to the 3x8-hour schedule and appeared to be less clearly linked to an advance in age. But the other types of cardiac complaints (palpitations and the declared use of beta-blockers) were not linked to customer confrontation.

Regarding digestion, if exception is made for bloating and flatulence (which had a significantly increased probability of appearing beginning in the 30- to 40-year age range), this job demand — of a psychosocial nature — had an effect on the different aspects of the digestive problems surveyed, for which the influence of age was equivalent only in the 50- to 60-year age range. These effects were roughly similar and of the same magnitude as those of the 3x8-hour and 4x6-hour schedules. For several elements of gastrointestinal problems, the effect of the "conflicting relation with travelers" variable existed although no variation with age was discernable.

The results presented concern a population for which the phenomena of selection by exclusion over the years could not have been taken into account. Customs officers who had left the units with the shift schedules analyzed could not be included in the survey. Customs officers have civil servant status and work within the framework of a public service containing numerous units spread out over the entire country. The units use diverse shift schedules, including a "normal" or "day" schedule. Therefore, the possibility exists of workers being able to escape, after a more-or-less long period, from the most stringent atypical shift schedule. However, this possibility is limited by the phenomena of intranational migration linked to a discord between the predominant geographic zones of recruitment for customs officers (southern France) and the zones of assignment (northern France).

The aforementioned limit being noted, the first point to emphasize concerns the respective harmfulness of the 3-shift schedules analyzed: (i) the 2x12-hour schedule, as organized and practiced in this professional sector, does not itself have a negative effect; (ii) the 4x6-hour schedule is a source of health problems of the same caliber as those resulting from the classic 3x8-hour schedule.

The major result that comes from this study is that the effects of job demands on health, for this population, are equivalent to the effects resulting from shift schedules. This finding signifies that the defining of a shift system, taking into consideration established knowledge regarding chronobiology and the rhythms of family and social life, represents only half of the battle to assure the full protection of shift workers' health.

The technique of logistic regression enables the different health risk factors to be weighed together. In relation to the reference situation (women aged 20 to 30

years; normal workhours; not subject to the constraints of a physically demanding job; a boring, monotonous job; or conflicting relations with travelers), the probability of sleep problems is multiplied by 3.5 for working a 4×6-hour shift schedule, by 4.1 for difficult relations with travelers, and by 2.7 for a physically demanding job. Our survey shows that the cumulation of these conditions is not exceptional. The statistic principle of logistic regression, which enables us to multiply these probabilities together, indicates that the conjunction of a conflicting relation with travelers and a physically demanding job results in the probability of sleep problems being multiplied by 11. The result is an increase greater than that linked only to shift schedules. We therefore agree with the point of view expressed in research conducted within the framework of the same problem (9), namely, it is necessary to intervene simultaneously on the level of work schedules and on the level of job demands and to proceed systematically with an examination of the job demands.

The joint consideration of the respective effects of job demands and the work schedule practiced not only comes up within the context of intervention, but also within the context of research. The results published on the combined effects are again fewer in number, and many questions remain unanswered. Earlier results (8–9) arrive at the conclusion that stress at work is an ill-health provoking factor independent of shift work. Is this conclusion, obtained from 2 different populations, valid in a general manner or are there professional sectors in which the effects of shift work and job demands are not simply additive but could combine with one another in an interactive manner? The logistic regressions presented in this paper were first carried out within the perspective of a simple additive scheme, but further logistic regression analyses could enable the testing of the hypothesis of the eventual effects of interaction.

Finally it must be emphasized that the variable shown to have the most impact on the customs agent population is "conflictual relations with travelers". This variable is also found in other professional groups which similarly practice shift work, such as among police, prison guards, and nurses (especially in psychiatric institutions). It is possible that shift work and job demands are not simply additive constraints but also interactive constraints. For example, the effect of a job demand at night differs from the effect of the same demand during the day. The feeling of reduced security linked to darkness, reduced recourse to colleagues, weakening of capacities, and circadian variations in mood are elements which increase the difficulty of a customer-focused job. Therefore the defining of the most adequate shift system should not fail to take job demands into consideration.

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