

## ORIGINAL ARTICLE

# Reducing the burden of arterial hypertension: what can be expected from an improved access to health care? Results from a study in 2420 unemployed subjects in the Caribbean

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High prevalence and poor control of hypertension have been observed in populations with low-socioeconomic status. Comparing an unemployed population with another employed population sharing the same culture, and another employed population living in another environment might enlighten the effects of factors accessible to primary prevention on the one hand and access to health care on the other hand. The objectives are, first, to describe blood pressure (BP) prevalence and control in an unemployed Caribbean population benefiting from State financial support and good access to health care and second, compare the results in this population with those observed, with the same methodology in two employed populations, one in the Caribbean and one in metropolitan France. A cross-sectional study of 2420 consecutive unemployed subjects referred for check-up in the two health centres of Guadeloupe, a French Caribbean island. Hypertension

prevalence was 25.2% in men and 22.1% in women. BP was controlled in 17.3% of men and 37.2% of women receiving antihypertensive medication. Among women, 58% were overweight and 29% obese. Prevalence of hypertension was higher among the unemployed and employed Caribbean population, than among an employed metropolitan French population. A high prevalence of obesity was observed in the two Caribbean populations suggesting the interest of primary prevention in the Caribbean. Burden of hypertension in a population relates to the development of hypertension (primary prevention) and control of hypertension (secondary prevention). Identifying hypertensive patients and controlling blood pressure are both important to reduce the disease burden.

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## Introduction

It has long been generally accepted by most health care professionals that the major discrepancies in health status between persons without financial problems and those who live in poverty are largely owing to the fact that different socioeconomic groups do not enjoy equal access to health care.

Others consider that multiple factors influence health status and that reducing or eliminating financial barriers to health care, in particular, will have little impact on reducing inequalities.<sup>1,2</sup>

Arterial hypertension is one of the important determinants in the development of cardiovascular diseases, which have been observed to persist or increase in developed countries in the last 20 years.<sup>3,4</sup> Higher prevalence of hypertension and poorer therapeutic control have been observed in lower social classes.<sup>5,6</sup> Information in this respect could provide guidance for more efficient interventions in order to reduce these disparities. Differences in prevalence would stress the importance of

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primary prevention. Differences in therapeutic blood pressure (BP) control would emphasise the need for reinforcing secondary prevention. These questions are all the more important because inadequate therapeutic control of hypertension at the population level has been shown to be persistent.<sup>7,8</sup>

Guadeloupe is an island in the French West Indies, in the Caribbean. Its area is 1200 km<sup>2</sup> with a population of 420 000. More than 90% of the population is Afro-Caribbean, the remainder being mostly Indo-Asians and Caucasians. All residents have equitable and uniform access to hospital and physician services, and for most of these there is no cost-sharing. As a result of its special status as a French department, the population benefits from a healthcare system similar to that in metropolitan France. Guadeloupe has experienced rapid economic development during the last 30 years with a progressive change from an agriculture-based economy to tourism and industry, resulting in a higher standard of living. Nevertheless, the unemployment rate (27%) is still one of the highest among French administrative regions. However, access to health care is good, owing to a national health insurance system with special coverage for the underprivileged (*couverture médicale universelle*). People with very low income, and the unemployed persons get income support or unemployed benefit: *revenu minimum d'Insertion* (RMI), about 359 euros/month.

Hypertension has been reported to be a major public health issue in the West Indies, with a high prevalence.<sup>9</sup> In the late 1980s, 90% of men and 74% of women with hypertension were unaware of their condition. Mortality by stroke has been found to be twice as high as in metropolitan France.<sup>9</sup>

The goal of our study was to describe BP prevalence and control in an unemployed Caribbean population benefiting from state financial support and good access to health care. As the same methodology was used in two employed populations, one in the Caribbean and one in metropolitan France, the results of these studies are compared. Comparing such a poor population with one employed and sharing the same cultural and nutritional habits and also with another population employed living in another environment is expected to enlighten as on the effects of accessibility to primary prevention on the one hand and access to health care on the other hand.

## Methods

### Population

This cross-sectional study was conducted among 2420 consecutive patients aged 18–69 years, enrolled between November 2001 and November 2003 by six physicians working in the two health centres of Guadeloupe. All persons receiving unemployment benefits from the regional administration are invited

to have a free check-up at the health centres every 5 years. There are two health centres in Guadeloupe. The physicians included all subjects attending the centres during the study period who were identified as receiving unemployment benefit or income support: RMI, about 359 euros/month. Each individual gave informed consent to enter the protocol. The percentage of persons excluded (refusing being included in the study), was very low: 0, 1%.

### Data collection

Information was collected by the physician during the examination. BP was measured using a validated automatic device (OMRON CP705, Dupont, France). A training session was organized for all physicians to standardize BP measurements. Systolic BP and diastolic BP were measured after 5, 6 and 7 min of seated rest, using a cuff properly adapted to the arm size. The mean of these three measurements was used to estimate BP during all visits. Hypertension was defined as BP  $\geq 140/90$  mm Hg and/or current antihypertensive treatment. For patients who were not currently treated for hypertension and whose BP was  $\geq 140/90$  mm Hg on the first visit, a diagnosis of hypertension was established from the results of a second measurement, 1 month later. Using the second criterion, subjects were defined as hypertensive, if their BP was  $\geq 140/90$  mm Hg on each of two visits or if they were under current antihypertensive treatment at the first visit.

Height and weight were measured and the body mass index (BMI) was calculated as weight/height<sup>2</sup> (kg/m<sup>2</sup>). 'Obesity' was defined as BMI  $\geq 30$  kg/m<sup>2</sup> and 'excess weight' as BMI  $\geq 25$  kg/m<sup>2</sup> and  $< 30$  kg/m<sup>2</sup>. Information on tobacco and alcohol consumption, participation in sports activities, education level, marital status and health services consumption was obtained through subject interviews. Alcohol intake (wine, beer and spirits) was quantified in glasses per day and  $> 4$  glasses per day was the threshold used to define 'heavy drinkers'. Blood samples were obtained to determine fasting lipid, glucose and  $\gamma$ -glutamyltransferase ( $\gamma$ -GT) levels. In the statistical method, covariates, such as education, physical activity, cigarette use, alcohol consumption and use of health service are included in multivariate logistic regression model to adjust for potential confounding effects of these factors on prevalence and hypertension care.

The quality, homogeneity and completeness of the data were monitored by a coordinating centre in Grenoble, France (LL, Rde G).

### Statistical analysis

Qualitative variables were compared using the  $\chi^2$  test and  $\chi^2$  test for trend. For prevalence, descriptive statistic was used. Quantitative variables were compared using variance analysis (ANOVA). Logistic regression models were used for multivariate

analysis of qualitative variables. Logistic regression models were used for multivariate analysis of categorical dependent variables. Differences were significant with  $P < 0.05$ . All statistical analyses were performed using the STATA statistical package (STATA software, version 8, STATA Corporation).

#### Confidentiality issues

Each subject gave informed consent to participate in the protocol. Data collection was approved by the National Committee on Informatics and Freedom (CNIL). Confidentiality and anonymity were guaranteed by the health centre physician, who as a medical practitioner is required to protect patient privacy.

Data were sent anonymously by the physician to the data centre.

## Results

### Population

Between November 2001 and November 2003, 1088 men (45%) and 1332 women (55%) were enrolled. The mean age of the men was 41.9 years ( $\pm 10.6$ ) and of the women, 39.9 years ( $\pm 11.2$ ) (Table 1). The prevalence of obesity (BMI  $> 30$  kg/m<sup>2</sup>) was 12.4% among men and 29% among women. Less than 1 h of physical activity in a week was reported by 73% of men and 85% of women. Among the 332 men and 231 women with BP  $\geq 140/90$  mm Hg not treated for

**Table 1** Characteristics of the study population: comparison of characteristic between men and women

	Men n = 1088 (44.96%)	Women n = 1332 (55.04%)
Age (year, mean $\pm$ s.d. <sup>a</sup> )	41.9 ( $\pm 10.6$ )	39.9 ( $\pm 11.2$ )
Age group, n (%)		
< 30 years	146 (13.42)	264 (19.82)
30–39 years	326 (29.96)	417 (31.31)
40–49 years	341 (31.34)	346 (25.87)
$\geq 50$ years	275 (25.28)	305 (22.90)
BMI (kg/m <sup>2</sup> , mean $\pm$ s.d.)	24.8 $\pm$ 4.9	27.1 $\pm$ 6.4
Weight status based on BMI (kg/m <sup>2</sup> )		
Normal (BMI $< 25$ ), n (%)	637 (58.55)	554 (41.59)
Excess weight ( $25 \geq$ BMI $< 30$ ), n (%)	317 (29.13)	392 (29.43)
Obesity (BMI $\geq 30$ ), n (%)	134 (12.32)	386 (28.98)
Low physical activity ( $\leq 1$ h/week), n (%)	766 (70.40)	1110 (83.33)
Smokers ( $\geq 1$ cigarette/day), n (%)	264 (24.26)	90 (6.76)
Alcohol drinkers ( $\geq 4$ glasses/day), n (%)	79 (7.26)	14 (1.05)
Hyperglycaemia, n (%)	78 (7.17)	108 (8.11)
Hypercholesterolaemia, n (%)	77 (7.08)	79 (5.93)
$\gamma$ -Glutamyltransferase > 50 IU (%)	299 (27.48)	170 (12.76)
Marital status, n (%)		
Married/cohabiting	328 (30.15)	371 (27.85)
Single/widowed/separated/divorced	760 (69.85)	961 (72.15)
Education level, n (%)		
$\leq 7$ years	422 (38.78)	386 (28.98)
7–11 years	651 (59.83)	891 (66.90)
$\geq 12$ years	15 (1.38)	55 (4.12)
Self-reported as having a general practitioner n (%)	688 (63.23)	1056 (79.28)
BP at first visit		
Systolic BP (mm Hg, mean $\pm$ s.d.)	134 $\pm$ 14.9	125 $\pm$ 21
Diastolic BP (mm Hg, mean $\pm$ s.d.)	82.3 $\pm$ 12.7	79.9 $\pm$ 12.3
Heart rate (b.p.m., mean $\pm$ s.d.)	68.2 $\pm$ 11.3	72.3 $\pm$ 10.3
Invited for a second BP visit (untreated BP $\geq 140/90$ mm Hg at first visit), n (%)	332, 30.51%	231, 34%
Visits among those invited, n (%)	269 (81.02)	172 (74.46)
BP at second visit		
Systolic BP (mm Hg)	144.8 $\pm$ 18.7	142.3 $\pm$ 21.8
Diastolic BP (mm Hg)	88.1 $\pm$ 12.5	87.9 $\pm$ 12
Heart rate (b.p.m.)	71.5 $\pm$ 11.9	79.4 $\pm$ 12.2

Abbreviations: BMI; body mass index; BP, blood pressure.

<sup>a</sup>S.d.

**Table 2** Prevalence of hypertension according to the number of visits used to assess BP levels (threshold >140/90 mm Hg)

	One visit	Two visits	Difference	P-value
<b>Men (%)</b>				
<30 years	16.4	9.2	-43	0.08
30-39 years	26.4	11.1	-58	<0.001
40-49 years	39.9	26.1	-34	<0.001
≥50 years	61.8	49.8	-19	0.006
Total	38.2	24.7	-34	<0.001
<b>Women (%)</b>				
<30 years	6.1	2.8	-54	0.14
30-39 years	17	9.3	-44	<0.001
40-49 years	36.7	28.0	-24	0.015
≥50 years	62.3	51.7	-17	0.009
Total	30.3	22.1	-27	<0.001

Abbreviations: BP, blood pressure.

hypertension at the initial visit, 269 men (81%) and 172 women (75%) were again examined 1 month later. The mean interval between the first and second visits was 45 days.

When the diagnosis of hypertension was based on measurements in two separate visits, its prevalence was reduced by 34% in men and 27% in women. The prevalence estimates varied according to patient age. The younger the patients, the greater the difference between estimates based on one or on two visits (Table 2).

*Prevalence, awareness, treatment and BP control*

The prevalence of hypertension (≥140/90 mm Hg) was 24.7% in men and 22.1% in women on the basis of estimates from two visits. In both genders, prevalence increased with age. It was 49.8% in men >50 years of age (Table 2)

Awareness among hypertensive subjects was better in women (67%) than in men (40%), and the percentage of patients under current treatment if aware of being hypertensive was high in both women (91%) and in men (82%). Among treated subjects, 17.3% of men and 37.5% of women had BP levels <140/90 mm Hg (Table 3). The prevalence of hypertension, the proportion of hypertensive subjects aware of their disease, and the proportion of subjects under current treatment among aware subjects increased with age in both genders. BP control among all hypertensive subjects decreased with age. BP control did not differ significantly between the 7.7% of men and 8.6% of women who had hyperglycaemia (glycaemia >1.26 g/l).

*Factors associated with hypertension*

Excess weight and obesity increased with age, and their prevalence was high in women. Hypertension was more prevalent in obese and overweight

**Table 3** Awareness, treatment, and blood pressure control based on estimates from two visits

Age groups (years)	Awareness among hypertensive subjects (nb, %)	Current antihypertensive treatment among aware subjects (nb, %)	BP control (BP <140/90 mm Hg) among treated hypertensive subjects (n, %)
<b>Men</b>			
<30	2 (16.7)	1 (50)	1 (100)
30-39	8 (24.2)	5 (62.5)	2 (40)
40-49	33 (41.3)	26 (78.8)	7 (26.9)
>50	56 (46.3)	49 (87.5)	4 (8.2)
Total	99 (40.2)	81 (81.8)	14 (17.3)
<b>Women</b>			
<30	5 (71.4)	5 (100)	4 (80)
30-39	23 (63.9)	22 (95.7)	9 (40.9)
40-49	57 (63.3)	50 (87.7)	22 (44)
>50	99 (71.2)	91 (91.9)	28 (30.8)
Total	184 (67.6)	168 (91.3)	63 (37.5)

Abbreviations: BP, blood pressure.

**Table 4** Association between hypertension and weight status according to age group

Age group (year)	Normal weight (%)	Excess weight (%)	Obesity (%)	P-value
<i>Prevalence of hypertension (%)</i>				
<b>Men</b>				
<35	7	13	33	<0.001
35-50	17	33	47	<0.001
>50	40	66	68	<0.001
<b>Women</b>				
<35	2.5	5	15	<0.001
35-50	15	24	68	<0.001
>50	41	55	63	<0.001

subjects (Table 4). In multivariate analysis and after adjustment for age, BMI and alcohol intake were related to hypertension in men. Similarly, prevalence of hypertension was higher among overweight and obese women (Table 5). Relationships between high BP and serum levels of  $\gamma$ -GT were also studied. Higher  $\gamma$ -GT levels were found among heavy drinkers than among those with low reported alcohol intake in both men ( $69.6 \pm 16.7$  vs  $49.9 \pm 18.0$ ,  $P < 0.05$ ) and women ( $58.4 \pm 12.8$  vs  $37.5$ ,  $P < 0.01$ ). Likewise,  $\gamma$ -GT serum levels were associated with alcohol consumption (age-adjusted Spearman  $r = 0.24$ ,  $P < 0.001$ ). Men and women with high  $\gamma$ -GT serum levels (>50 IU) had significantly higher prevalence of hypertension, and  $\gamma$ -GT levels were correlated with prevalence of hypertension in univariate and multivariate logistic regression analyses (data not shown).

The prevalence of hypertension was not related to education level or to income, as both these factors were homogeneous in this population.

**Table 5** Impact of lifestyle behaviours on prevalence and control of hypertension among unemployed subjects – multivariate analysis

	Odds ratio	95% CI	P-value
<i>Prevalence of hypertension</i>			
Age (/10years)	1.09	1.08–1.11	<0.001
Gender (women)	0.73	0.56–0.90	0.004
Low education	1.12	0.4–2.8	0.81
Low physical activity	1.13	0.9–1.3	0.56
Alcohol consumption	1.36	1.05–1.08	0.02
Tobacco use	0.66	0.48–0.91	0.01
<i>Weight status</i>			
Normal	1	—	—
Overweight	1.92	1.50–2.46	<0.001
Obesity	3.59	2.74–4.71	<0.001
<i>Inadequately treated hypertension</i>			
Age (/10years)	1.00	0.96–1.02	0.89
Gender (women)	0.30	0.15–0.56	<0.001
Low education	1.61	0.16–15	0.68
Low physical activity	0.92	0.50–1.67	0.77
Alcohol consumption	2.48	0.99–6.14	0.051
Tobacco use	0.79	0.31–2.03	0.63
<i>Weight status</i>			
Normal	1	—	—
Overweight	0.73	0.37–1.40	0.34
Obesity	0.84	0.44–1.60	0.60
Declared physician	0.50	0.23–1.09	0.60

Abbreviations: CI; confidence interval; OR, odds ratio.

## Discussion

In this underprivileged population of men and women aged 18–69 years in Guadeloupe, French West Indies, the prevalence of hypertension was 25 and 22%, respectively, on the basis of two measurements. In both men and women over 50 years of age, the prevalence of hypertension was very high at 50%.

Only 40% of hypertensive men were aware of their condition. Eighty percent of these patients were treated, although the disorder was controlled by the treatment in only one in five. These figures were better among women: two-thirds were aware of their disease, almost nine out of ten were receiving treatment, and 37% were controlled by treatment. In both genders, but especially in men, awareness and control under treatment were thus the main problems identified.

Some limits of the study should be discussed. The sample is not quite representative of the disadvantaged unemployed population of Guadeloupe. Each person receiving unemployment benefits from the regional administration is invited to have a free check-up at the health centres every 5 years. The subjects attending the centres during the study period included in the study were thus persons receiving unemployment benefits. However, they also volunteered for a screening at the health centre.

As in many studies, alcohol intake was assessed on the basis of self-reported information. Such an approach may lead to misclassification of exposure status, for example alcohol consumption. We, therefore, used serum  $\gamma$ -GT levels as an unbiased, although imperfect, marker for alcohol intake. This method has already been used in various clinical settings as well as in epidemiological studies.<sup>13,14</sup> We found a consistent relationship between high reported alcohol intake and  $\gamma$ -GT, as well as between hypertension and  $\gamma$ -GT. BP levels, in contrast, were carefully assessed. These figures were based on the results of two visits. Prevalence based on a single visit would have been indeed much higher. For patients under 40 years of age, the prevalence estimated on one visit was reduced by 50% after controlling during a second visit. This also means that in this context overdiagnosis and overtreatment of hypertension is quite possible and cannot be ruled out.

It is interesting to compare our results with those of two studies undertaken under the auspices of the French Society of Hypertension which used the same methodology for BP measurement in two active populations: the INHAPAG study of 6113 Caribbean working men and women,<sup>10</sup> and the IHPAF study of 29656 persons in metropolitan France.<sup>8</sup>

The prevalence of hypertension among unemployed women (22%) in our study was only slightly higher than that reported among employed women in the Caribbean (19%), but much higher than among employed women in metropolitan France (9%). Findings were similar in men, 25, 20 and 16%, respectively. Concerning BP management, awareness and treatment rates were similar in the three studies. Awareness was insufficient in all populations (about 50% in men and 70% in women) with no major difference between studies. The percentage of treated subjects among aware hypertensives was similarly high in all three populations (around 80% in men and 90% in women). BP control under treatment was low in the three populations. It was, however, much lower among unemployed men (17.3%, compared with 34% and 38% among metropolitan and Caribbean workers, respectively). BP control under treatment in women was 37.5% in our unemployed. These findings are based on observation of crude rates in each population, and are especially interesting as the age distribution was quite similar. In INHAPAG study, mean age for men (51% of the population) was 39 years, and 40 years for women. In IHPAF study, mean age for men was 38.8 years (58% of the population), and the same mean age for women. However, definite comparisons of the three populations need further adjustments on all demographic variables.

BMI emerged very clearly as a risk factor, especially in women among whom excess weight and obesity are very common. Fifty-eight percent are

overweight, and one-third are obese. Obesity affects 29% of underprivileged Caribbean women, compared with 16% in the Caribbean working population<sup>10</sup> and 9% in metropolitan France.<sup>8</sup> In men, the figure is much less striking: 12, 10 and 9%, respectively.

Obesity and excess weight thus account for the higher prevalence of hypertension in this unemployed population and appear as a good target for primary prevention in the Caribbean, whether employed or not. Excessive alcohol intake was found to be an independent risk factor for hypertension in this population. Therefore, excessive alcohol intake is reliably evidenced in our study as an important risk factor for hypertension among unemployed subjects, deserving adequate primary and secondary prevention. We use logistic regression model to explore some explanatory factors for the disparities we observed in prevalence and control of hypertension. These factors include gender, education, alcohol consumption, tobacco use, physical activity and BMI (Table 5).

However, social factors and individual behaviours should not be seen as mutually independent. To understand the distribution of health behaviour, theoretical models should include the role of social factors and social context.<sup>12</sup> Personal behaviour may be considered as a link relating hypertension to social factors in this underprivileged population. A primary prevention approach to hypertension should thus consider this social aspect of excess weight.

Our results suggest that in Guadeloupe hypertension prevalence is indeed higher among low-socioeconomic groups, such as our study population. In high-income countries, BP and hypertension was also reported to be negatively associated with socioeconomic status.<sup>15</sup> In contrast, the relationship between BP and socioeconomic status in middle and low-income countries is less clear. In Colhoun's review<sup>15</sup> of nine studies from developing countries, which reported on the association between socioeconomic status and hypertension, four showed a negative association, four a positive, and one no association. In the Caribbean, Dressler's study in Jamaica<sup>16</sup> showed that BP was positively associated with social class for men, but negatively for women. In Hutchinson's study from St Vincent,<sup>17</sup> BP was positively associated with years of education in men, but negatively in women. In Trinidad and Tobago, Gulliford *et al.*<sup>18</sup> observed a negative association of systolic BP with increasing income or education in women, and no consistent association between BP and education or income in men.

Compared with the US NHANES III study,<sup>11</sup> in which BP measurement was based on two visits, the percentage of treated subjects among aware hypertensives was much higher in metropolitan France (IHPAF Study<sup>8</sup>) and in our underprivileged population, living in a poorer area. Differences in health insurance systems between the two countries (USA

and France) may explain these discrepancies. In Guadeloupe, which is a West Indies island with special status as a French department, the whole population benefits from the national French health-care system.

BP control under treatment was low in the three populations. It was, however, much lower among unemployed men (17.3%, compared with 34 and 38% among metropolitan and Caribbean workers respectively). BP control under treatment in women was 37.5% in our unemployed population, 61 and 52%, respectively, in employed women in the Caribbean and in metropolitan France. This suggests that secondary access to care might be a target to deal with. Secondary access is defined as being all the events which happen after the first contact with the health services, which is described as 'primary access to care'.<sup>19</sup> This step includes patient compliance with treatment, but also prescribing practices according to patient social characteristics and the interaction between the patient and the doctor, which has been shown to vary with the patient social characteristics. As BP control among treated subjects appears to be a major challenge, more information is needed about the quality of the doctor-patient relationship, which may vary according to social class.<sup>20,21</sup>

Our results suggest that prevalence of hypertension is high among unemployed groups in the French West Indies. A mass strategy policy focusing on weight and alcohol issues, in addition to a policy directed toward hypertensive persons, might be appropriate to reduce this prevalence of obesity, and to a lesser extent excessive alcohol intake, which are highly prevalent in this group; burden of hypertension in a population relates to the development of hypertension (primary prevention) and control of hypertension (secondary prevention).

Improved social conditions, promotion of healthy behaviours by individuals and a good access to medical care are not alternative but synergistic strategies in the pursuit of health.

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#### Summary Table

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##### *What is known about the topic*

- Prevalence and control of Hypertension are adversely affected by poor socioeconomic conditions
- Obesity is advocated as a proxy factor underlying this relationship
- Increased access to healthcare is advocated as a way to reduce healthcare disparities

##### *What this study adds*

- High prevalence of obesity is strongly linked to the prevalence of hypertension in Caribbean population suggesting the interest of primary prevention
  - Improved social conditions, promotion of healthy behaviours by individuals and primary and secondary access to medical care are not alternative but synergistic strategies in the pursuit of health
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## Conflict of Interest

These authors have no conflict of interest.

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## Appendix

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